

## 52 Headlamps (headlamps of gas-discharge type excluded)

Refer to: R05 02-S4, R31 02-S4, R112 00-S4, R113 00-S2/C2

### 52.1 Effective date and Scope:

- 52.1.1 As for the category symbols M and N, the new vehicle types from 2008/1/1 and all vehicle types from 2010/1/1, the Headlamps shall comply with this regulation and shall use bulbs that is conform with "Filament lamps" and/or "LED light sources" of this regulation.
- 52.1.2 As for the category symbols L1 and L3, the new vehicle types from 2009/1/1 and all vehicle types from 2011/1/1, the Headlamps shall comply with this regulation and shall use bulbs that is conform with "Filament lamps" and/or "LED light sources" of this regulation.
- 52.1.3 The applicants applying for low volume safety approval may be exempt from regulation of "headlamps (headlamps of gas-discharge type excluded)" except large passenger vehicle and child-only vehicle.
- 52.1.4 Applying for vehicle-by-vehicle low volume safety approval, the vehicle may be exempt from regulation of "headlamps (headlamps of gas-discharge type excluded)".

### 52.2 Definitions:

- 52.2.1 Sealed-beam headlamp unit : A headlamp unit whose components, comprising a reflector system, a lens system and one or more electrical light sources, are all parts of an integral whole which has been sealed in the course of manufacture and which can not be dismantled without rendering the unit completely unusable.
- 52.2.2 Halogen sealed-beam headlamp unit : A headlamp whose components, including a reflector of glass, metal or other material, an optical system and one or more halogen light sources, form an integral whole which is indivisibly joined and cannot be dismantled without rendering the unit completely unusable.
- 52.2.3 Asymmetrical-beam headlamp unit : A headlamp emitting an asymmetrical beam, which may incorporate lenses of glass or plastic material and which is equipped with replaceable filament lamp.

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52.2.4 Symmetrical-beam headlamp unit : A headlamp emitting an symmetrical beam, which may incorporate lenses of glass or plastic material and which is equipped with replaceable filament lamp.

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

52.3.1 Trade name or mark;

52.3.2 Characteristics of the optical system;

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

52.3.4 The kind the beam produced (passing beam, driving beam of both);

52.3.5 The materials constituting the lens and coating, if any.

52.4 Rated voltage and power of headlamp unit

52.4.1 The values of rated voltages are: 6, 12 and 24 volts in principle.

52.4.2 The power consumed at test voltage by any submitted sealed-beam headlamp unit shall not exceed the rated wattage marked on the unit, by more than the percentage specified in Table 1. No lower limit is specified for the tolerance on wattage but the minimum illumination values specified in Table 2 must be obtained. In the case of halogen sealed-beam headlamp unit, the wattage shall not exceed 75 watts on the driving beam filament and 68 watts on the passing beam filament measured at a test voltage of 13.2 volts.

Table 1. Rated voltage and wattage of sealed- beam headlamp unit

		Circular units of 180 mm diameter		Circular units of 145mm diameter	
Rated voltage		6	12	6	12
Test voltage		6	12	6	12
		Rated wattage and permitted tolerance			
Double filaments*	Driving beam	60 + 0%		37.5 + 0%	

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	Passing beam	50 + 0%	50 + 0%
Driving beam filament only		75 + 0%	50 + 0%
Passing beam filament only		50 + 0%	50 + 0%

\*In the case of sealed-beam headlamp units with double filaments, the sample may be submitted for approval for the two functions or for passing beam only.

## 52.5 Specifications of the measuring screen

52.5.1 Figure 1 – for the sealed-beam headlamp units, Figure 2 – for the halogen sealed-beam headlamp units and the asymmetrical beam headlamp units, Figure 3 – for the symmetrical beam headlamp units. (Unit : mm)

