32-1 Front fog lamps

Refer to: R19 03-S4

32-1.1 Effective date and Scope:

32-1.1.1 Effective date from 2013/1/1 the new type of B and F3 Front Fog Lamps using in category symbols L3, L5, M and N and from 2017/1/1 the all type of B and F3 Front Fog Lamps using in category symbols L3, L5, M and N shall comply with this regulation and shall be use bulbs that is conform with this Direction.

32-1.1.2 As for the Front Fog Lamps which were confirmed with ”320. Front Fog Lamps” could be assumed as comply with type B Front Fog Lamps of ”321. Front Fog Lamps”.

32-1.1.3 Paragraph 32-1.7 Test for stability of photometric performance, the test voltage shall comply with either 32-1.7.1.1 or 32-1.7.1.2 of this regulation.

32-1.1.3.1 Effective date from 2015/1/1, the new type of Front Fog Lamps using in category symbols L3 L5, M and N, the test voltage shall comply with 32-1.7.1.2 of this regulation.

32-1.1.4 The applicants applying for low volume safety approval may be exempt from regulation of “front fog lamps” except large passenger vehicle and child-only vehicle.

32-1.1.5 Applying for vehicle-by-vehicle low volume safety approval, the vehicle may be exempt from regulation of “front fog lamps”.

32-1.1.6 The definitions given in「The installation of lighting and light-signaling devices」and its series of amendments in force at the time of application for type approval shall apply to this Regulation.

32-1.1.7 References made in this Regulation to standard (etalon) light sources and lamps shall refer to ”Filament lamps” and their series of amendments in force at the time of application for type approval.

32-1.2 Definitions

32-1.2.1 The lamp on a vehicle that improves the illumination of the road in condition of fog, snowfall, heavy rain and dust cloud..

32-1.2.2 "Colour of the light emitted from the device." The definitions of the colour of the light emitted, given in ”03 The installation of lighting and light-signaling devices” and its series of amendments in force at the time of application for type approval, shall apply to this Regulation.

32-1.3 Front fog lamps shall according to suitable variants and range are of principle：

32-1.3.1 Brand.

32-1.3.2 The same lamp classes (B or F3), the characteristics of the optical system (basic optical design), type / category of light source, LED module, DLS etc.), However, if the colour of light source or filter is change that it does not mean to change the variants.

32-1.3.3 The inclusion of components capable of altering the optical effects by reflection, refraction, absorption and/or deformation during operation and the variable intensity control.

32-1.3.4 The category of bulbs and/or LED module or light generator specific identification code (s).

32-1.3.5 The lenses and coating of material constitution

32-1.3.6 A device intended for the installation on the left side of the vehicle and the corresponding device intended for the installation of the right side of the vehicle shall be considered to be of the same type.

32-1.4 General Specifications

32-1.4.1 In the case of the use of replaceable light sources:

32-1.4.1.1 The light source's holder shall conform to the characteristics given in IEC Publication No. 60061. The holder data sheet relevant to the category of light sources used applies;

32-1.4.1.2 The light source shall fit easily into the front fog lamp;

32-1.4.1.3 The design of the device shall be such that the light source(s) can be fixed in no other position but the correct one.

32-1.4.2 In the case of Class B, the front fog lamp shall be equipped with one filament lamp approved according to 「29 Filament lamps」 even if the filament lamp cannot be replaced. Any ”29 Filament lamps” filament lamp may be used, provided that no restriction on the

use is made in 「29 Filament lamps」 and its series of amendments in force at the time of application for type approval.

32-1.4.2.1 Even if this filament lamp cannot be replaced it shall comply with the requirements in paragraph 32-1.4.2.

32-1.4.3 In the case of Class F3, the light sources shall be:.

32-1.4.3.1 One or more replaceable light sources approved according to 「29 Filament lamps」 and its associated series of amendments in force at the time of application for type approval.

32-1.4.3.2 And/or, one or more LED modules where the requirements in paragraph 32-1.9. to this Regulation shall apply. The compliance with the requirements shall be tested.

32-1.4.3.3 And/or light generators where the requirements in paragraph 32-1.9. to this Regulation shall apply. The compliance with the requirements shall be tested.

