

30-2 Gas-discharge Headlamps :Effective date from 2017/1/1

Refer to: R98 01-S5,01-S6, R113 01-S5

30-2.1 Effective date and Scope:

30-2.1.1 Effective date from 2017/1/1, the new types of gas-discharge headlamps and distributed lighting systems of gas-discharge light sources equipped on category symbols M, N ,L3 and L5, shall comply with this regulation and shall be use bulbs that is conform with "Filament lamps" and/or "LED light sources" of this Direction.

30-2.1.2 Effective date from 2018/1/1, the new types of Class E headlamps equipped on categories of L, shall comply with paragraph10. and shall be use gas-discharge light source that is conform with "Filament lamps" and/or "LED light sources" of this Direction.

30-2.1.3 Effective date from 2019/1/1, existing types of gas-discharge headlamps which were confirmed to "30-1 Gas-discharge Headlamps" of category symbols M, N and L, shall comply with 30-2.4.6 in addition, except the applicants applying for low volume safety approval and applying for vehicle-by-vehicle low volume.

30-2.1.4 The applicants applying for low volume safety approval could exempt from regulation of "gas-discharge headlamps" except large passenger vehicle and child-only vehicle.

30-2.1.5 Applying for vehicle-by-vehicle low volume safety approval, the vehicle could exempt from regulation of "gas-discharge headlamps".

30-2.2 Definitions:

30-2.2.1 "Lens" means the outermost component of the headlamp (unit) which transmits light through the illuminating surface;

30-2.2.2 "Coating" means any product or products applied in one or more layers to the outer face of a lens;

30-2.2.3 "Additional lighting unit" means the part of a headlamp system that provides the bend lighting. It is independent from the device that provides the principal passing beam, may consist of optical, mechanical and electrical components, and it may be grouped and/or reciprocally incorporated with other lighting or light-signaling devices.

30-2.3 Gas-discharge Headlamps shall according to suitable types and range of principle are as below :

30-2.3.1 The same trade name

30-2.3.2 The same characteristics of the optical system , however , if bulbs or filter's color is change that it doesn't mean to change the variants.

30-2.3.3 The same inclusion or elimination of components capable of altering the optical effects by reflection, refraction, absorption and/or deformation during operation

30-2.3.4 The same kind of beam produced (passing beam or driving beam or both)

30-2.3.5 The same category of filament lamp(s), the gas-discharge light source or the light source module specific identification code(s);

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30-2.4 General rule

30-2.4.1 Provisions concerning passing beams

30-2.4.1.1 Gas-discharge light source: The test voltage is either $13.2\text{ V} \pm 0.1\text{V}$ for 12V systems or otherwise specified by the mark on headlamp unit.

30-2.4.1.2 It shall conform to requirements concerning light sources of "Filament lamps" regulated in VSTD : The lamp shall be measured by means of an uncoloured standard (etalon) filament lamp designed for a rated voltage of 12 V. During the checking, the voltage at the terminals of the filament lamp shall be regulated so as to obtain the reference luminous flux at 13.2 V as indicated at the relevant data sheet .

30-2.4.1.3 In the case of LED module(s): The lamp shall be measured at 6.3 V, 13.2 V or 28.0V 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.

30-2.4.2 Only one gas-discharge light source is permitted for each passing beam headlamp. A maximum of two additional light sources are permitted as follows:

30-2.4.2.1 One additional light source according to Regulation "bulbs" or one or more additional LED module(s) may be used inside the passing beam headlamp to contribute to bend lighting.

30-2.4.2.2 One additional light source according to Regulation "bulbs", and/or one or more LED module(s) inside the passing beam headlamp, may be used for the purposes of generating infrared radiation. It/they shall only be activated at the same time as the gas-discharge light source. In the event that the gas-discharge light source fails, this additional light source and/or LED module(s) shall be automatically switched off. The test voltage for the measurement with this additional light source and/or LED module(s) shall be the same as in paragraph 30-2.4.1.

30-2.4.2.3 In the event of failure of an additional light source or LED module, the headlamp shall continue to fulfil the requirements of the passing beam.

30-2.4.3 Except for Class E headlamps, 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 a bend lighting, any mechanical, electro-mechanical or other device incorporated in the headlamp for these purposes must be so constructed that:

30-2.4.3.1 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.

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30-2.4.3.2 In the case of failure, the luminous intensity of the headlamp above the line H-H shall not exceed the values of a passing beam according to paragraph 30-2.5.4.; in addition, on headlamps designed to provide a passing and/or a driving beam to become a bend lighting, a luminous intensity of at least 2500 cd shall be fulfilled in test point 25 V (VV line, 1.72D).

30-2.4.4 The headlamp (if equipped with LED modules) and the LED module(s) themselves shall comply with the relevant requirements specified in paragraph 30-2.9 of this Regulation.

30-2.4.5 For Class E: The headlamp shall be equipped with (a) gas-discharge light source(s) and/or (an) LED module(s) approved according to "Filament lamps" of "Directions".

30-2.4.5.1 The lamp holder shall conform to the dimensional characteristics as given on the data sheet of IEC Publication 60061-2, relevant to the category of gas-discharge light source used. The gas-discharge light source shall fit easily into the headlamp.

30-2.4.5.2 For Class E, the headlamp and ballast system shall not generate radiated or power line disturbances to cause a malfunction of other electric/electronic systems of the vehicle.

30-2.4.5.3 For Class E shall comply with paragraph 30-2.11.

30-2.4.5.4 In the case of (an) LED module(s) the following requirements apply:

30-2.4.5.4.1 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);

30-2.4.5.4.2 The headlamp and the LED module(s) themselves shall comply with the relevant requirements specified in paragraph 30-2.9. to this Regulation. The compliance with the requirements shall be tested.

30-2.4.5.4.3 The total objective luminous flux of all LED modules producing the passing beam shall be measured as described in paragraph 30-2.11.6. The following minimum limit shall apply:

	Headlamps Class E
Passing beam minimum	2000 lumen

30-2.4.5.4.4 "The installation of lighting and light-signaling devices" of "Directions" allow the use of LED module, which may contain holders for other light sources. Notwithstanding this provision a mixture of LED'(s) and other light sources for the passing beam or each driving beam, as specified by this Regulation is not allowed.

30-2.4.5.4.5 A LED module shall be:

30-2.4.5.4.5.1 Only removable from its device with the use of tools, unless it is stated in the communication sheet that the LED

module is non replaceable and;

30-2.4.5.4.5.2 So designed that regardless of the use of tool(s), it is not mechanically interchangeable with any replaceable approved light source.

30-2.4.6 Specifications marked

30-2.4.6.1 Non class E headlamps, means the marks shall be clearly legible on the outside of the marking material and shall be indelible to include below:

30-2.4.6.1.1 Brand (or marking), type of replaceable light sources(or MD(or MODULE) the light source module specific identification code).

30-2.4.6.1.2 In the case of lamps with LED module(s), the lamp shall bear the marking of the rated voltage and rated wattage and the light source module specific identification code.

30-2.4.6.1.3 The light source module must to mark Brand (or marking), MD(or MODULE) the light source module specific identification code, rated voltage (or ranged voltage)and rated wattage. However this provision does not apply to the LED is non-replaceable.

30-2.4.6.1.4 If an electronic light source control gear which is not part of a LED module is used to operate a LED module(s), it shall be marked with its MD(or MODULE) specific identification code(s), rated voltage (or range voltage)and rated wattage.

30-2.4.6.1.5 On headlamps meeting left-hand traffic requirements only, a horizontal arrow pointing to the right of an observer facing the headlamp, i.e. to the side of the road on which the traffic moves; Not apply for this lamp of specification (figure as below , "a" is at least 5 mm).



30-2.4.6.1.6 On headlamps designed to meet the requirements of both traffic systems by means of an appropriate adjustment of the setting of the optical unit or the light source, a horizontal arrow with a head at each end, the heads pointing respectively to the left and to the right.

30-2.4.6.1.7 On headlamps meeting the requirements of this Regulation in respect of the passing beam only, the letter "DC".

30-2.4.6.1.8 On headlamps meeting the requirements of this Regulation in respect of the driving beam only, the letter "DR".

30-2.4.6.1.9 On headlamps meeting the requirements of this Regulation in respect of both the passing beam and the driving beam, the letters "DCR".

30-2.4.6.1.10 On headlamps incorporating a lens of plastic material, the letters "PL" to be affixed near the symbols prescribed in

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paragraphs 30-2.4.6.1.7. to 30-2.4.6.1.9 above.



30-2.4.6.1.11 On headlamps meeting the requirements of this Regulation in respect of the driving beam, an indication of the maximum luminous intensity expressed by a reference mark as defined in paragraph 30-2.5.5.4.

In the case of reciprocally incorporated headlamps, indication of the maximum luminous intensity of the driving beam as a whole shall be expressed as above.

30-2.4.6.1.12 On headlamps meeting the requirements of this Regulation which are so designed that the passing beam shall not be lit simultaneously with that of any other lighting function with which it may be reciprocally incorporated: an oblique stroke (/) shall be placed behind symbol indicating the headlamp producing the passing beam in the approval mark.



30-2.4.6.1.13 The requirement in paragraph 30-2.4.6.1.12. above shall not apply to headlamps meeting the requirements of this Regulation which are so designed that the passing beam and the driving beam are provided by the same gas-discharge light source.

30-2.4.6.1.14 The marks in paragraphs 30-2.4.6.1.5. to 30-2.4.6.1.13. above shall be clearly legible and be indelible and they may be placed on an inner or outer part (transparent or not) of the headlamp, which cannot be separated from the transparent part of the headlamp emitting the light.

In any case the marking shall be visible when the headlamp or the system is fitted on the vehicle or when a movable part (such as the hood, trunk's lid which belong to vehicle's liftable panel) is opened.

30-2.4.6.1.15 Voltage markings



This marking must be placed on the main body of each headlamp containing only gas discharge light sources and ballast, and on each external part of the ballast

The ballast(s) is(are) designed for a ** volts network system.



This marking must be placed on the main body of each headlamp containing at least one gas discharge light source and ballast.

The ballast(s) is(are) designed for a ** volts network system.

None of the filament lamps and/or LED module(s) which the headlamp contains is designed for a 24 volts network system.

30-2.4.6.2 Class E headlamps ,means the marks shall be clearly legible on the outside of the marking material and shall be indelible to include below:

30-2.4.6.2.1 Brand (or marking).

30-2.4.6.2.2 Filament lamp(s) or gas-discharge light source type.

30-2.4.6.2.3 Class E headlamps may bear on their light-emitting surface a centre of reference.

30-2.4.6.2.4 Class E headlamps shall bear the voltage markings



This marking must be placed on the main body of each headlamp containing only gas discharge light sources and ballast, and on each external part of the ballast.

The ballast(s) is(are) designed for a ** volts network system.



This marking must be placed on the main body of each headlamp containing at least one gas discharge light source and ballast.

The ballast(s) is(are) designed for a ** volts network system.

None of the filament lamps and/or LED module(s) which the headlamp contains is designed for a 24 volts network system.