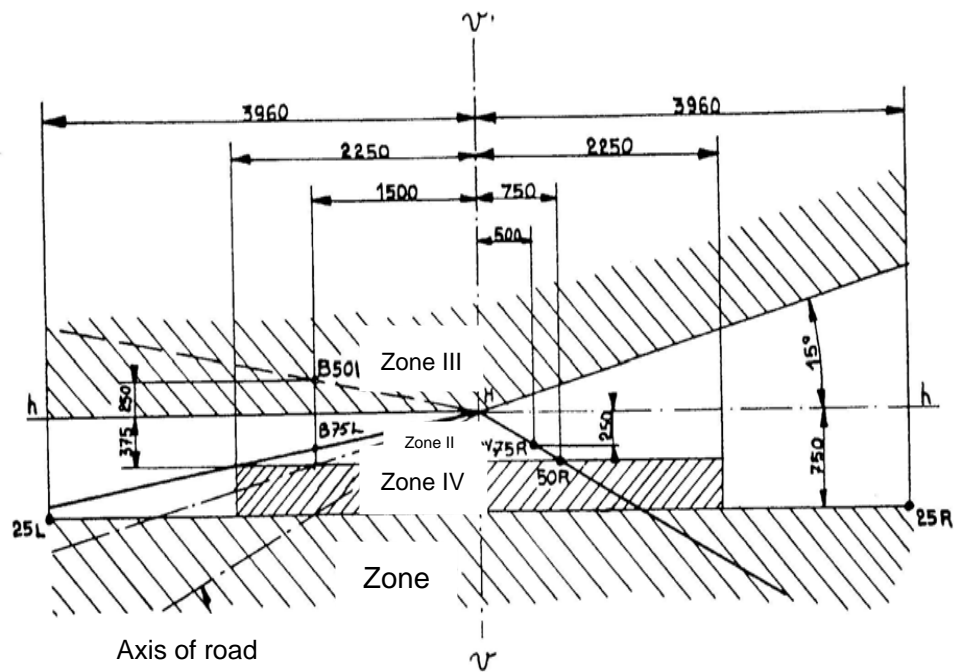


Figure 1. Measuring screen for sealed-beam headlamp

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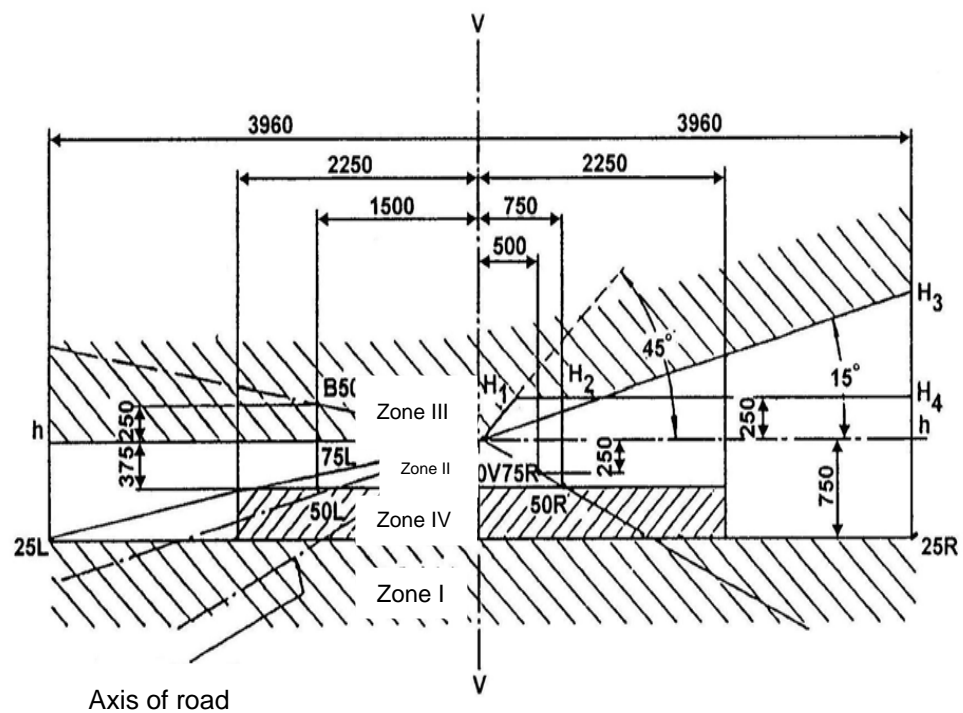
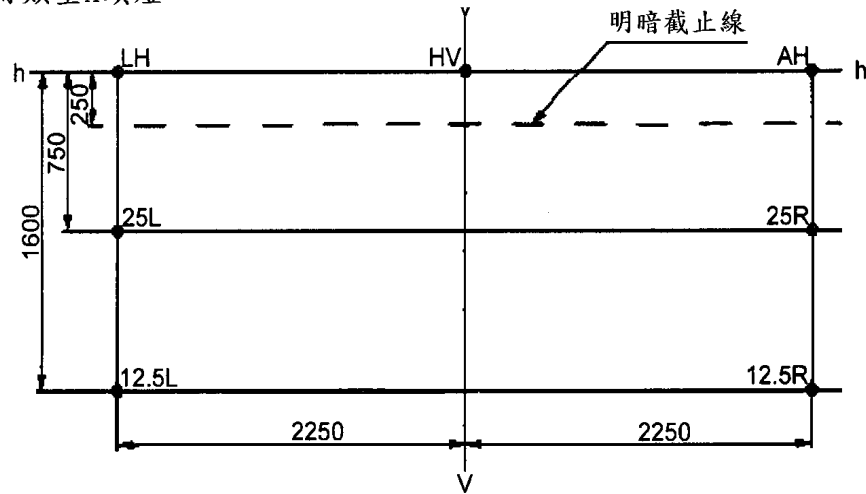


Figure 2. Measuring screen for halogen sealed-beam headlamp and asymmetrical headlamp