32-1.4.4 Even if these light sources cannot be replaced they shall comply with the requirements in paragraph 32-1.9, the requirements shall be tested.

32-1.4.5 In the case of LED module or light generator it shall be checked, that:

32-1.4.5.1 The design of the LED module(s) or light generator(s) shall be such that they can be fitted in no position other than the correct one.

32-1.4.5.2 Non-identical light source modules, if any, shall be non-interchangeable within the same lamp housing.

32-1.4.5.3 The LED module(s) or light generator(s) shall be tamperproof.

32-1.4.6 In case of front fog lamps with light source(s) having a total objective luminous flux that exceeds 2,000 lumen, a reference shall be record in the report.

32-1.4.7 If the lens of the front fog lamp is made of plastic material tests shall be done according to the requirements in paragraph 32-1.7.

32-1.4.7.1 The UV resistance of light transmitting components located inside the front fog lamp and made of plastic material shall be tested according to paragraph 32-1.7.

32-1.4.7.2 The test in paragraph 32-1.4.7.1 is not necessary if low-UV type light sources as specified in 「29 Filament lamps」 or LED module are used, or if provisions are taken to shield the relevant lamp components from UV radiation, e.g. by glass filters.

32-1.4.8 The front fog lamp and its ballast system or light source control gear shall not generate radiated or power line disturbances, which cause a malfunction of other electric/ electronic systems of the vehicle.

32-1.4.9 Front fog lamps, designed to operate permanently with an additional system to control the intensity of the light emitted, or which are reciprocally incorporated with another function, using a common light source, and designed to operate permanently with an additional system to control the intensity of the light emitted, are permitted.

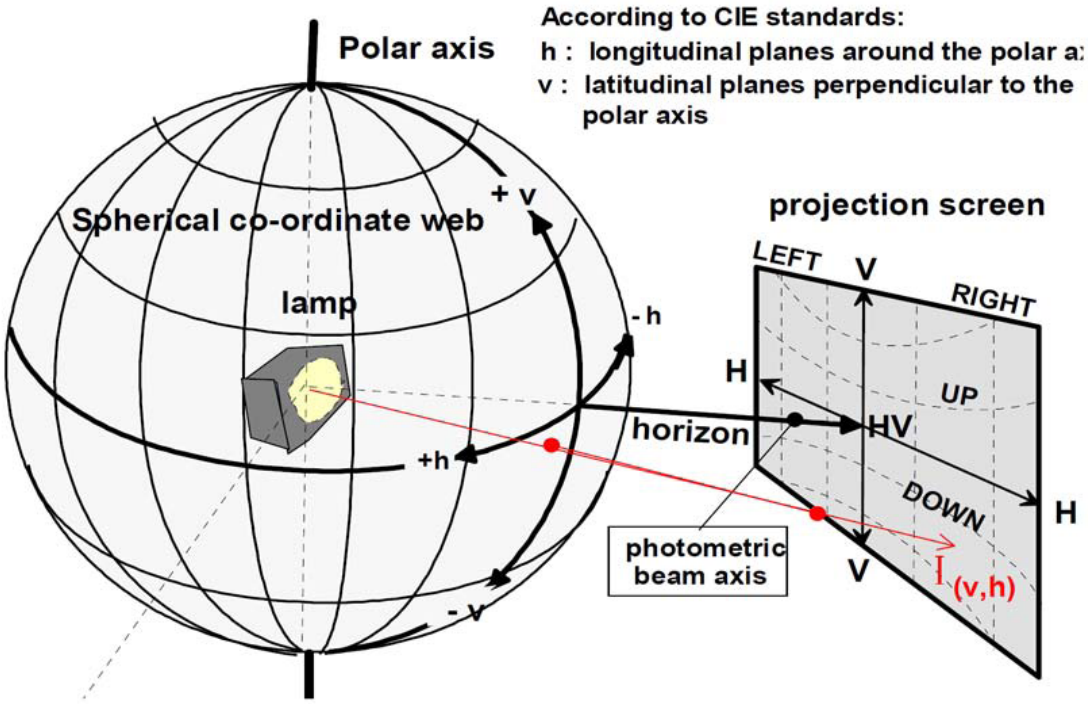
32-1.4.10 In the case of Class F3 the sharpness and linearity of the cut-off shall be tested according to the requirements in paragraph 32-1.5.8.2.4.