30-2.4.6.2.5 In the case of lamps with LED module(s), the lamp shall bear the marking of the rated voltage and rated wattage and

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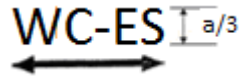
the light source module specific identification code.

30-2.4.6.2.6 The LED module must to mark Brand (or marking), MD(or MODULE) the light source module specific identification code, rated voltage (or ranged voltage)and rated wattage. However this provision does not apply to the LED is non-replaceable.

30-2.4.6.2.7 If an electronic light source control gear which is not part of a LED module is used to operate a LED module(s), it shall be marked with its MD(or MODULE) specific identification code(s), the rated input voltage and wattage.

30-2.4.6.2.8 A horizontal arrow with a head on each end, pointing to the left and to the right.

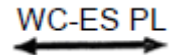
30-2.4.6.2.9 On headlamps meeting the requirements of this Regulation in respect of the passing beam only, the letters "WC-ES" for Class E headlamps (in a is at least 5 mm ,as figure below).

WC-ES 

30-2.4.6.2.10 On headlamps meeting the requirements of this Regulation in respect of the driving beam only, the letters "WR-ES" for Class E headlamps.

30-2.4.6.2.11 On headlamps meeting the requirements of this Regulation in respect of both the passing beam and the driving beam, the letters "WCR-ES" for Class E headlamps.

30-2.4.6.2.12 On headlamps incorporating a lens of plastic material, the letters "PL" to be affixed near the symbols prescribed in paragraphs 30-2.4.6.2.9. to 30-2.4.6.2.11. above;

WC-ES PL 

30-2.4.6.2.13 Except class A headlamps ,on headlamps meeting the requirements of this Regulation in respect of the driving beam, an indication of the maximum luminous intensity expressed by a reference mark as defined in paragraph 30-2.5.5.4.

30-2.4.6.2.14 On headlamps meeting the requirements of this Regulation which are so designed that the filament lamp, gas-discharge light source or LED module(s) producing the passing beam shall not be lit simultaneously with that of any other lighting function with which it may be reciprocally incorporated: an oblique stroke (/) shall be placed behind the passing lamp symbol in the approval mark.

C/R-BS 

30-2.4.6.2.15 The marks stipulated in 30-2 4.6.2.8 to 30-2 4.6.2.14 shall be clearly legible and be indelible and they may be placed on an inner or outer part (transparent or not) of the headlamp, which cannot be separated from the transparent part of the

headlamp emitting the light. In any case the marking shall be visible when the headlamp or the system is fitted on the vehicle or when a movable part such as the hood is opened.

30-2.5 Photometric test

30-2.5.1 Specifications of measuring screen and distribution of cut-off

30-2.5.1.1 The luminous intensity produced by the headlamp shall be measured at 25 m distance by means of a photoelectric cell having a useful area comprised within a square of 65 mm 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, Figure 2 and Figure 3). (Dimensions are in cm on a flat vertical screen at 25m. The HH and VV lines are the intersections with this screen of the horizontal and vertical planes passing through the axis of reference of the passing beam as declared by the applicant. Angle HVH2-HH-15 degrees.)

30-2.5.1.2 The dimensions determining the position of the arc inside the standard gas-discharge light source shall comply with the requirements of regulation "bulbs" specified in the "Directions for the Safety Type Approval and Conformity of Production of Motor Vehicle Components".

30-2.5.1.3 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.

30-2.5.1.3.1 The "cut-off" shall provide:

- (a) a straight "horizontal part" towards the left;
- (b) a raised "elbow – shoulder" part towards the left. In each case the "elbow – shoulder" part shall have a sharp edge.

30-2.5.1.3.2 The headlamp shall be visually aimed by means of the "cut-off" (see figure 4 below) 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 as shown to this Regulation. The screen shall be sufficiently wide to allow examination and adjustment of the "cut-off" of the passing beam over at least 5 degrees (Class E shall at least 3 degrees) on either side of the V-V line.

30-2.5.1.3.2.1 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;

30-2.5.1.3.2.2 for horizontal adjustment: the "elbow–shoulder" part of the "cut-off" shall be moved:

- ☐ a above the line 0.2° D its "shoulder" shall not exceed the line A to the left and
- ☐ b on the line 0.2° 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; (Figure 4)

30-2.5.1.3.3 Where a headlamp so aimed does not meet the requirements set out in paragraphs 30-2.5.4, 30-2.5.4.1. and 30-

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2.5.5, its alignment may be changed, provided that the axis of the beam is not displaced:

Horizontally from line A by more than: 0.5° to the left or 0.75° to the right, for right hand traffic or ; 0.5° to the right or 0.75° to the left, for left hand traffic and vertically not more than 0.25° up or down from line B.

30-2.5.1.3.4 If, however, vertical adjustment cannot be performed repeatedly to the required position within the tolerances described in paragraph 30-2.5.1.3.3. above, the instrumental method of paragraph 30-2.10. 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.

30-2.5.1.4 The passing beam of headlamp shall be so aimed that the horizontal part of the "cut-off" is situated on the screen 25 cm below the line HH. The kink of the elbow of the cut-off shall be on the VV line. Where a headlamp so aimed does not meet the requirements of illumination for driving beam and passing beam, its alignment may be changed, provided that the axis of the beam is not displaced laterally by more than 0.5° ($=22\text{cm}$) to the right or left and vertically not more than 0.2° ($=8.7\text{cm}$) up or down.

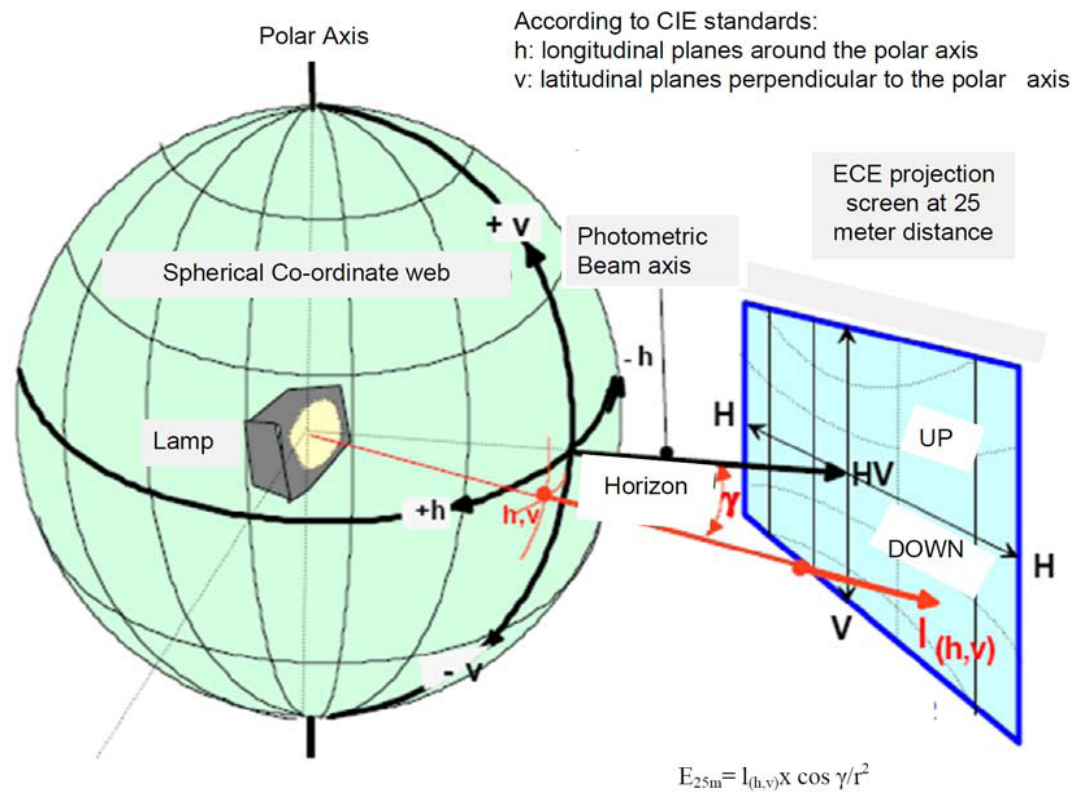
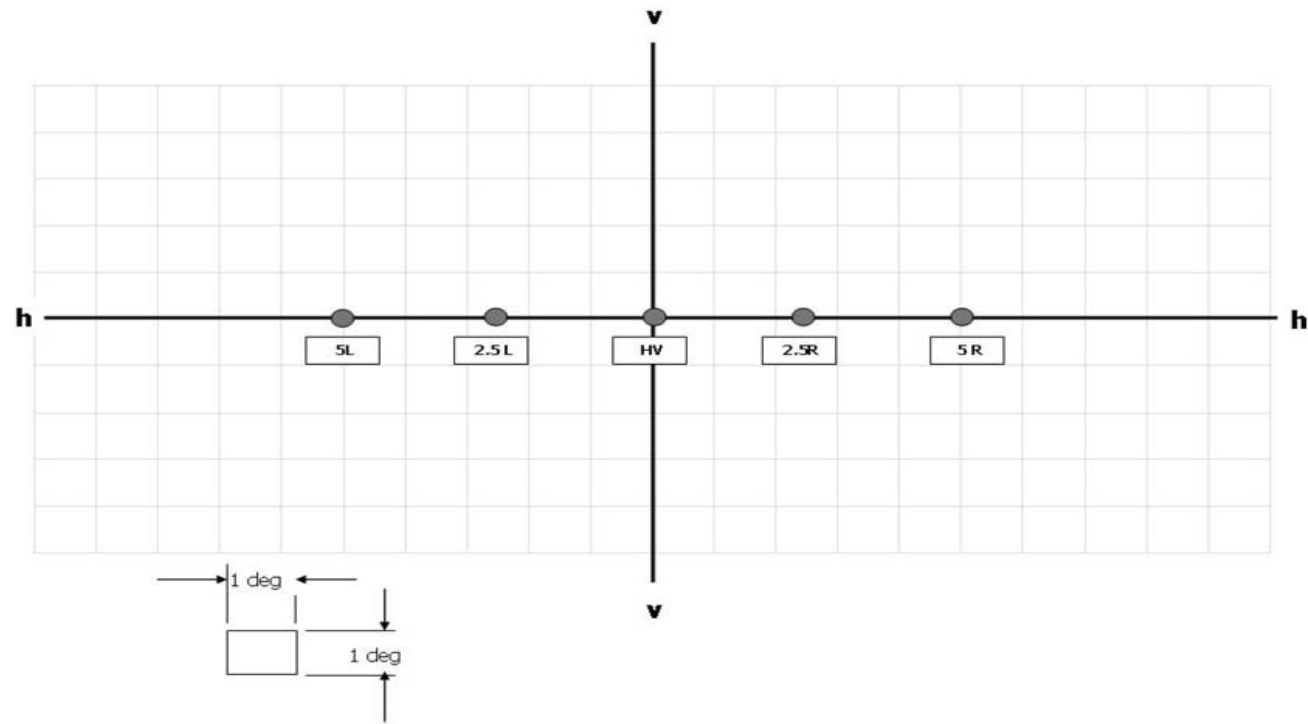


Figure 1.Measuring screen 1

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h-h = horizontal plane , v-v = vertical plane passing through the optical axis of the headlamp"

Figure 3.Measuring points for illumination values

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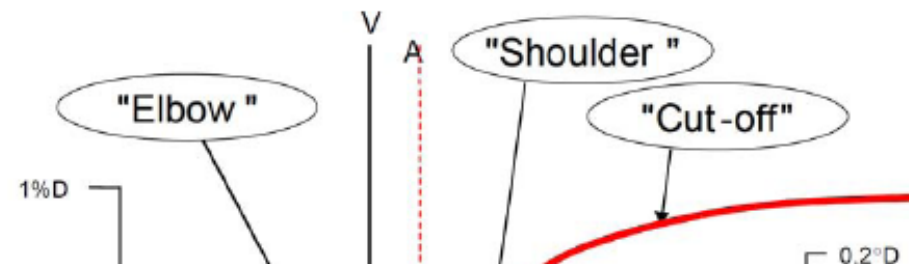


Figure 4:

30-2.5.2 Four seconds after ignition of a headlamp, equipped with a gas discharge light source with the ballast not integrated with the light source, and that has not been operated for 30 minutes or more:

30-2.5.2.1 At least 37500 cd shall be attained at point HV, for a headlamp producing driving beam only.