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適用類型A頭燈

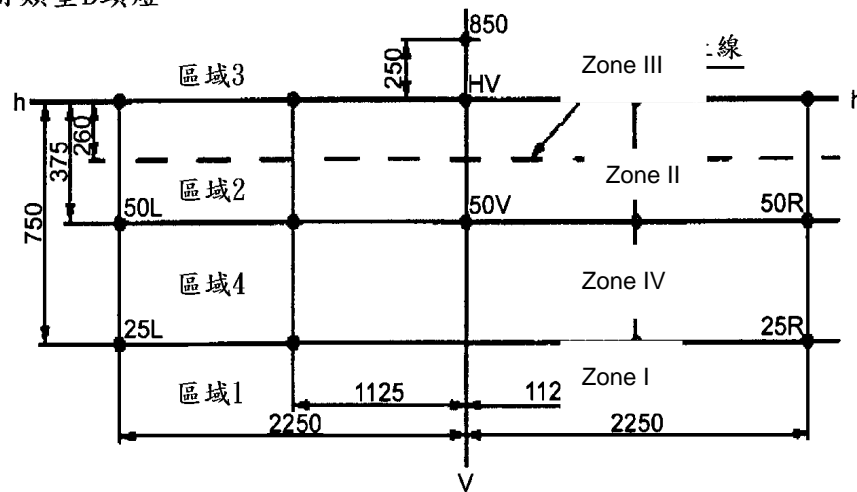
For Class A headlamp



Cut-off

適用類型B頭燈

For Class B headlamp



Cut-off

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Figure 3. Measuring screen for symmetrical headlamp

52.5.2 The passing beam must produce a sufficiently sharp “cut-off” to permit satisfactory alignment with its aid.

52.5.2.1 Sealed-beam headlamp unit : The “cut-off” must be a horizontal line on the left-side of vv-line on measuring screen, on the other side it should be within an angle of 15 degrees above the horizontal.

52.5.2.2 Halogen sealed-beam headlamp unit and asymmetrical-beam headlamp unit : The cut-off shall be a horizontal straight line on the left side of vv-line on measuring screen. On the other side, it shall not extend beyond either the broken line HV H1 H4 formed by a straight line HV H1 making a 45° angle with the horizontal and a straight line H1 H4, 25 cm above the straight line h-h, or the straight line HV H3, inclined at an angle of 15° above the horizontal.

52.5.2.3 Symmetrical-beam headlamp unit : The “cut-off” must be substantially horizontal and as straight as possible over a horizontal length of at least  $\pm 3^\circ$  for Class A 、C and D headlamps and at least  $\pm 5^\circ$  for Class B headlamps.

## 52.6 Alignment of headlamp unit before test

52.6.1 In the case of sealed-beam headlamp unit, halogen sealed-beam headlamp unit and asymmetrical-beam headlamp unit, it shall be aimed so that on passing beam: the horizontal part of the “cut-off” is situated, on the screen, 25cm below the level of the horizontal plane passing through the focus of the unit (h-h line). The “elbow” of the “cut-off” is on line vv. If the beam does not have a “cut-off” with a clear “elbow”, lateral adjustment shall be effected in the manner which best satisfies the requirements for illumination at points 75 R and 50 R. Where a headlamp unit so aimed does not meet the requirements referred to the illumination of driving beam and passing beam, its alignment may be changed, provided that the axis of the beam is not laterally displaced by more than  $1^\circ$  (= 44 cm) in horizontal direction and over the h-h line in vertical direction. To facilitate alignment by means of the “cut-off”, the unit may be partially occulted in order to sharpen the “cut-off”.

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

52.6.2.1 Laterally, the beam is as symmetrical as possible with reference to line v-v.

52.6.2.2 Vertically, the headlamp shall be so aimed that the “cut-off” is situated 250 mm below the line h-h. It shall be as horizontal as possible.

52.7 Illumination: The illumination produced by the unit shall be checked on a vertical screen set at a distance of 25 m in front of the unit and at right angles to its axis. The screen illumination values shall be measured by means of a photoelectric cell, the effective area of which shall be contained within a square of 65 mm of side.

52.7.1 The illumination produced on the screen by the passing beam shall meet the following requirements :

52.7.1.1 Sealed-beam headlamps : The required illumination is indicated in Table 2. In the case where the light emitted is selective yellow, the illumination produced on the screen by the passing beam must meet the requirements of Table 2 with all the figures multiplied by a factor of 0.84.

52.7.1.2 Halogen sealed-beam headlamps : The required illumination is indicated in Table 2. In the case of the light emitted is, the illumination produced on the screen by a selective yellow passing beam shall meet the requirement of Table 2 with the minimum illuminations multiplied by a factor of 0.85; the maximum illumination values remain the same.