32-1.5 Photometric test

32-1.5.1 Front fog lamps shall be so designed as to provide illumination with limited dazzle.

32-1.5.2 The luminous intensity produced by the front fog lamp 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. As figure 1., the point HV is the centre-point of the coordinate system with a vertical polar axis. Line h is the horizontal through HV.

Figure 1



32-1.5.3 In the case of Class B front fog lamps:

32-1.5.3.1 A colourless standard (etalon) filament lamp as specified in 「29 Filament lamps」, of the category specified by the manufacturer, which may be supplied by the manufacturer or applicant, shall be used.

32-1.5.3.1.1 During the testing of the front fog lamp the power supply for this filament lamp shall be regulated so as to obtain the reference luminous flux as indicated in the relevant data sheet of 「29 Filament lamps」.

32-1.5.3.1.2 During the testing of a front fog lamp where the filament lamp cannot be replaced, the voltage at the terminals of the front fog lamp shall be regulated at 12.0 V.

32-1.5.3.2 The front fog lamp shall be deemed satisfactory if the photometric requirements are met with at least one standard filament

lamp.

32-1.5.3.3 The aiming screen for visual adjustment shall be positioned at either a distance of 10 m or a distance of 25 m in front of the front fog lamp.

32-1.5.3.3.1 The beam shall produce on this aiming screen, over a width of not less than 5.0 degrees on both sides of the line v, a symmetrical and substantially horizontal cut-off to enable visual vertical adjustment.

32-1.5.3.3.2 The front fog lamp shall be so adjusted that the cut-off on the aiming-screen is 1.15 degrees below the line h.

32-1.5.3.4 When so adjusted, the front fog lamp shall meet the requirements in paragraph 5.3.5.

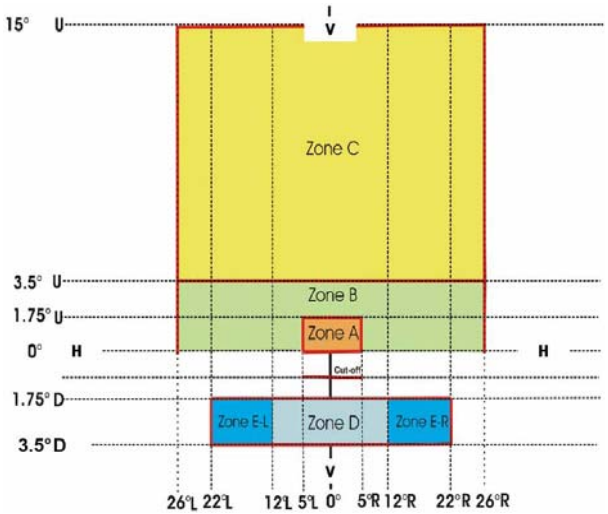
32-1.5.3.5 The illumination (refer to figure 2.) shall meet the following requirements:

Table 1

Designated lines or zones	Vertical position */	Horizontal position */	Luminous intensity	To comply
Line 1	15 degrees U to 60 degrees U	0 degrees	100 cd max	All line
Zone A	0 degrees to 1.75 degrees U	5 degrees L to 5 degrees R	62 cd min	Whole zone
Zone B	0 degrees to 3.5 degrees U	26 degrees L to 26 degrees R	400 cd max	Whole zone
Zone C	3.5 degrees U to 15 degrees U	26 degrees L to 26 degrees R	250 cd max	Whole zone
Zone D	1.75 degrees D to 3.5 degrees D	12 degrees L to 12 degrees R	1,250 cd min 8,000 cd max	At least one point on each vertical line
Zone E	1.75 degrees D to 3.5 degrees D	12 degrees L to 22 degrees L and 12 degrees R to 22 degrees R	600 cd min 8,000 cd max	At least one point on each vertical line

*/ The co-ordinates are specified in degrees for an angular web with a vertical polar axis.

Figure 2: Light distribution of the Class B front fog lamp



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32-1.5.3.6 In the light-distribution as specified in the table 1, single narrow spots or stripes inside the area above 15 degrees with not more than 160 cd are allowed, if not extending beyond a conical angle of 2 degrees aperture or a width of 1 degree. If multiple spots or stripes are present they shall be separated by a minimum angle of 10 degrees.