30-2.5.2.2 At least 6250 cd shall be attained at point 50V for headlamps producing passing beam only or alternately passing and driving beam functions.(in paragraph 30-2.4.3. above).

30-2.5.2.3 In either case the power supply shall be sufficient to secure the required rise of the high current pulse.

30-2.5.3 The screen illuminance values emitted by a driving beam and a passing beam shall be measured by means of a photo-receptor, the effective area of which shall be contained within a square of 65 mm side.

30-2.5.4 After more than 10 minutes after ignition, the luminous intensities produced by passing beam on measuring screen 2 (Figure 2) shall meet the requirements of Table 1.

Table 1.The requirement of illumination produced on the screen by a passing beam of gas-discharge headlamp

Points or segments	Designation**	Luminous Intensity (cd)	Horizontal Angle (Degree)	Vertical Angle (Degrees)

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Any point in zone A (bounded by the following coordinates in degrees)										s)	
8L	8L	8R	8R	6R	1.5R	V-V	4L	Max	Min		
1U	4U	4U	2U	1.5U	1.5U	H-H	H-H	625			
2	B 50 L							350		3.43L	0.57U
3	75 R								12,500	1.15R	0.57D
4	50 L							18,480		3.43L	0.86D
5	25 L 1							18,800		3.43L	1.72D
6	50 V								7,500	0	0.86D
7	50 R								12,500	1.72R	0.86D
8	25 L2								2,500	9L	1.72D
9	25 R1								2,500	9R	1.72D
10	25 L3								1,250	15L	1.72D
11	25 R2								1,250	15R	1.72D
12	15 L								625	20L	2.86D
13	15 R								625	20R	2.86D
14									*	8L	4U
15									*	0	4U
16									*	8R	4U
17									*	4L	2U
18									*	0	2U
19									*	4R	2U
20									65	8L	0
21									125	4L	0
A to B	Segment I								3,750	5.15L to 5.15R	0.86D
C - D								1,750		2.5R	1U
E to F	Segment III and under							12,500		9.37L to 8.53R	4.29D
	E max R							43,800		Right of VV line	Above 1.72 D

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Points or segments	Designation**	Luminous Intensity (cd)	Horizontal Angle (Degree)	Vertical Angle (Degrees)
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	E max L	31,300		Left of VV line	
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Note :

Letter L means that the point or segment is located on the left of VV line.

Letter R means that the point or segment is located on the right of VV line.

Letter U means that the point or segment is located above HH line.

Letter D means that the point or segment is located below HH line.

The illumination values at points 14 through 19 shall be such that :

$$14+15+16 \geq 190\text{cd}$$

$$\text{and } 17+18+19 \geq 375\text{ cd}$$

30-2.5.4.1 The requirements in paragraph 30-2.4.2.2. above shall also apply to headlamps designed to provide bend lighting and/or that include the additional light source or LED module(s) referred to in paragraph 30-2.5.4. 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°.

30-2.5.5 Provisions concerning driving beams:

30-2.5.5.1 In the case of a headlamp designed to provide a driving beam and a passing beam, measurement of the illumination produced on the screen by the driving beam shall be taken with the same headlamp alignment as for measurement of passing beam above.

30-2.5.5.2 In the case of a headlamp providing a driving beam only, it shall be so adjusted that the area of maximum illumination is centered on the point (HV) of intersection of lines HH and VV.

30-2.5.5.3 Referring to Figure 3, and the table below, the luminous intensity distribution of the driving beam shall meet the following requirements :

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Test point	Angular coordinates Degrees	Required luminous intensity cd
		Min
H-5L	0.0 , 5.0 L	6,250
H-2.5L	0.0 , 2.5 L	25,000
H-2.5R	0.0 , 2.5 R	25,000
H-5R	0.0 , 5.0 R	6,250

30-2.5.5.3.1 The point of intersection (HV) of lines HH and VV shall be situated within the isolux representing 80 % of the maximum luminous intensity. This maximum value (IM) shall not be less than 43,800 cd.

30-2.5.5.3.2 The maximum value (IM) shall in no circumstances exceed 215,000 cd.

30-2.5.5.4 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.

30-2.5.6 Provisions concerning movable reflectors: With the lamp fixed according to all the positions, the headlamp must meet the photometric requirements of driving beam and passing beam, or both. Additional tests are made after the reflector has been tilted vertically upwards by the angle (the maximum vertical angles above and below the nominal position(s) which the aiming device can achieve) or 2 degrees, whichever is smaller, by means of the headlamp-aiming devices. The headlamp is then re-aimed downwards by means of the goniometer, and the photometric specifications must be met at the following points :

Passing beam : HV and 75R (75L respectively)

Driving beam : IM and point HV (percentage of IM).

If the aiming devices do not allow a continuous movement, the position nearest to 2 degrees is chosen.

The reflector is brought back to its nominal angular position, and the goniometer is set back to its position of origin. The reflector is tilted vertically downwards by the angle (the maximum vertical angles above and below the nominal position(s) which the aiming device can achieve) or 2 degrees, whichever is smaller, by means of the headlamp aiming device. The headlamp is then re-aimed upwards by means of the goniometer, and points as above are checked.

30-2.5.7 If bend lighting is obtained by following ways as below that shall not only testing in the following situations but also comply with paragraph 30-2.5.4

- 30-2.5.7.1 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;
- 30-2.5.7.2 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;
- 30-2.5.7.3 means of one additional 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.

30-2.6 Trichromatic coordinates: In the case of gas-discharge headlamp, the light emitted shall be white as definition in “The installation of lighting and light-signalling devices”.

30-2.7 Test for stability of photometric performance:

- (a) The test shall be carried out in a dry and still atmosphere at an ambient temperature of $23 \pm 5^{\circ}\text{C}$, the complete headlamp 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 dismantled 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.

30-2.7.1 Clean headlamp

30-2.7.1.1 Test procedure: The headlamps shall be operated for 12 hours.

30-2.7.1.1.1 When the tested headlamp is grouped and/or reciprocally incorporated with signaling lamps, the signaling lamps 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. Should two or more light sources be simultaneously lit when headlamp flashing is used, this shall not be considered as being normal use of the light sources simultaneously.

30-2.7.1.1.2 In the case where only one lighting function (driving or passing beam), is to be tested, the corresponding light source is lit for the prescribed time.

30-2.7.1.1.3 In the case of a reciprocally incorporated passing beam and driving beam or in the case of a reciprocally incorporated front fog lamp and driving beam headlamp:

30-2.7.1.1.3.1 If the applicant declares that the headlamp is to be used with a single light source lit at a time, the test shall

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be carried out in accordance with this condition, activating each specified function successively for half the time specified above.

30-2.7.1.1.3.2 In all other cases, the headlamp shall be subjected to the following cycle until the time specified is reached:

15 minutes, passing beam lit

5 minutes, all functions lit;

30-2.7.1.1.4 In the case of grouped lighting functions, all the individual functions shall be lit simultaneously for the time specified for individual lighting functions (a), also taking into account the use of reciprocally incorporated lighting functions (b), according to the manufacturer's specifications.

30-2.7.1.1.5 In the case of a passing beam designed to provide bend lighting with the addition of a light source, this light source shall be switched on for 1 minute, and switched off for 9 minutes during the activation of the passing beam only.

30-2.7.1.1.6 In the case that the driving beam uses several light sources, if the applicant declares that a part of the driving beam (one of these additional light sources) will be used exclusively for short time signals (flash to pass), the test shall be carried out without this part of the driving beam.

30-2.7.1.1.7 Test voltage :

The voltage shall be applied to the terminals of the test sample as follows:

30-2.7.1.1.7.1 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.

30-2.7.1.1.7.2 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 \pm 0.1 volts for 12 V vehicle voltage system, or otherwise specified in the application for approval.

30-2.7.1.1.7.3 In the case of non-replaceable light source 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.

30-2.7.1.1.7.4 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).

30-2.7.1.1.7.5 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

30-2.7.1.1.7.6 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.

30-2.7.1.2 Test results:

30-2.7.1.2.1 Visual inspection : It shall be inspected visually, no distortion, deformation, cracking or change in color of either the headlamp lens or the external lens, if any, shall be noticeable.

30-2.7.1.2.2 Photometric test : A 10 % discrepancy between the photometric characteristics and the values measured prior to the test is permissible including the tolerances of the photometric procedure.

To comply with the requirements of this Regulation, the photometric values shall be verified in the following points:

30-2.7.1.2.2.1 Passing beam: 50 R - B 50 L - 25L

30-2.7.1.2.2.2 Driving beam: Point of I_{max}.

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

Except for point B50L, a 10 per cent discrepancy between the photometric characteristics and the values measured prior to the test is permissible including the tolerances of the photometric procedure. The value measured at point B50L shall not exceed the photometric value measured prior to the test by more than 170 cd.

30-2.7.2 Dirty headlamp:

30-2.7.2.1 Preparation of the test

30-2.7.2.1.1 Test mixture

30-2.7.2.1.1.1 For headlamp with the outside lens in glass: The mixture of water and a polluting agent to be applied to the headlamp shall be composed of:

- (a) 9 parts by weight of silica sand with a particle size of 0-100 micrometres,
- (b) 1 part by weight of vegetal carbon dust produced from beech wood with a particle size of 0-100 micrometres,
- (c) 0.2 parts by weight of NaCMC, and
- (d) 5 parts by weight of sodium chloride (pure at 99 per cent),

(e) an appropriate quantity of distilled water, with a conductivity of < 1 microS/m.

The mixture must not be more than 14 days old.