52.7.1.3 Asymmetrical-beam headlamps : The illumination produced on the screen by the passing beam shall meet the requirements of Table 4 (also apply to headlamps designed to provide bend lighting). The illumination values in zones “A” and “B” as shown in Figure 4 shall be checked by the measurement of the photometric values of points 1 to 8 on this figure; these values shall lie within the following limits :

$$1+2+3 \geq 0.3 \text{ lux , and}$$

$$4+5+6 \geq 0.6 \text{ lux , and}$$

$$0.7 \text{ lux} \geq 7 \geq 0.1 \text{ lux and}$$

$$0.7 \text{ lux} \geq 8 \geq 0.2 \text{ lux}$$

52.7.1.4 Symmetrical-beam headlamps :

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52.7.1.4.1 The illumination produced on the screen by the passing beam shall meet the requirements of Table 5.

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

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

Point on measuring screen	Required illumination (Unit : lux)	
	Minimum	Maximum
B50L	—	0.3
75R	6	—
50R	6	—
25L	1.5	—
25R	1.5	—
Every point in Zone III	—	0.7
Every point in Zone IV	2	—
Every point in Zone I	—	20

Table 3. Required illumination for a passing beam of halogen sealed-beam headlamp

Point on measuring screen			Required illumination (Unit : lux)	
Point B	50	L	$\leq$	0.4
Point	75	R	$\geq$	12
Point	75	L	$\leq$	12

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Point	50	L	$\geq$	12
Point	50	R	$\leq$	15
Point	50	V	$\geq$	6
Point	25	L	$\geq$	2
Point	25	R	$\geq$	2
Any point in Zone III			$\leq$	0.7
Any point in Zone IV			$\geq$	3
Any point in Zone I			$\leq$	$2x (E_{50R} \text{ or } E_{50L})^*$

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

Table 4.Required illumination for a passing beam of asymmetrical-beam headlamp

Point on measuring screen			Required illumination (Unit : lux)	
			Class A	Class B
Point B	50	L	$\leq$ 0.4	$\leq$ 0.4
Point	75	R	$\geq$ 6	$\geq$ 12
Point	75	L	$\leq$ 12	$\leq$ 12
Point	50	L	$\leq$ 15	$\leq$ 15
Point	50	R	$\geq$ 6	$\geq$ 12
Point	50	V	--	$\geq$ 6
Point	25	L	$\geq$ 1.5	$\geq$ 2

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Point	25	R	$\geq$	1.5	$\geq$	2
Any point in		III	$\leq$	0.7	$\leq$	0.7
Any point in		IV	$\geq$	2	$\geq$	3
Any point in		I	$\leq$	20	$\leq$	2E*

\*E<sub>50R</sub> or E<sub>50L</sub> : E<sub>50R</sub> and E<sub>50L</sub> are the actually measured values in points 50R and 50L respectively.

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

Table 5-2.Required illumination for a passing beam of the category C、D of symmetrical-beam headlamp

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

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

Notes: "D" means under the H-H line. "U" means above the H-H line.

"R" means right of the V-V line. "L" means left of the V-V line.

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

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

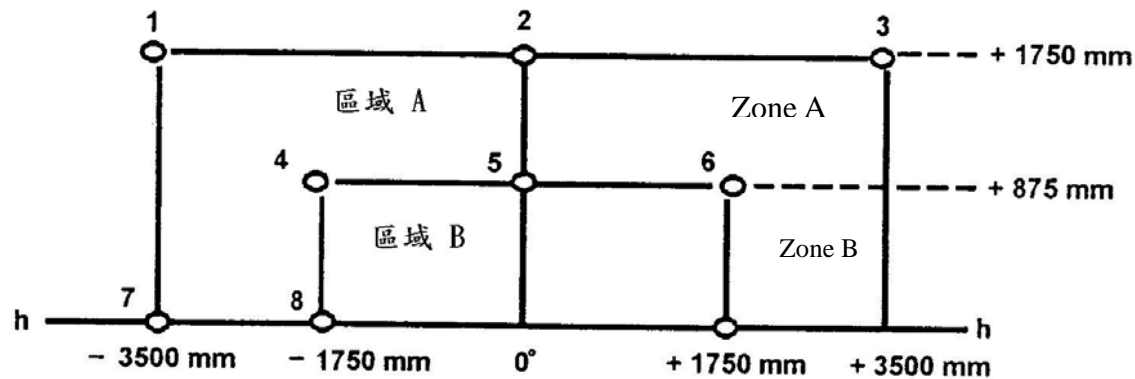


Figure 4.Measuring points of illumination for the passing beam of asymmetrical-beam headlamp

52.7.2 The illumination produced on the screen by the driving beam shall meet the following requirements :

In the case of a headlamp unit designed to provide a driving beam and a passing beam, measurements of the illumination produced on the screen by the driving beam shall be taken with the same unit alignment and voltage as for measurements under paragraph 52.7.1. In the case of a headlamp providing a driving beam only, it shall be so aimed that the area of maximum illumination is centered on the point of intersection HV. Where more than one light source is used for asymmetrical-beam headlamps to provide the driving beam, the combined functions shall be used to determine the maximum value of the illumination.

