

30 Gas-discharge Headlamps

Refer to: R98 00-S10

30.1 Effective date and Scope:

- 30.1.1 As for the category symbols M, N, L1 and L3, the new vehicle types as of 2006/7/1 and all vehicle types as of 2008/7/1, shall comply with this regulation and shall be use gas-discharge Headlamps that is conform with "Filament lamps" and/or "LED light sources" of this regulation.
- 30.1.2 The applicants applying for low volume safety approval could exempt from regulation of "gas-discharge headlamps" except large passenger vehicle and child-only vehicle.
- 30.1.3 Applying for vehicle-by-vehicle low volume safety approval, the vehicle could exempt from regulation of "gas-discharge headlamps".

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

- 30.2.1 Trade name
- 30.2.2 The characteristics of the optical system , however , if bulbs or filter'color is change that it doesn't mean to change the types.
- 30.2.3 The inclusion or elimination of components capable of altering the optical effects by reflection, refraction, absorption and/or deformation during operation
- 30.2.4 The kind of beam produced (passing beam or driving beam or both)
- 30.2.5 The materials constituting the lenses and coating, if any.

30.3 The test voltage applied to the terminals of the ballast(s) unit is either $13.5\text{ V} \pm 0.1\text{V}$ for 12V systems or otherwise specified by the mark on headlamp unit.

30.4 Photometric test

30.4.1 Specifications of measuring screen and distribution of cut-off

- 30.4.1.1 The illumination produced by the headlamp shall be determined by means of a vertical screen, as shown on the Figure 1, Figure 2 and Figure 3, set up 25 m forward of the headlamp (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.)
- 30.4.1.2 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".
- 30.4.1.3 The passing beam must produce a sufficiently sharp "cut-off" to permit a satisfactory adjustment with its aid. The "cut-off"

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must be a horizontal straight line at the left side of v-v line on measuring screen; on the other side, it must not extend either above the line HV/H2 (Figure 1) or above the line HV/H3/H4 (Figure2) on measuring screen.

- 30.4.1.4 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° ($\approx 22\text{cm}$) to the right or left and vertically not more than 0.2° ($\approx 8.7\text{cm}$) up or down.