30-2.7.2.1.1.2 For headlamp with outside lens in plastic material: The mixture of water and polluting agent to be applied to the headlamp shall be composed of:

(a) 9 parts by weight of silica sand with a particle size of 0-100 micrometres,

(b) 1 part by weight of vegetal carbon dust produced from beech wood with a particle size of 0-100 micrometres,

(c) 0.2 part by weight of NaCMC

(d) 5 parts by weight of sodium chloride (pure at 99 per cent),

(e) 13 parts by weight of distilled water with a conductivity of < 1 microS/m, and

(f) 2 +/- 1 parts by weight of surface-actant.

The mixture must not be more than 14 days old.,

30-2.7.2.1.2 After being tested as specified in paragraph 30-2.7.1, the headlamp shall be operated for one hour as described paragraph 30-2.7.1, 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:

30-2.7.2.1.2.1 Point Emax in passing beam/driving beam and in driving beam only,

30-2.7.2.1.2.2 50 R and 50 V for a passing lamp only.

30-2.7.3 Test for change in vertical position of the cut-off line under the influence of heat

30-2.7.3.1 The headlamp tested in accordance with paragraph 30-2.7.1 (Clean headlamp) and 30-2.7.2 (Dirty headlamp) shall be subjected to the test without being moved from or readjusted in relation to its test fixture.

30-2.7.3.2 Using a mass production gas-discharge light source which has been aged for at least 15 hours, the headlamp shall be operated on passing beam function. The position of the cut-off line in its horizontal part, between VV and the vertical line passing through point B50L, shall be verified 3 minutes (r3) and 60 minutes (r60) respectively after operation.

30-2.7.3.3 Test result expressed in milliradians (mrad) shall be considered as acceptable when the absolute value $\Delta r_l = |r_3 - r_{60}|$ recorded on the headlamp is not more than 1.0 mrad.

30-2.7.3.4 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 30-2.7.3.2, after being subjected three consecutive times to the cycle as described below :

Operation of the passing beam for one hour;

Period of rest for one hour.

The headlamp type shall be considered as acceptable if the mean value of the absolute values Δr_l measured on the

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

30-2.8 Requirements for lamps incorporating lenses of plastic material -Testing of lenses or material samples and of complete.

Fourteen lenses shall be supplied, numbered and tested pursuant to the Table 2. Two samples of complete lamps shall be supplied, numbered and tested in accordance with the Table 3. The test method and the standards for respective test item are indicated below :

Table 2. Tests on plastic material (lenses or samples)

Sample No.	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 measurements	○	○	○											

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Resistance to detergents and hydrocarbons				○	○	○								
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 3 Tests on complete headlamps

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

30-2.8.1 Resistance to temperature changes

30-2.8.1.1 Before the test, the samples shall be kept at $23 \pm 5^{\circ}\text{C}$ and 60% ~ 75% RH (RH = relative humidity) for at least four hours.

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Then three new samples (lenses) shall be subject to five cycles of temperature and humidity change in accordance with the following program :

3 hours at $40 \pm 2^{\circ}\text{C}$ and 85% ~95% RH,

1 hours at $23 \pm 5^{\circ}\text{C}$ and 60% ~75% RH,

15 hours at $-30 \pm 2^{\circ}\text{C}$,

1 hours at $23 \pm 5^{\circ}\text{C}$ and 60% ~75% RH,

3 hours at $80 \pm 2^{\circ}\text{C}$,

1 hours at $23 \pm 5^{\circ}\text{C}$ and 60% ~75% RH.

30-2.8.1.2 Photometric measurements shall be carried out on the samples before and after the test. These measurements shall be made by using a standard lamp, at the following points :

For the passing beam of a passing lamp or a passing/driving lamp: B50L and 50R,

For the driving beam of a driving lamp or a passing/driving lamp: point of maximum photometric value Emax

30-2.8.1.3 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.

30-2.8.2 Resistance to atmospheric and chemical agents

The definition of the following readings are indicated in the table :

Reading	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

30-2.8.2.1 Three samples shall be exposed to an energetic illumination of $1200 \text{ W/m}^2 \pm 200 \text{ W/m}^2$ for a period such that the luminous

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energy that they receive is equal to $4500 \text{ MJ/m}^2 \pm 200 \text{ MJ/m}^2$. Within the enclosure, the temperature measured on the black panel placed on a level with the sample shall be $50^\circ\text{C} \pm 5^\circ\text{C}$. 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 $23^\circ\text{C} \pm 5^\circ\text{C}$ in accordance with the following cycle :

Spraying : 5 minutes,

Drying : 25 minutes

30-2.8.2.2 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 (Δt_m) in transmission $\Delta t = (T_2 - T_3)/T_2$ measured on the three samples shall not exceed 0.020.

30-2.8.2.3 Soak a piece of cotton cloth until saturation with the test mixture (The test mixture shall be composed of 61.5% n-heptane, 12.5% toluene, 7.5% ethyl tetrachloride, 12.5% trichloroethylene and 6% xylene (volume%).), and, within 10 seconds, apply it for 10 minutes to the outer face of the sample 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 $23^\circ\text{C} \pm 5^\circ\text{C}$. Afterward the samples shall be carefully rinsed with distilled water at $23^\circ\text{C} \pm 5^\circ\text{C}$ and then wiped off with a soft cloth.

30-2.8.2.4 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.

30-2.8.2.5 Flat samples of each light transmitting plastic component of the headlamp are exposed to the light of the gas-discharge light source. The parameters such as the angles and distances of these samples shall be the same as in the headlamp. After 1,500 hours of continuous exposure, the colorimetric specifications of the transmitted light must be met with a new standard gas-discharge light source, and the surface of the samples shall be free of cracks, scratches, scalings and deformation.

30-2.8.3 Resistance to detergents and hydrocarbons

30-2.8.3.1 The outer face of three samples shall be heated to $50^\circ\text{C} \pm 5^\circ\text{C}$ and then immersed for five minutes in a mixture maintained at $23^\circ\text{C} \pm 5^\circ\text{C}$ 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 $50^\circ\text{C} \pm 5^\circ\text{C}$. The surface of the samples shall be cleaned with a moist cloth

30-2.8.3.2 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.

30-2.8.3.3 After the above two tests have been performed successively, the mean value (Δt_m) of the variation in transmission $\Delta t = (T_2 - T_3)/T_2$ measured on the three samples shall not exceed 0.010.

30-2.8.4 Resistance to mechanical deterioration

30-2.8.4.1 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 l/minute at an operating pressure of 6.0 bars $-0, +0.5$ bar, at a distance of $380 \text{ mm} \pm 10 \text{ mm}$ 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: $\Delta d = (T_5 - T_4)/T_2 = 0.025 \pm 0.0025$.

30-2.8.4.2 After this test, the variations in transmission: $\Delta t = (T_2 - T_3)/T_2$ and in diffusion: $\Delta d = (T_5 - T_4)/T_2$ shall be measured. The mean value of the three samples shall be such that: $\Delta t_m \leq 0.100$, $\Delta d_m \leq 0.050$.

30-2.8.5 Test of adherence of coatings, if any

30-2.8.5.1 The lens with coating shall be conducted by the test of the adherence of coating, if any.

30-2.8.5.2 A surface of $20 \text{ mm} \times 20 \text{ mm}$ in area of the coating of a lens shall be cut a razor blade into a grid of squares approximately $2 \text{ mm} \times 2 \text{ mm}$. An adhesive tape with a force adhesion of $2 \text{ N/cm} \pm 20\%$, at least 25 mm 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 $1.5 \text{ m/s} \pm 0.2 \text{ m/s}$.

30-2.8.5.3 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.

30-2.8.6 Tests of the complete headlamp

30-2.8.6.1 Resistance to mechanical deterioration (the lens of lamp sample No. 1 shall be subjected to the test)

30-2.8.6.1.1 The lens of lamp sample No. 1 shall be subjected to the test described in paragraph 30-2.8.4.1.

30-2.8.6.1.2 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 and HV and not be more than 10% below the minimum values prescribed at point 75 R.

By more than 10 per cent below the minimum values prescribed for HV in the case of a headlamp producing driving beam only.

30-2.8.6.2 Test of adherence of coating (the sample of complete headlamp No. 2 shall be tested). The lens of lamp sample No. 2 shall be subjected to the test and meet the results described in paragraph 30-2.8.5.

30-2.9 Requirement for LED modules and headlamps including LED modules

30-2.9.1 General specifications

30-2.9.1.1 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.

30-2.9.1.2 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.

30-2.9.1.3 LED module(s) shall be tamperproof.

30-2.9.1.4 The design of removable LED module(s) shall be such that:

30-2.9.1.4.1 when the LED module is removed and replaced with another module provided by the applicant and bearing the same light source module identification code, the photometric specifications of the headlamp shall be met;

30-2.9.1.4.2 LED modules with different light source module identification codes within the same lamp housing, shall not be interchangeable.

30-2.9.1.5 Electronic light source control gear(s) may be part of the LED module(s)."

30-2.9.2 Manufacture

30-2.9.2.1 The LED(s) on the LED module shall be equipped with suitable fixation elements.

30-2.9.2.2 The fixation elements shall be strong and firmly secured to the LED(s) and the LED module.

30-2.9.3 Test conditions

30-2.9.3.1 Application: all samples shall be tested as specified in paragraph 30-2.9.4. below;

30-2.9.3.2 Operation conditions:

30-2.9.3.2.1 LED module operating conditions: All samples shall be tested under the conditions as specified in paragraphs 30-2.4.1 of this Regulation. If not specified differently in this annex LED modules shall be tested inside the headlamp as submitted by the manufacturer.

30-2.9.3.2.2 Ambient temperature: For the measurement of electrical and photometric characteristics, the headlamp shall be operated in dry and still atmosphere at an ambient temperature of $23\text{ °C} \pm 5\text{ °C}$.

30-2.9.3.2.3 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.

30-2.9.4 Specific requirements and tests

30-2.9.4.1 UV-radiation: The UV-radiation of low-UV-type LED module shall be such that:

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

where:

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

$k_m = 683 \text{ lm/W}$ is the maximum value of the luminous efficacy of radiation.

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 4)

λ	$S(\lambda)$	λ	$S(\lambda)$
250	0.430	330	0.00041
255	0.520	335	0.00034
260	0.650	340	0.00028
265	0.810	345	0.00024
270	1.000	350	0.00020
275	0.960	355	0.00016
280	0.880	360	0.00013
285	0.770	365	0.00011
290	0.640	370	0.000090
295	0.540	375	0.000077
300	0.300	380	0.000064
305	0.060	385	0.000053
310	0.015	390	0.000044
315	0.003	395	0.000036
320	0.001	400	0.000030
325	0.00050		

30-2.10 Instrumental verification of the “cut-off “ for passing beam headlamps

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30-2.10.1 General:

In the case where paragraph 30-2.5.1.3.4 of this Regulation applies, the quality of the "cut-off" shall be tested according to the requirements set out in paragraph 30-2.10.2. below and the instrumental vertical and horizontal adjustment of the beam shall be performed according to the requirements set out in paragraph 30-2.10.3. below.

Before carrying out the measurement of the quality of "cut-off" and the instrumental aiming procedure, a visual pre-aim in accordance with paragraphs 30-2.5.1.3.2.1 and 30-2.5.1.3.2.2 of this Regulation is required.