#### 52.7.2.1 Sealed-beam headlamp

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52.7.2.1.1 The point of intersection HV of the line hh and vv shall be situated within the isolux 90% of maximum illumination. The maximum value of illumination (EM) shall not be less than 32 lux.

52.7.2.1.2 Starting from point HV, horizontally to the left and right, illumination shall not be less than 16 lux up to a distance of 1.125 m, and not less than 4 lux up to a distance of 2.25 m.

#### 52.7.2.2 Halogen sealed-beam headlamps

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

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

#### 52.7.2.3 Asymmetrical-beam headlamps

52.7.2.3.1 The point of intersection (HV) shall be situated within the isolux 80 per cent of maximum illumination. This maximum value shall be not less than 32 lux for Class A headlamps and 48 lux for Class B headlamps. The maximum value shall in no circumstances exceed 240 lux; in addition, in the case of a combined passing and driving headlamp, this maximum value shall be not more than 16 times the illumination measured for the passing beam at point 75 R (or 75 L).

52.7.2.3.2 Starting from point HV, horizontally to the left and right, the illumination shall be not less than 16 lux for Class A headlamp and 24 lux for Class B headlamp up to a distance of 1.125 m, and not less than 4 lux for Class A headlamp and 6 lux for Class B headlamp up to a distance of 2.25 m.

52.7.2.4 Symmetrical-beam headlamps : Except for Class A headlamp, the illumination produced on the screen by B · C and D shall

meet the following requirements:

- 52.7.2.4.1 The point of intersection (HV) of lines H-H and V-V shall be situated within the isolux 80 per cent of maximum illumination. This maximum value (EM) shall not be less than 32 lux for Class B or C headlamps and 51.2 lux for Class D headlamps. The maximum value shall in no circumstances exceed 240 lux in the case of Class B headlamps and 180 lux in the case of Class C and D headlamps.
- 52.7.2.4.2 starting from point HV, horizontally to the right and left, the illumination shall be not less than 12 lux for Class B headlamp to a distance of 1,125 mm and not less than 3 lux for Class B headlamp to a distance of 2,250 mm.
- 52.7.2.4.3 In the case of a Class C or D headlamp, the intensities shall conform to the tables 6. Table 6-1 applies in the case where a primary driving beam is being produced with a single light source. Table 6-2 applies in the case where the driving beam is being produced by a secondary driving beam headlamp operated with a harmonized passing beam headlamp or a primary driving beam headlamp.

#### 6-1 Primary high beam headlamp

( Refer to figure 5 for details of test point positions )



TEST POINT NUMBER	TEST POINT LOCATION	Required illumination in lux			
		Class D		Class C	
		> 125cc		≤ 125cc	
		MIN.	MAX.	MIN.	MAX.
1	H-V (1)	(1)	---	(1)	---
2	H-3R & 3L	19.2	---	12.8	---
3	H-6R & 6L	6.4	---	4.16	---
4	H-9R & 9L	3.84	---	2.56	---
5	H-12R & 12L	1.28	---	0.8	---
6	2U-V	1.92	---	1.28	---
7	4D-V	---	(2)	---	(2)
	MIN. LUMINOUS INTENSITY OF THE MAXIMUM	51.2	---	32	---
	MAX. LUMINOUS INTENSITY	---	180.0	---	180.0

- (1) Intensity at H-V shall be equal to or greater than 80 per cent of the maximum intensity in the beam pattern.
- (2) Intensity at 4d-v shall be equal to or less than 30 per cent of the maximum intensity in the beam pattern.

## 6-2 Primary high beam headlamp

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

TEST POINT NUMBER	TEST POINT LOCATION	Required illumination in lux			
		Class D		Class C	
		> 125cc		≤ 125cc	
		MIN.	MAX.	MIN.	MAX.
1	H-V (1)	(1)	---	(1)	---
2	H-3R & 3L	19.2	---	12.8	---
3	H-6R & 6L	6.4	---	4.16	---
6	2U-V	1.92	---	1.28	---
7	4D-V	---	(2)	---	(2)
	MIN. LUMINOUS INTENSITY OF THE MAXIMUM	51.2	---	32	---
	MAX. LUMINOUS INTENSITY	---	180.0	---	180.0

- (1) Intensity at H-V shall be equal to or greater than 80 per cent of the maximum intensity in the beam pattern.
- (2) Intensity at 4D-V shall be equal to or less than 30 per cent of the maximum intensity in the beam pattern.