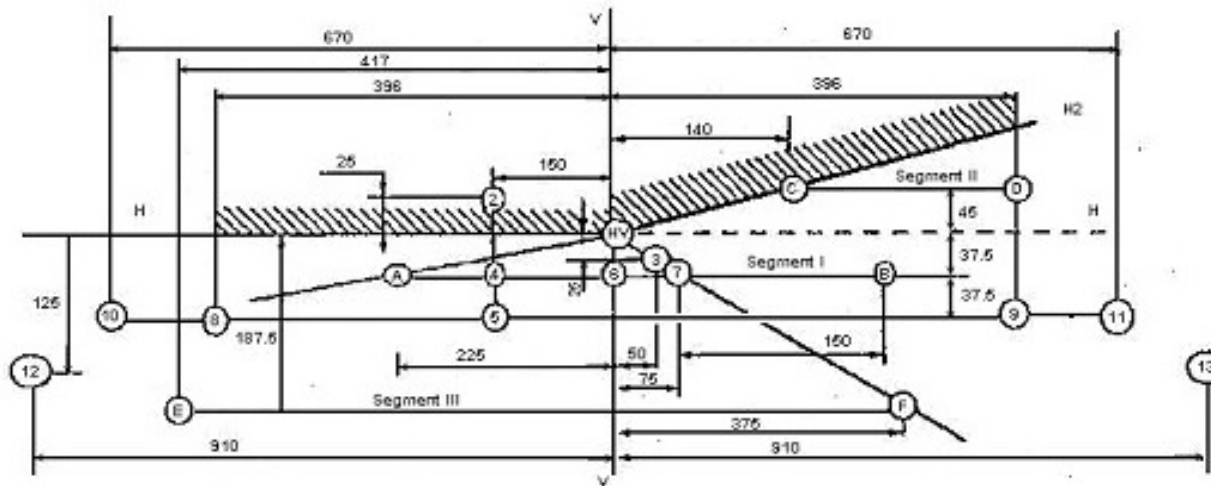


Figure 1.Measuring screen 1

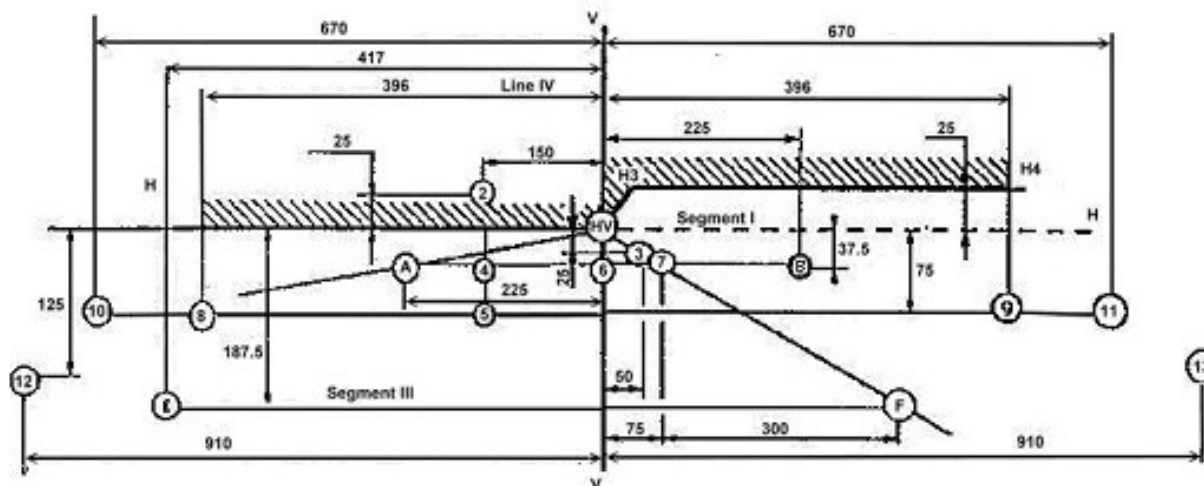


Figure 2.Measuring screen 2

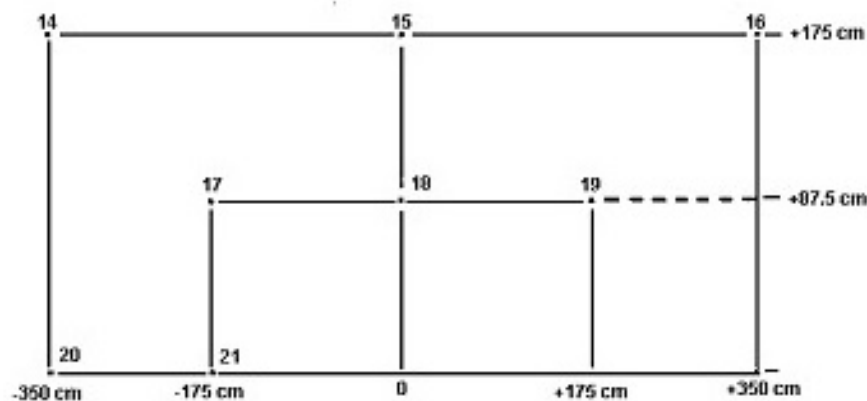


Figure 3.Measuring points for illumination values

30.4.2 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 10 lux at point 50V of a passing beam for headlamps incorporating driving beam and passing beam functions, or 10 lux at point 50V for headlamps having only a passing beam function.

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- 30.4.3 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.
- 30.4.4 After more than 10 minutes after ignition, the illuminances produced by passing beam on Screen 1 or 2 (Figure 1 or 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	Illuminances (lux)	Horizontal distances (cm)	Vertical distances (cm)
	On and above line H/H2, or on and above line H/H3/H4			
1	HV	1 max	0	0
2	B50L	0.5 max	L150	U25
3	75R	20 min	R50	D25
4	50L	20 max	L150	D37.5
5	25L1	30 max	L150	D75
6	50V	12 min	0	D37.5
7	50R	20 min	R75	D37.5
8	25L2	4 min	L396	D75
9	25R1	4 min	R396	D75
10	25L3	2 min	L670	D75
11	25R2	2 min	R670	D75
12	15L	1 min	L910	D125
13	15R	1 min	R910	D125
14		*/	L350	U175
15		*/	0	U175
16		*/	R350	U175
17		*/	L175	U87.5
18		*/	0	U87.5
19		*/	R175	U87.5
20		0.1 min	L350	0
21		0.2 min	L175	0
A to B	Segment I	6 min	L225 to R225	D37.5
C to D	Segment II	6 max	R140 to R396	U45
E to F	Segment III and under	20 max	L417 to R375	D187.5
	Maximum illumination (R)	70 max	Right of VV line	Above D75