30-2.10.2 Measurement of the quality of the "cut-off":

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° at either a measurement distance of:

- (a) 10 m with a detector having a diameter of approximately 10 mm or
- (b) 25 m with a detector having a diameter of approximately 30 mm.

The measuring distance at which the test was carried out shall be recorded in item 9. of the communication form.

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° exclusively at a measurement distance of 25 m and with a detector having a diameter of approximately 30 mm.

The "cut-off" quality shall be considered acceptable if the requirements of paragraph 30-2.10.2.1. to 30-2.10.2.3. below comply with at least one set of measurements.

30-2.10.2.1 Not more than one "cut-off" shall be visible.

30-2.10.2.2 Sharpness of "cut-off": The sharpness factor G is determined by scanning vertically through the horizontal part of the "cut-off" at 2.5° from the V-V where: $G = (\log E\beta - \log E(\beta + 0.1^\circ))$ where β = 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).

30-2.10.2.3 Linearity: The part of the horizontal "cut-off" that serves for vertical adjustment shall be horizontal between 1.5° and 3.5° from the V-V line (see figure 5 below)

- (a) The inflection points of the "cut-off" gradient at the vertical lines at 1.5° , 2.5° and 3.5° shall be determined by the equation: $d^2(\log E) / d\beta^2 = 0$.
- (b) The maximum vertical distance between the inflection points determined shall not exceed 0.2° .

30-2.10.3 Vertical and horizontal adjustment: If the "cut-off" complies with the quality requirements of paragraph 30-2.10.2, the beam adjustment may be performed instrumentally. (Figure 5)

30-2.10.3.1 Vertical adjustment: Moving upward from below the line B (see figure 6 below), a vertical scan is carried out through the horizontal part of the "cut-off" at 2.5° from V-V. The inflection point (where $d^2(\log E) / d\beta^2 = 0$) is determined and positioned on

the line B situated one per cent below H-H.

30-2.10.3.2 Horizontal adjustment: The applicant shall specify one of the following horizontal aim methods:

(a) The "0.2 D line" method (see figure 6 below). A single horizontal line at 0.2° D shall be scanned from 5° left to 5° right after the lamp has been aimed vertically. The maximum gradient "G" determined using the formula $G = (\log E\beta - \log E(\beta + 0.1^\circ))$ where β is the horizontal position in degrees, shall not be less than 0.08.

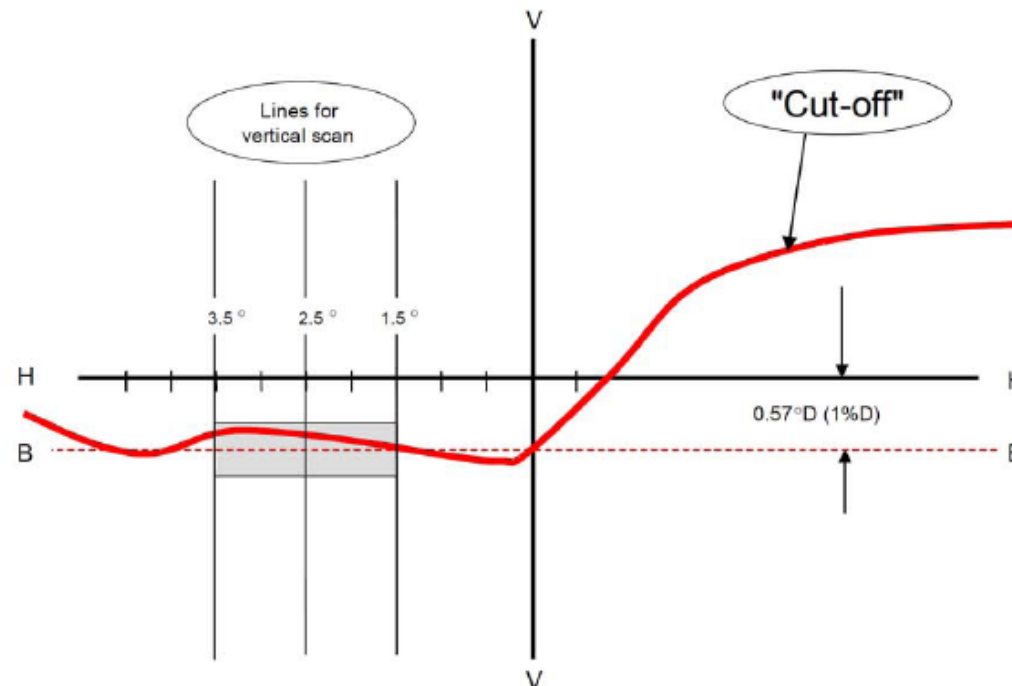
The inflection point found on the 0.2 D line shall be positioned on the line A. (Figure 6)

(b) The "3 line" method (see figure 7 below) Three vertical lines shall be scanned from 2° D to 2° U at 1° R, 2° R, and 3° R after the lamp has been aimed vertically. The respective maximum gradients "G" determined using the formula:

$$G = (\log E\beta - \log E(\beta + 0.1^\circ))$$

where β is the vertical position in degrees, shall not be less than 0.08. The inflection points found on the three lines shall be used to derive a straight line.

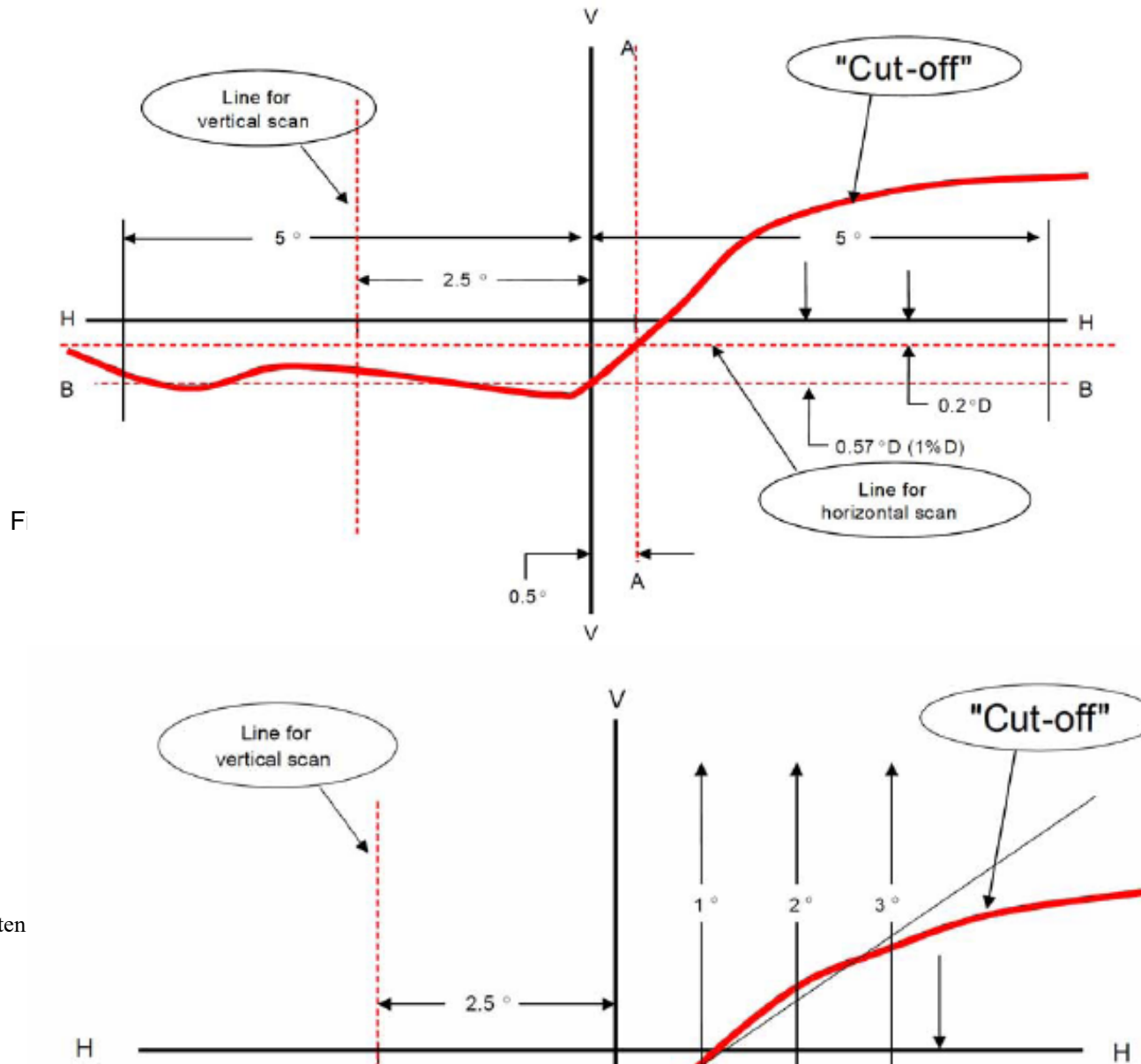
The intersection of this line and the line B found while performing vertical aim shall be placed on the V line. (Figure 7)



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Note: The scales are different for vertical and horizontal lines.

Figure 5: Measurement of "cut-off" quality



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Gas-discharge Headlamps

Figure 7: Instrumental vertical and horizontal adjustment-three line scan method

30-2.11 In the case of a Class E headlamp:

30-2.11.1 The headlamp shall be aimed so that:

30-2.11.1.1 For horizontal adjustment: The beam is as symmetrical as possible with reference to line V-V;(Figure 8)

30-2.11.1.2 For vertical adjustment: the horizontal part of the "cut-off" line is adjusted to its nominal position (0.57 degree) below the H-H line. If, however, vertical adjustment cannot be performed repeatedly to the required position within the allowed tolerances, the instrumental method of 30-2 11.1.2.3. shall be applied to test compliance with the required minimum quality of the "cut-off" line and to perform the beam vertical adjustment.

30-2.11.1.2.1 Vertical adjustment: After horizontal adjustment of the symmetrical passing-beam headlamp according to paragraph 30-2.11.1.1. 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.

30-2.11.1.2.2 When the vertical adjustments of three different individuals 0.3 degrees for class E head lamps, the horizontal part of the "cut-off" line is assumed not to provide sufficient linearity or sharpness for performing visual adjustment. In this case the quality of "cut-off" shall be tested instrumentally for compliance with requirements as follows 30-2.11.1.2.3.

30-2.11.1.2.3 Measurement of the quality of cut-off:

30-2.11.1.2.3.1 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.

30-2.11.1.2.3.2 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:

30-2.11.1.2.3.2.1 Not more than one cut-off line shall be visible.

30-2.11.1.2.3.2.2 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:

$$G = (\log EV - \log E(V + 0.1 \text{ degrees}))$$

is called the sharpness factor G of the cut-off line. The value of G shall not be less than 0.08 for class E.

30-2.11.1.2.3.2.3 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 30-2.11.1.2.1. above .

30-2.11.1.2.4 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 $d^2(\log E) / dv^2 = 0$ 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.