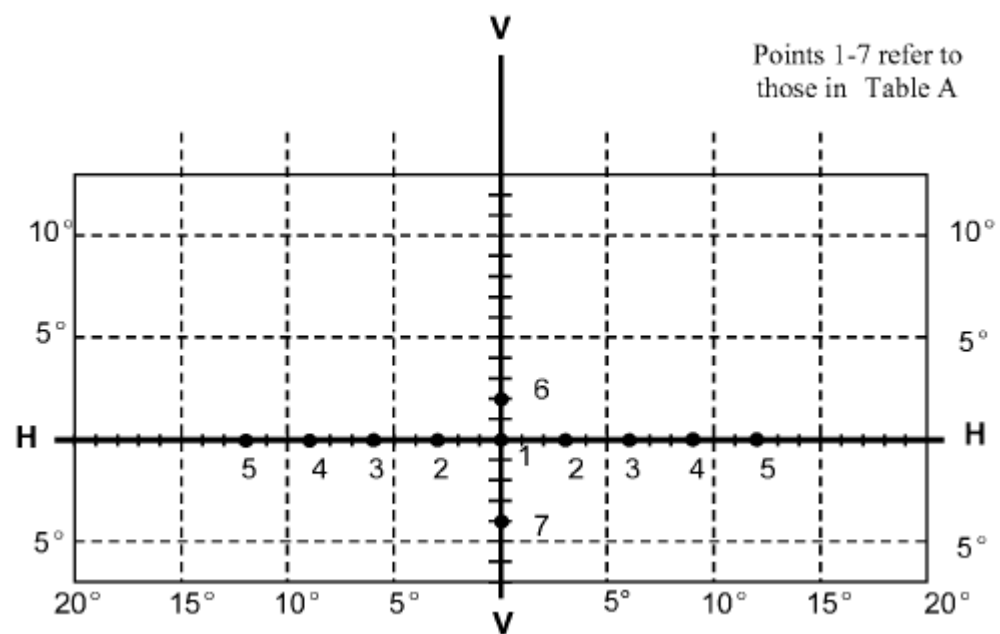


Figure 5  
Primary Driving Beam

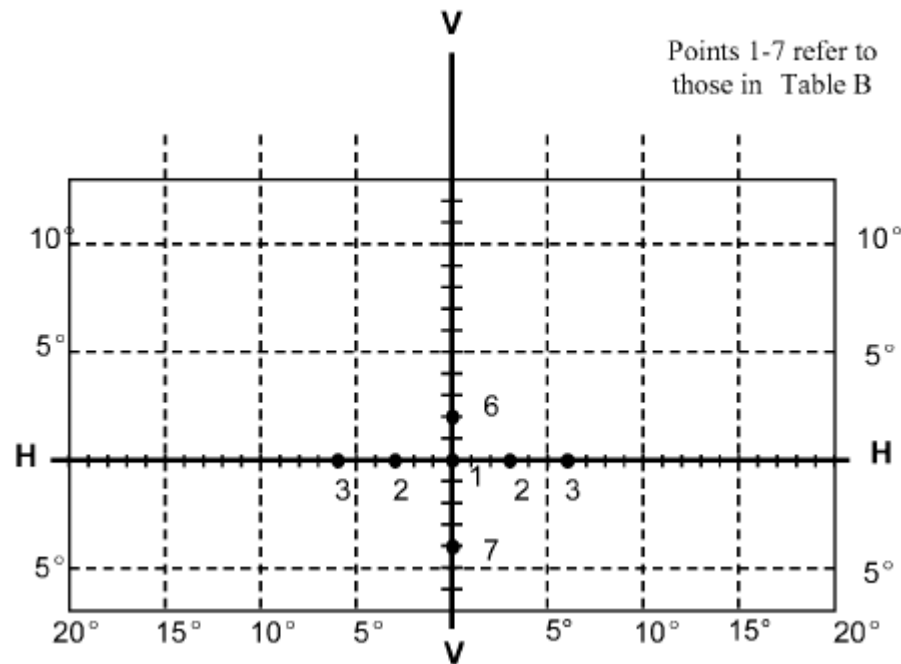


Figure 6  
Secondary Driving Beam

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

52.7.3.1 asymmetrical-beam headlamp :

passing beam: points HV and 75 R (75 L respectively);

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driving beam: EM and point HV (percentage of EM).

52.7.3.2 symmetrical-beam headlamp :

passing beam: points HV and 0.86D-V

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

52.8 Color

52.8.1 In the case of sealed-beam headlamp and halogen sealed-beam headlamp, the light emitted shall be white or selective yellow. In the case of white light as follows in paragraph 52.8.2.

Limit towards red :  $y \geq 0.138 + 0.580x$

Limit towards green :  $y \leq 1.290x - 0.100$

Limit towards white :  $y \geq -x + 0.966$

Limit towards spectral value :  $y \leq -x + 0.992$

which can be expressed as follows:

Dominant wavelength : 575 ~ 585 nm

Purity factor : 0.90 ~ 0.98

52.8.2 In the case of symmetrical headlamp and asymmetrical headlamp, the color of light emitted shall be white. Expressed in CIE trichromatic coordinates, the light of the beams shall be in the following boundaries:

Limit towards blue :  $x \geq 0.310$

Limit towards yellow :  $x \leq 0.500$

Limit towards green :  $y \leq 0.150 + 0.640x$

Limit towards green :  $y \leq 0.440$

Limit towards purple :  $y \geq 0.050 + 0.750x$

Limit towards red :  $y \geq 0.382$

52.9 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.