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Points or segments	Designation	Illuminances (lux)	Horizontal distances (cm)	Vertical distances (cm)
	On and above line H/H2, or on and above line H/H3/H4			
	Maximum illumination (L)	50 max	Left of VV line	

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 :

$14+15+16 \geq 0.3 \text{ lux}$

and $17+18+19 \geq 0.6 \text{ lux}$

30.4.5 Provisions concerning driving beams:

30.4.5.1 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.

30.4.5.2 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.

30.4.5.3 Photometric requirements :

30.4.5.3.1 The point of intersection (HV) of the lines HH and VV shall be situated within the isolux representing 80 % of the maximum illuminance. This maximum illuminance, hereunder designated as E_{max} , shall lie between 70 and 180 lux.

30.4.5.3.2 Starting from point HV, horizontally to the left and right, the illumination shall be not less than 40 lux up to a distance of 1.125m and not less than 10 lux up to a distance of 2.25m.

30.4.6 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 : E_{max} and HV (as percent of E_{max})

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

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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.

30.5 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”.

30.6 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 being mounted on a base representing the correct installation on the vehicle.

30.6.1 Clean headlamp

30.6.1.1 Test procedure: The headlamps shall be operated for 12 hours.

30.6.1.1.1 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.

30.6.1.1.2 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.

30.6.1.1.3 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:

30.6.1.1.3.1 If the applicant declares that the headlamp is to be used with a single light source lit at a time, the test shall be carried out in accordance with this condition, activating each specified function successively for half the time specified above.

30.6.1.1.3.2 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;

30.6.1.1.4 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.

30.6.1.1.5 Test voltage : The test voltage for the ballast is 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.

30.6.1.2 Test results:

30.6.1.2.1 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.

30.6.1.2.2 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:

30.6.1.2.2.1 Passing beam: 50 R - B 50 L - HV

30.6.1.2.2.2 Driving beam: Point of Emax.

30.6.2 Dirty headlamp: After being tested as specified in paragraph 30.6.1, the headlamp shall be operated for one hour as described paragraph 30.6.1, 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:

30.6.2.1 Point Emax in passing beam/driving beam and in driving beam only,

30.6.2.2 50 R and 50 V for a passing lamp only.

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

30.6.3.1 The headlamp tested in accordance with paragraph 30.6.1 (Clean headlamp) and 30.6.2 (Dirty headlamp) shall be subjected to the test without being moved from or readjusted in relation to its test fixture.

30.6.3.2 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.

30.6.3.3 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.

30.6.3.4 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 30.6.3.2, 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 Δr_{ll} measured on the second sample is not more than 1.0 mrad.

30.7 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. Tests	Lenses or samples of material										Lenses			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
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 coatings														○
Resistance to light source radiation (5)B (V)										○				

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. Tests	Complete headlamp	
	1	2
Resistance to mechanical deterioration	○	

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Test of adherence of coating		○
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30.7.1 Resistance to temperature changes

30.7.1.1 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.

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.

30.7.1.2 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

30.7.1.3 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.

30.7.2 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

- 30.7.2.1 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
- 30.7.2.2 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.
- 30.7.2.3 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.
- 30.7.2.4 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.
- 30.7.2.5 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.
- 30.7.3 Resistance to detergents and hydrocarbons
- 30.7.3.1 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
- 30.7.3.2 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.
- 30.7.3.3 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.

30.7.4 Resistance to mechanical deterioration

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: $\Delta d = (T_5 - T_4)/T_2 = 0.025 \pm 0.0025$.

30.7.4.1 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: $\Delta t_m \leq 0.100$, $\Delta d_m \leq 0.050$.

30.7.5 Test of adherence of coatings, if any

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

30.7.5.2 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 $1.5 \text{ m/s} \pm 0.2 \text{ m/s}$.

30.7.5.3 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.

30.7.6 Tests of the complete headlamp

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

30.7.6.1.1 The lens of lamp sample No. 1 shall be subjected to the test described in paragraph 30.7.4.1.

30.7.6.1.2 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.

30.7.6.2 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 30.7.5.