30-2.11.1.3 When so aimed, the headlamp must, if its approval is sought solely for provision of a passing beam¹⁰, comply with the requirements set out in paragraphs 30-2.11.2.2 and 30-2.11.2.6 ; if it is intended to provide both a passing beam and a driving beam, it shall comply with the requirements set out in paragraphs 30-2.11.2.2, 30-2.11.2.6. and 30-2.11.2.9.

30-2.11.1.4 Where a headlamp so aimed does not meet the requirements set out in paragraphs 30-2.11.2.2. 30-2.11.2.6 and 30-2.11.2.9, 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 0.5 degree to the right or left and vertically by not more than 0.25 degree up or down. To facilitate alignment by means of the "cut-off", the headlamp may be partially occulted in order to sharpen the "cut-off". However, the "cutoff" should not extend beyond the line H-H.

30-2.11.2 General provisions

30-2.11.2.1 The luminous intensity produced by the headlamp shall be measured at 25 m distance by means of a photoelectric cell having a useful area comprised within a square of 65 mm 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 、 Figure 9 、 Figure 10 、 Figure 11).

30-2.11.2.2 The light shall be as evenly distributed as possible within zones 1 and 2 for E headlamps.

30-2.11.2.2.1 However, the additional light source(s) or additional lighting unit(s) shall not be activated when the bank angle is less

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than 3 degrees.

30-2.11.2.3 The headlamp shall be deemed satisfactory if the photometric requirements set in the above. are met with one light source, which has been aged during at least 15 cycles, in accordance with "Filament lamps" of this Direction.

It shall be a standard (etalon) light-source and its luminous flux may differ from the objective luminous flux specified. In this case, the illumination shall be corrected accordingly.

The voltage applied to the terminals of the ballast(s) is: either: 13.2 V +/- 0.1 V for 12 V systems or: as otherwise specified.

30-2.11.2.4 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".

30-2.11.2.5 Four seconds after ignition of a headlamp 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.

30-2.11.2.6 For Class E headlamp (Table 5):

Table 5: For Class E headlamp

Test point / line / zone	Test point angular coordinates degrees*		Required luminous intensity in cd			
			Minimum			Maximum
			Class C	Class D	Class E	Classes C,D,E
1	0.86 deg. D	3.5 deg. R	2,000	2,000	2,500	13,750
2	0.86 deg. D	0	2,450	4,900	4,900	-
3	0.86 deg. D	3.5 deg. L	2,000	2,000	2,500	13,750
4	0.50 deg. U	1.50 deg. L and 1.50 deg. R	--	--	--	900
5	2.00 deg. D	15 deg. L and 15 deg. R	550	1,100	1,100	--
6	4.00 deg. D	20 deg. L and 20 deg. R	150	300	600	-
7	0	0	--	--	--	1,700
Line 1	2.00 deg. D	9 deg. L to 9 deg. R	1,350	1,350	1,900	-
8**	4.00 deg. U	8.0 deg. L	$\sigma 8 + 9 + 10 \geq 150 \text{ cd}^{**}$			700
9**	4.00 deg. U	0				700
10**	4.00 deg. U	8.0 deg. R				700
11**	2.00 deg. U	4.0 deg. L	$\sigma 11 + 12 + 13 \geq 300 \text{ cd}^{**}$			900
12**	2.00 deg. U	0				900
13**	2.00 deg. U	4.0 deg. R				900
14**	0	8.0 deg. L and 8.0 deg. R	50 cd**	50 cd**	50 cd**	-
15**	0	4.0 deg. L and 4.0 deg. R	100 cd**	100 cd**	100 cd**	900
Zone 1	1 deg. U/8 deg. L-4 deg. U/8 deg. L-4 deg. U/8 deg. R-1 deg. U/8 deg. R-0/4 deg. R-0/1 deg. R-0.6 deg. U/0-0/1 deg. L-0/4 deg. L-1 deg. U/8 deg. L		--	--	--	900
Zone 2	>4U to <15 U	8 deg. L to 8 deg. R	--	--	--	700

Letter L means that the point is located on the left of VV line.

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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

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

** On request of the applicant during measurement of these points, the front position lamp; if combined, grouped, or reciprocally incorporated-shall be switched ON.

30-2.11.2.7 In the case of headlamp systems having additional light source(s) and/or additional lighting unit(s) used to produce bend lighting, the additional light source(s) shall be measured according to the paragraph 30-2.11.2.3., 30-2.11.2.4. and 30-2.11.2.5.

30-2.11.2.8 Additional light source(s) and/or additional lighting unit(s) used to produce bend lighting is (are) permitted, provided that:

30-2.11.2.8.1 The following requirement regarding illumination shall be met, when the principal passing beam(s) and corresponding additional light source(s) used to produce bend lighting are activated simultaneously:

30-2.11.2.8.1.1 Left bank (when the motorcycle is rotated to the left about its longitudinal axis) the luminous intensity values shall not exceed 900cd in the zone extending from HH to 15 deg above HH and from VV to 10 deg left.

30-2.11.2.8.1.2 Right bank (when the motorcycle is rotated to the right about its longitudinal axis) the luminous intensity values shall not exceed 900cd in the zone extending from HH to 15 deg above HH and from VV to 10 deg right.

30-2.11.2.8.2 This test shall be carried out with the minimum bank angle specified by the applicant simulating the condition by means of the test fixture etc.

30-2.11.2.8.3 For this measurement, at the request of the applicant, principal passing beam and additional light source(s) used to produce bend lighting, may be measured individually and the photometric values obtained combined to determine compliance with the specified luminous intensity values.

30-2.11.2.9 Provisions concerning driving beams

30-2.11.2.9.1 In the case of a headlamp 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 headlamp alignment as applied to the condition of paragraph 10.1.4. above; in the case of a headlamp providing a driving beam only, it shall be so adjusted that the area of maximum luminous intensity (I_M) is centred on the point of intersection of lines H-H and V-V.

30-2.11.2.9.2 The luminous intensity produced by the driving beam shall either conform to the requirements of paragraph 30-2.11.2.9.2.1 (primary driving beam) or paragraph 30-2.11.2.9.2.2. (secondary driving beam).

30-2.11.2.9.2.1 A primary driving beam according to table 6-1 (see figure10) can be approved in any case.

- 30-2.11.2.9.2.2 A secondary driving beam according to the table 6-2 (see figure11). can only be approved in the case where the driving beam is operated together with a passing beam or a primary driving beam.
- 30-2.11.2.10 On headlamps designed to provide alternately a driving beam and a passing beam, or headlamp systems including additional light source(s) and/or additional lighting unit(s) used to produce bend lighting, any mechanical, electromechanical or other device incorporated in the headlamp for these purposes shall be so constructed that:
- 30-2.11.2.10.1 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.
- 30-2.11.2.10.2 Except for additional light source(s) and additional lighting unit(s) used to produce bend lighting, in the case of failure it must be possible to obtain automatically a passing beam or a state with respect to the photometric conditions which yields values not exceeding 1200 cd in Zone 1 and at least 2400 cd at 0,86D-V by such means as e.g. switching off, dimming, aiming downwards, and/or functional substitution;
- 30-2.11.2.10.3 Except for additional light source(s) and additional lighting unit(s) used to produce bend lighting, either the passing beam or the driving beam shall always be obtained without any possibility of the mechanism stopping in between the two positions;
- 30-2.11.2.11 In the case of headlamps with an adjustable reflector, additional tests shall be made after the reflector has been moved vertically +/- 2 degrees or at least into the maximum position, if less than 2 degrees, from its initial position by means of the headlamp adjusting device. The whole headlamp shall then be re-positioned (for example by means of the goniometer) by moving it through the same number of degrees in the opposite direction to the movement of the reflector. The following measurements shall be made and the points shall be within the required limits:
- Passing beam: points HV and 0.86 D-V
- Driving beam: IM and point HV (percentage of IM).
- 30-2.11.2.12 Above shall be measured by means of a photoreceptor, the effective area of which shall be contained within a square of 65 mm side.
- 30-2.11.3 The light emitted shall be white defined in "The installation of lighting and light-signaling devices" of "Directions".