52.9.1 Clean headlamp

52.9.1.1 Test procedure

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

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

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

52.9.1.1.2 In the case where only one lighting function (driving or passing beam) is to be tested, the corresponding filament is lit for the prescribed time of 12 hours.

52.9.1.1.3 In the case of a reciprocal incorporated passing beam and driving beam :

52.9.1.1.3.1 The headlamp shall be subjected to the following cycle until the time specified is reached - i.e. 12 hours:  
15 minutes, passing filament lit  
5 minutes, all filaments lit

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

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

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

52.9.1.1.5.1 In the case of a headlamp with a passing beam and a front fog lamp :

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

15 minutes – passing beam filament lit

5 minutes – all filaments lit

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

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

15 minutes – front fog lamp lit

5 minutes – all filaments lit

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

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

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

15 minutes – passing beam filament lit

5 minutes – all filaments lit

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

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

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

52.9.1.1.6 In the case of asymmetrical-beam headlamp , 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.

52.9.1.1.6.1 The headlamp shall be operated following cycle for 12 hours 15 minutes, passing-beam filament lit , 5



minutes, all filaments lit.

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

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

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

#### 52.9.1.1.7 Test voltage :

In the case of sealed-beam headlamp, the voltage shall be adjusted so as to supply a wattage 15% (26% for 24 V types) higher than the rated wattage. In the case of halogen sealed-beam headlamp, asymmetrical-beam headlamp and symmetrical-beam headlamp, the voltage shall be adjusted so as to supply 90% of the maximum wattage. In the case of asymmetrical-beam headlamps and symmetrical headlamp, the applied wattage shall in all cases comply with the corresponding value of a filament lamp of 12 V rated voltage, except if the applicant for approval specifies that the headlamp may be used at a different voltage. In the latter case, the test shall be carried out with the filament lamp whose wattage is the highest that can be used.

#### 52.9.1.2 Test results

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

52.9.1.2.2 Photometric test : To comply with the requirements of this Regulation, the photometric values shall be verified in the

following points and a 10% discrepancy between the photometric characteristics and the values measured prior to the test is permissible including the tolerances of the photometric procedure:

52.9.1.2.2.1 Passing beam for sealed-beam headlamp, halogen sealed-beam headlamp and asymmetrical headlamp :  
50R, B50L, HV.

52.9.1.2.2.2 Passing beam for symmetrical headlamp :  
50R, 50L, B50, HV.

52.9.1.2.2.3 Driving beam : Point of maximum photometric value

#### 52.9.2 Dirty headlamp test

After being tested as specified in paragraph 52.9.1, the headlamp shall be operated for one hour as described paragraph 52.9.1, after being prepared as: The test mixture shall be uniformly applied to the entire light emitting surface of the headlamp and then left to dry. This procedure shall be repeated until the illumination value has dropped to 15-20% of the values measured for each following point:

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

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

52.9.2.3 In the case of the symmetrical headlamp, passing beam only: B 50 and 50 V.

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

52.9.3.1 The headlamp tested in accordance with 52.9.1, shall be subjected to the test, without being moved and readjusted its position.

52.9.3.2 Using a mass production headlamp which has been aged for at least one hour, the headlamp shall be operated on passing

beam without being dismantled from or readjusted in relation to its test fixture. The position of the cut-off line shall be verified 3 minutes (r3) and 60 minutes (r60) respectively after operation.

52.9.3.2.1 Symmetrical headlamp :

Horizontal part between the vertical lines passing through point 50 L and 50 R.

52.9.3.2.2 Other headlamps :

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

52.9.3.3 The 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 ( $\Delta r_l \leq 1.0$  mrad).

52.9.3.4 However, if this value is more than 1.0 mrad but not more than 1.5 mrad, a second headlamp shall be tested as described in paragraph 52.9.3.2 after being subjected three consecutive times to the cycle as described below, in order to stabilize the position of mechanical parts of the headlamp on a base representative of the correct installation on the vehicle:

Operation of the passing beam for one hour,

Period of rest for one hour.

The headlamp shall be considered as acceptable if the mean value of the absolute values  $\Delta r_l$  measured on the first sample and  $\Delta r_{ll}$  measured on the second sample is not more than 1.0 mrad.

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

Thirteen 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 :

52.10.1 Resistance to temperature changes

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

3 hours at  $40 \pm 2^{\circ}\text{C}$  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.