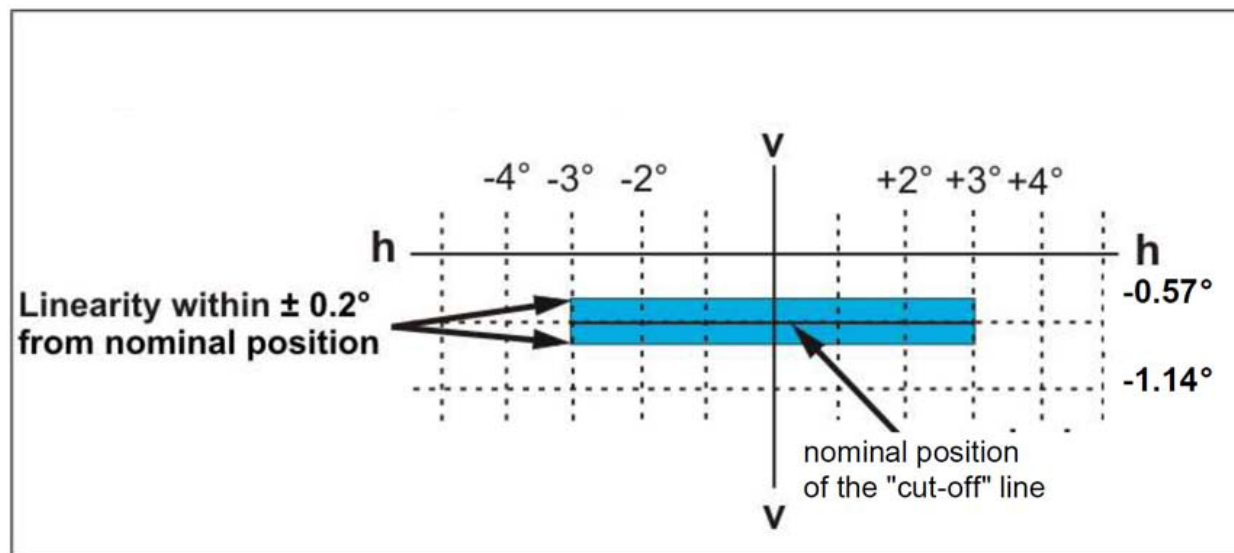


Figure8: Shape and position of the "cut-off" line

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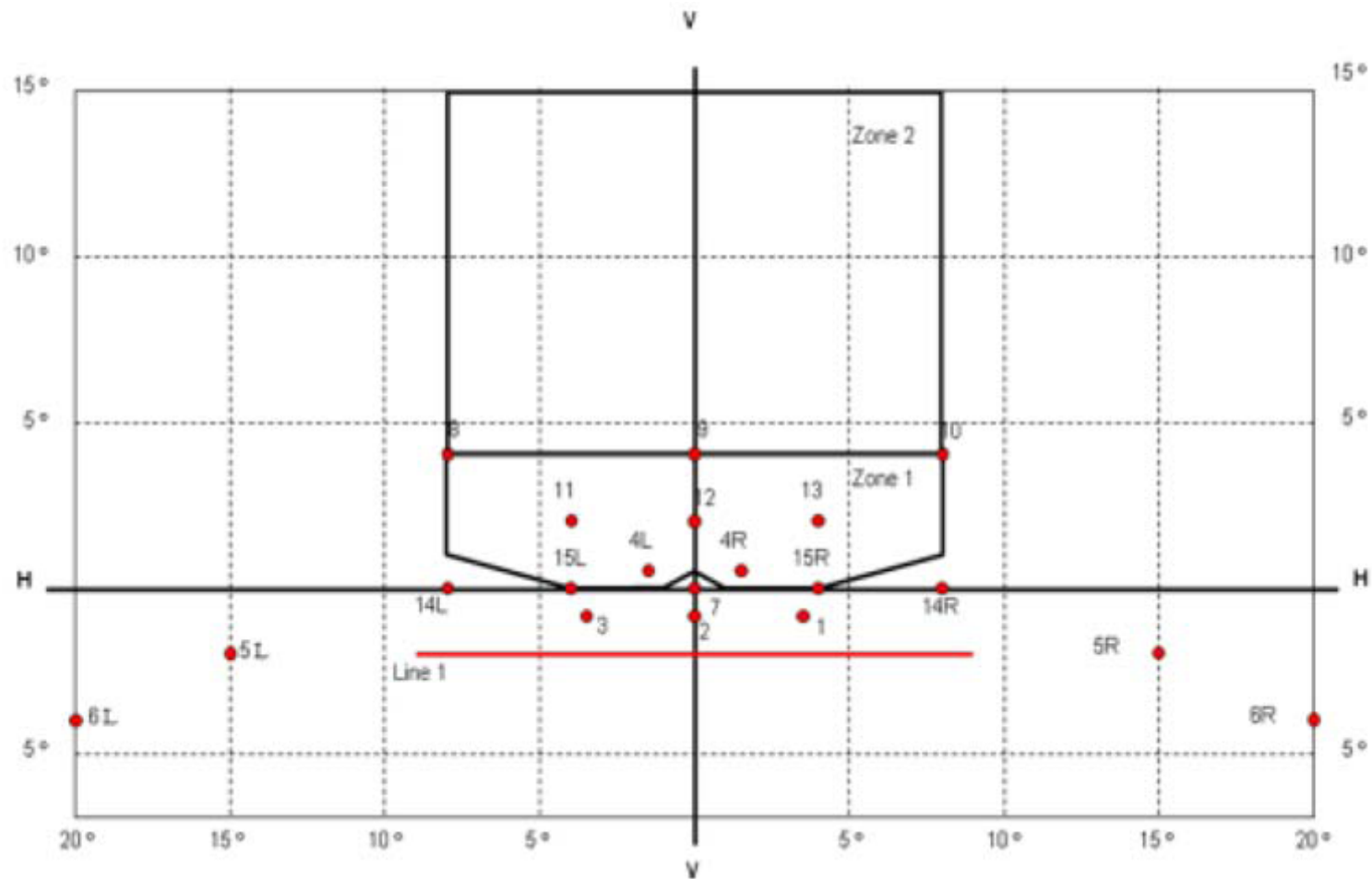


Figure 9: Passing beam - position of test points and zones for Classes E headlamp(s)

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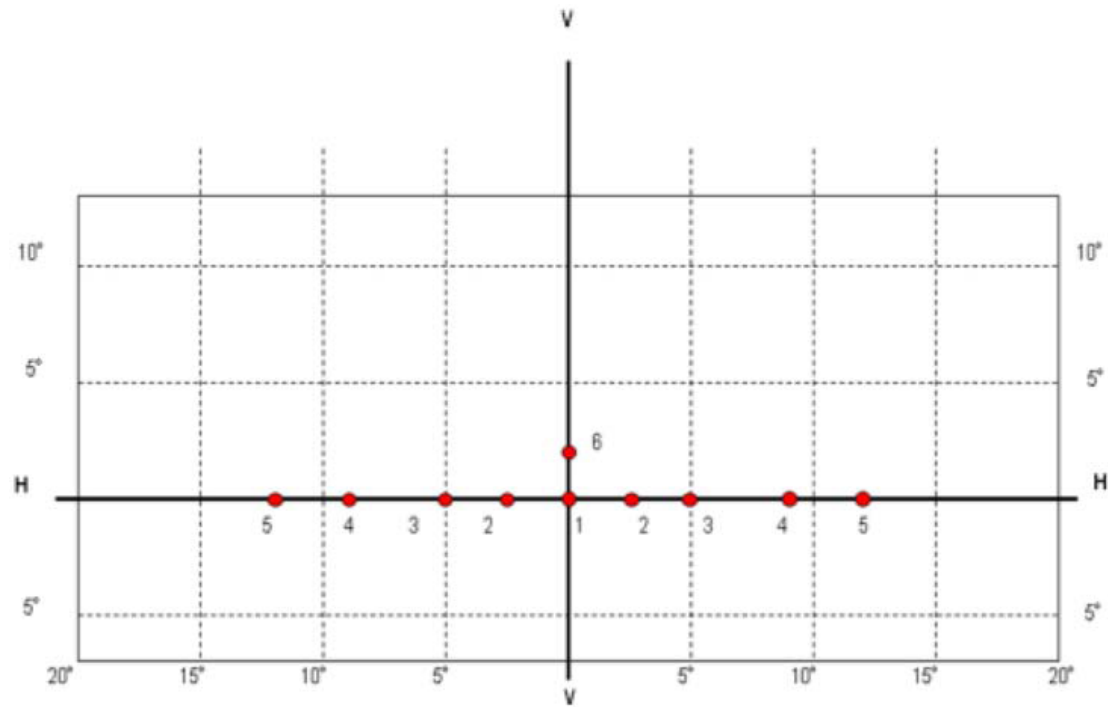


Figure 10: Primary driving beam - position of test points

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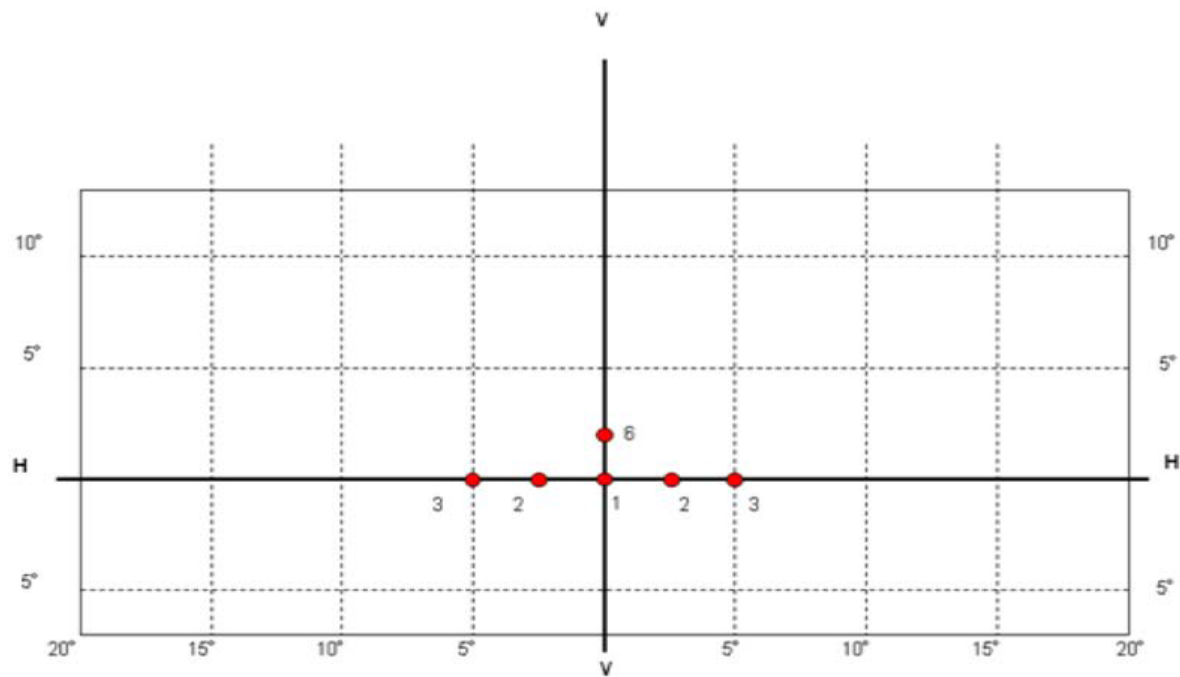


Figure 11: Secondary driving beam - position of test points

Table 6-1 The luminous intensity of a primary driving beam

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Test point number	Test point angular coordinates - degrees*	Required luminous intensity [cd]					
		Class B		Class C		Class D, E	
		MIN	MAX	MIN	MAX	MIN	MAX
1	H-V	16,000	---	20,000	---	30,000	---
Test point number	Test point angular coordinates - degrees*	Required luminous intensity [cd]					
		Class B		Class C		Class D, E	
		MIN	MAX	MIN	MAX	MIN	MAX
2	H-2.5 deg. R and 2.5 deg. L	9,000	---	10,000	---	20,000	---
3	H-5 deg. R and 5 deg. L	2,500	---	3,500	---	5,000	---
4	H-9 deg. R and 9 deg. L	---	---	2000	---	3,400	---
5	H-12 deg. R and 12 deg. L	---	---	600	---	1,000	---
6	2 deg. U-V	---	---	1000	---	1,700	---
	MIN luminous intensity of the maximum (I_M)	20,000	---	25,000	---	40,000	---
	MAX luminous intensity of the maximum (I_M)	---	215,000	---	215,000	---	215,000

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

Table 6-2 The luminous intensity of a secondary driving beam

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Test point number	Test point angular coordinates - degrees*	Required luminous intensity [cd]					
		Class B		Class C		Classes D, E	
		MIN	MAX	MIN	MAX	MIN	MAX
1	H-V	16,000	---	20,000	---	30,000	---
2	H-2.5 deg. R and 2.5 deg. L	9,000	---	10,000	---	20,000	---
3	H-5 deg. R and 5 deg. L	2,500	---	3,500	---	5,000	---
6	2 deg. U-V	---	---	1,000	---	1,700	---
	MIN luminous intensity of the maximum (I_M)	20,000	---	25,000	---	40,000	---
	MAX luminous intensity of the maximum (I_M)	---	215,000	---	215,000	---	215,000

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

30-2.11.4 Test for stability of photometric performance: The test shall be carried out in a dry and still atmosphere at an ambient temperature of $23 \pm 5^\circ\text{C}$. The complete headlamp is mounted on a base representing the correct installation on the vehicle.

30-2.11.4.1 Clean headlamp: The headlamp shall be operated for 12 hours as described in paragraph 30-2.11.4.1.1. and checked as prescribed in paragraph 30-2.11.4.1.3.

30-2.11.4.1.1 Test procedure:

30-2.11.4.1.1.1 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.

30-2.11.4.1.1.2 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:

30-2.11.4.1.1.2.1 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

30-2.11.4.1.1.2.2 If the applicant declares that the headlamp is to be used with a single filament lit at a time, the test

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shall be carried out in accordance with this condition, activating each specified function successively for half the time specified- i.e.6 hours.

30-2.11.4.1.1.3 In the case of a headlamp with a front fog lamp and one or more driving beams :

30-2.11.4.1.1.3.1 The headlamp shall be subjected to the following cycle until the time specified is reached - i.e. 12 hours:

15 minutes – front fog lamp lit

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

30-2.11.4.1.1.3.2 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).

30-2.11.4.1.1.4 In the case of a headlamp with a passing beam, one or more driving beams and a front fog lamp :

30-2.11.4.1.1.4.1 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

30-2.11.4.1.1.4.2 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;

30-2.11.4.1.1.4.3 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 :

30-2.11.4.1.1.4.4 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).

30-2.11.4.1.1.4.5 In the case of a headlamp having additional light source(s) used to produce bend lighting, except for additional lighting unit(s), it (they) shall be switched on for one minute, and switched off for nine minutes during the activation of the principal passing beam.

If the headlamp has several additional light sources used to produce bend lighting, the test shall be carried out with the combination of light source(s) that represents the most severe operating condition.

30-2.11.4.1.2 Test voltage : The voltage applied at the terminals of the ballast(s) or at the terminals of the light source in case the ballast is (are) integrated with the light source, is either 13.5 +/- 0.1 Volts for 12 V network system, or otherwise specified in the application for approval. If there are reciprocally incorporated filament lamps, the voltage producing the reference flux shall be used.

30-2.11.4.1.3 Test results :

30-2.11.4.1.3.1 Visual inspection : No distortion, deformation, cracking or change in color of either the headlamp lens or the external lens, if any, shall be noticeable.

30-2.11.4.1.3.2 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. 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 in paragraph 2. of this annex).

For Class E headlamp:

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

Driving beam: Point of I_{max}

30-2.11.4.2 Dirty headlamp test:

30-2.11.4.2.1 Preparations of the test

30-2.11.4.2.1.1 Test mixture

30-2.11.4.2.1.1.1 For headlamp with the outside lens in glass: The mixture of water and a polluting agent to be applied to the headlamp shall be composed of:

(a) 9 parts by weight of silica sand with a particle size of 0-100 micrometres,

(b) 1 part by weight of vegetal carbon dust produced from beech wood with a particle size of 0-100 micrometres,

- (c) 0.2 parts by weight of NaCMC, and
- (d) 5 parts by weight of sodium chloride (pure at 99 per cent),
- (e) an appropriate quantity of distilled water, with a conductivity of < 1 microS/m.

The mixture shall not be more than 14 days old.

30-2.11.4.2.1.1.2 For headlamp with outside lens in plastic material: The mixture of water and polluting agent to be applied to the headlamp shall be composed of:

- (a) 9 parts by weight of silica sand with a particle size of 0-100 micrometres,
- (b) 1 part by weight of vegetal carbon dust produced from beech wood with a particle size of 0-100 micrometres,
- (c) 0.2 part by weight of NaCMC
- (d) 5 parts by weight of sodium chloride (pure at 99 per cent),
- (e) 13 parts by weight of distilled water with a conductivity of < 1 microS/m, and
- (f) 2 +/- 1 parts by weight of surface-actant.

The mixture shall not be more than 14 days old.

30-2.11.4.2.2 After being tested, the headlamp shall be operated for one hour as described paragraph 30-2.11.4.1.1, 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:

30-2.11.4.2.2.1 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.

30-2.11.4.2.2.2 Passing beam only: 0.50U/1.5L and 1.5R and 0.86D/V.

30-2.11.4.3 Test for change in vertical position of the cut-off line under the influence of heat (applicable to passing beam only)

30-2.11.4.3.1 Test procedure:

30-2.11.4.3.1.1 The headlamp tested in accordance with 30-2.11.4.1, shall be subjected to the test, without being moved and readjusted its position.

30-2.11.4.3.1.2 Using a mass production headlamp which has been aged for at least 15 hour, 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. Between the vertical lines passing through point 3.5 L and 3.5 R

30-2.11.4.3.2 Test results:

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30-2.11.4.3.2.1 The result in milliradians (mrad) shall be considered as acceptable for a passing lamp, only when the absolute value $\Delta r_l = |r_3 - r_{60}|$ recorded on the headlamp is not more than 1.0 mrad ($\Delta r_l \leq 1.0$ mrad) upward and not more than 2.0 mrad ($\Delta r_l \leq 2.0$ mrad) downwards.

30-2.11.4.3.2.2 However, if this value (upward) is more than 1.0 mrad but not more than 1.5 mrad and this value (downward) is more than 2.0 mrad but not more than 3.0 mrad then a further sample of headlamp shall be tested as described in paragraph 30-2.11.4.3.1 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.

After this period of one hour, the headlamp type shall be considered as acceptable if the absolute value Δr measured on this sample meets the requirements in paragraph 30-2.11.4.3.2.1 above.

30-2.11.5 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 7. Two samples of complete headlamp shall be supplied, numbered and undergone the test in accordance with table 8. The test method and the standards for respective test item are indicated below :

30-2.11.5.1 Resistance to temperature changes

30-2.11.5.1.1 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 degrees C +/- 2 degrees C and 85-95 per cent RH;

1 hour at 23 degrees C +/- 5 degrees C and 60-75 per cent RH;

15 hours at -30 degrees C +/- 2 degrees C;

1 hour at 23 degrees C +/- 5 degrees C and 60-75 per cent RH;

3 hours at 80 degrees C +/- 2 degrees C;

1 hour at 23 degrees C +/- 5 degrees C and 60-75 per cent RH;

30-2.11.5.1.2 Photometric measurements shall be carried out on the samples before and after the test. These measurements shall be made using a standard lamp , as present in the headlamp at the following points :

30-2.11.5.1.2.1 For the passing beam of a passing lamp or a passing/driving lamp: 0.86D/3.5R, 0.86D/3.5L, 0.50U/1.5L and 1.5R.

30-2.11.5.1.2.2 Point of maximum photometric value for the driving beam of a driving lamp or a passing/driving lamp.

30-2.11.5.1.3 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.

30-2.11.5.2 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

30-2.11.5.2.1 Three samples shall be exposed to an energetic illumination of $1200 \text{ W/m}^2 \pm 200 \text{ W/m}^2$ for a period such that the luminous energy that they receive is equal to $4500 \text{ MJ/m}^2 \pm 200 \text{ MJ/m}^2$. Within the enclosure, the temperature measured on the black panel placed on a level with the sample shall be $50^\circ\text{C} \pm 5^\circ\text{C}$. 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 $23^\circ\text{C} \pm 5^\circ\text{C}$ in accordance with the following cycle :

Spraying : 5 minutes,

Drying : 25 minutes

30-2.11.5.2.2 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 (Δt_m) in transmission $\Delta t = (T2-T3)/T2$ measured on the three samples shall not exceed 0.020.

30-2.11.5.2.3 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 30-2.11.5.2.1, 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 $23\text{ }^{\circ}\text{C} \pm 5^{\circ}\text{C}$. Afterward the samples shall be carefully rinsed with distilled water at $23\text{ }^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and then wiped off with a soft cloth.

30-2.11.5.2.4 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.

30-2.11.5.3 Resistance to detergents and hydrocarbons

30-2.11.5.3.1 The outer face of three samples shall be heated to $50\text{ }^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and then immersed for five minutes in a mixture maintained at $23\text{ }^{\circ}\text{C} \pm 5^{\circ}\text{C}$ 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 $50\text{ }^{\circ}\text{C} \pm 5^{\circ}\text{C}$. The surface of the samples shall be cleaned with a moist cloth.

30-2.11.5.3.2 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.

30-2.11.5.3.3 After the above two tests have been performed successively, the mean variation (Δt_m) in transmission $\Delta t = (T_2 - T_3)/T_2$ measured on the three samples shall not exceed 0.010.

30-2.11.5.4 Resistance to mechanical deterioration

30-2.11.5.4.1 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 l/minute at an operating pressure of 6.0 bars ± 0.5 bar, at a distance of $380 \text{ mm} \pm 10 \text{ mm}$ 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: $\Delta d = (T_5 - T_4)/T_2 = 0.025 \pm 0.0025$.

30-2.11.5.4.2 After this test, the variations in transmission: $\Delta t = (T_2 - T_3)/T_2$ and in diffusion: $\Delta d = (T_5 - T_4)/T_2$ shall be measured. The mean value of the three samples shall be such that: $\Delta t_m \leq 0.100$, $\Delta d_m \leq 0.050$.

30-2.11.5.5 Test of adherence of coatings, if any

30-2.11.5.5.1 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 $2 \text{ N/cm} \pm 20\%$, 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 $1.5 \text{ m/s} \pm 0.2 \text{ m/s}$.

30-2.11.5.5.2 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.

30-2.11.5.6 Resistance to light source radiations for Class E:

30-2.11.5.6.1 The following test shall be done: Flat samples of each light transmitting plastic component of the headlamp are exposed to the light of the gas-discharge light source. 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.

30-2.11.5.6.2 After 1,500 hours of continuous exposure, the colorimetric specifications of the transmitted light must be met with a new standard gas-discharge light source, and the surfaces of the samples shall be free of cracks, scratches, scalings or deformation.

30-2.11.5.7 Tests of the complete headlamp

30-2.11.5.7.1 Resistance to mechanical deterioration (the lens of lamp sample No. 1 shall be subjected to the test)

30-2.11.5.7.1.1 The lens of lamp sample No. 1 shall be subjected to the test described in paragraph 30-2.11.5.4.

30-2.11.5.7.1.2 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 and D symmetrical headlamp point 0.86D/3.5R, 0.86D/3.5L not be more than 10% below the minimum values.

30-2.11.5.7.2 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 30-2.11.5.5.

30-2.11.6 The LED module(s) shall be in the configuration as described in the technical specification as defined. 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.

30-2.11.6.1 One modules of each type shall be submitted by the applicant with the light source control gear, if applicable, and sufficient instructions.

30-2.11.6.1.1 Suitable thermal management (e.g. heat sink) may be provided, to simulate similar thermal conditions as in the corresponding headlamp application.

30-2.11.6.1.2 Before the test each LED module shall be aged at least for 72 hours under the same conditions as in the corresponding headlamp application.

30-2.11.6.1.3 In the case of use of an integrating sphere, the sphere shall have a minimum diameter of one meter, and at least ten

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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 the CIE - Publication 84 - 1989, regarding the room temperature, positioning, etc., shall be taken into consideration.

30-2.11.6.1.4 The LED module shall be burned in for approximately one hour in the closed sphere or goniophotometer.

30-2.11.6.1.5 The flux shall be measured after stability has occurred.

Table 7. Tests on plastic material (lenses or samples)

Samples Tests	Lenses or samples of material										Lenses			
	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				○	○	○								
Hydrocarbons				○	○	○								
Transmission measurement				○	○	○								
Deterioration								○	○	○				

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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 8. Tests on complete headlamps

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