52.10.1.2 Photometric measurement shall be carried out on the samples before and after the test. These measurements shall be made using a standard lamp at the following points :

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

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

52.10.1.2.2.1 The category of B : B50 , 50L , 50R

52.10.1.2.2.2 The category of C and D : 0.86D/3.5R , 0.86D/3.5L , 0.50U/1.5L and 1.5R

52.10.1.2.3 Point of maximum photometric value for the driving beam of a driving lamp or a passing/driving lamp

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

52.10.2 Resistance to atmospheric and chemical agents

The following readings shall be taken :

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

52.10.2.1 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  $50 \text{ °C} \pm 5\text{°C}$ . 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  $23 \text{ °C} \pm 5\text{°C}$  in accordance with the following cycle :

Spraying : 5 minutes,

Drying : 25 minutes

52.10.2.2 After the test of resistance to atmospheric agents, the outer face of the samples shall be free from cracks, scratches, chipping

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and deformation, and the mean variation ( $\Delta t_m$ ) in transmission  $\Delta t = (T_2 - T_3)/T_2$  measured on the three samples shall not exceed 0.020.

- 52.10.2.3 Soak a piece of cotton cloth until saturation with the test mixture, and, within 10 seconds, apply it for 10 minutes to the outer face of the sample after being carried out the test in paragraph 52.10.2.1, at a pressure of 50 N/cm<sup>2</sup>. At the end of the application of the test mixture, the samples shall be dried in the open air and then washed with the solution-detergents at 23 °C  $\pm$  5°C. Afterward the samples shall be carefully rinsed with distilled water at 23 °C  $\pm$  5°C and then wiped off with a soft cloth.
- 52.10.2.4 After the test of resistance to chemical agents, the samples shall not bear any traces of chemical staining likely to cause a variation of flux diffusion  $\Delta d = (T_5 - T_4)/T_2$ , whose mean variation ( $\Delta d_m$ ) measured on the three samples shall not exceed 0.020.

#### 52.10.3 Resistance to detergents and hydrocarbons

- 52.10.3.1 The outer face of three samples shall be heated to 50 °C  $\pm$  5°C and then immersed for five minutes in a mixture maintained at 23 °C  $\pm$  5°C and composed of 99% distilled water and 1% of alkylaryl sulphonate. At the end of the test, the samples shall be dried in a test chamber at 50 °C  $\pm$  5°C. The surface of the samples shall be cleaned with a moist cloth.
- 52.10.3.2 The outer face of these three samples shall then be lightly rubbed for one minute with a cotton cloth soaked in a mixture composed of 70% n-heptane and 30% toluene (volume percent), and then shall be dried in the open air.
- 52.10.3.3 After the above two tests have been performed successively, the mean variation ( $\Delta t_m$ ) in transmission  $\Delta t = (T_2 - T_3)/T_2$  measured on the three samples shall not exceed 0.010.

#### 52.10.4 Resistance to mechanical deterioration

- 52.10.4.1 The spray gun used with test mixture of silica sand shall be equipped with a nozzle 1.3 mm in diameter allowing a liquid flow rate of 0.24 $\pm$ 0.02 l/minute at an operating pressure of 6.0 bars -0, +0.5 bar, at a distance of 380 mm $\pm$ 10 mm from the nozzle. The jet shall be sprayed almost perpendicular to the surface to be tested. The deterioration shall be checked by means of one or more samples of glass placed as a reference near the lenses to be tested. The mixture shall be sprayed until the

variation in the diffusion of light on the sample or samples measured by the method, is such that:  $\Delta d = (T5-T4)/T2 = 0.025 \pm 0.0025$ .

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

#### 52.10.5 Test of adherence of coatings, if any

52.10.5.1 A surface of 20 mm x 20 mm in area of the coating of a lens shall be cut a razor blade into a grid of squares approximately 2 mm x 2 mm. An adhesive tape with a force adhesion of 2 N/cm  $\pm$  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 m/s  $\pm$  0.2 m/s.

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

#### 52.10.6 Tests of the complete headlamp

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

52.10.6.1.1 The lens of lamp sample No. 1 shall be subjected to the test described in paragraph 52.10.4.

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

52.10.6.2 Test of adherence of coating, if any (The lens of lamp sample No. 2 shall be subjected to the test): The lens of lamp sample No. 2 shall be subjected to the test and meet the results described in paragraph 52.10.5.

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

Sample No. Tests	Lenses or samples						Lenses						
	1	2	3	4	5	6	7	8	9	10	11	12	13
Resistance to Temperature changes										○	○	○	
Resistance to atmospheric agents	○	○	○										
Resistance to chemical agents	○	○	○										
Resistance to detergents and hydrocarbons				○	○	○							
Resistance to mechanical deterioration							○	○	○				
Test of adherence of coating													○

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. Tests	Complete headlamp	
	1	2

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Resistance to mechanical deterioration	<input type="radio"/>	
Test of adherence of coating		<input type="radio"/>