32-1.5.4 In the case of Class F3 front fog lamps

32-1.5.4.1 Depending on the light source, the following conditions shall apply.

32-1.5.4.1.1 In the case of replaceable filament light sources:

32-1.5.4.1.1.1 The front fog lamp shall comply with the requirements of paragraph 32-1.5.4.3. of this Regulation with at least one complete set of appropriate standard (etalon) lamps, which may be supplied by the manufacturer or applicant.

In the case of filament lamps operating directly under vehicle voltage system conditions: The front fog lamp shall be checked by means of colourless standard (etalon) filament lamps as specified in 「29 Filament lamps」. During the testing of the front fog lamp, the power supply to the filament lamp(s) shall be regulated so as to obtain the reference luminous flux as indicated on the relevant data sheet of 「29 Filament lamps」.

32-1.5.4.1.1.2 In the case of a system that uses a light source control gear being part of the lamp, the voltage declared by the applicant shall be applied to the input terminals of that lamp. The measured photometric value shall be multiplied by a factor of 0.7 prior to checking for compliance.

32-1.5.4.1.1.3 In the case of a system that uses a light source control gear not being part of the lamp the voltage declared by the applicant shall be applied to the input terminals of that light source control gear. The test laboratory shall require from the applicant the special light source control gear needed to supply the light source and the applicable functions. The identification of that light source control gear if applicable and/or the voltage applied including the tolerances shall be noted in the report. The measured photometric value shall be multiplied by a factor of 0.7 prior to checking for compliance.

32-1.5.4.1.2 In the case of a gas-discharge light source:

A standard light source shall be used as specified in 「29 Filament lamps」, which has been aged during at least 15 cycles.

During testing of the front fog lamp the voltage at the terminals of the ballast shall be regulated to maintain 13.5 V for a 12 V system, or at the vehicle voltage as specified by the applicant, with a tolerance of +/-0.1 V.

The measured luminous intensity values shall be multiplied by a factor of 0.7 prior to the check for compliance.

The objective luminous flux of the gas- discharge light source may differ from that specified in 「29 Filament lamps」 In this case, the luminous intensity values shall be corrected accordingly.

32-1.5.4.1.3 In the case of non-replaceable light sources:

All measurements on front fog lamps equipped with non-replaceable light sources shall be made at 6.3 V, 13.2 V or 28.0 V or at other vehicle voltage as specified by the applicant. The test laboratory may require from the applicant the special power supply needed to supply the light sources. The test voltages shall be applied to the input terminals of the lamp. The measured luminous intensity values shall be multiplied by a factor of 0.7 prior to checking for compliance.

32-1.5.4.1.4 In the case of LED modules:

All measurements on front fog lamps equipped with LED module(s) shall be made at 6.3 V, 13.2 V or 28.0 V respectively, if not otherwise specified within this Regulation. LED modules operated by an electronic light source control gear shall be measured as specified by the applicant.

The measured luminous intensity values shall be multiplied by a factor 0.7 prior to the check for compliance.

32-1.5.4.1.5 Compliance with the requirement in paragraph 32-1.4.5.1 shall be verified at least with respect to the values in line 3 and 4 of table 2.

32-1.5.4.2 Photometric adjustment and measuring conditions:

32-1.5.4.2.1 The aiming screen for visual adjustment (refer to figure 2.) shall be positioned at either a distance of 10 m or a distance of 25 m in front of the front fog lamp.

32-1.5.4.2.2 The beam shall produce on this aiming screen, over a width of not less than 5.0 degrees on both sides of the line v, a symmetrical and substantially horizontal cut-off to enable visual vertical adjustment.

32-1.5.4.2.3 The sharpness of the cut-off shall be tested according to the requirements in paragraph 32-1.5.4.2.4.. The value of G shall not be less than 0.08.

32-1.5.4.2.4 Sharpness of cut-off:

If scanned vertically through the horizontal part of the cut-off line along vertical lines at +/- 1 degree from the v-v line, the maximum value measured for the sharpness factor G of the cut-off line shall not be less than 0.08 where:

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

32-1.5.4.3 Photometric requirements

When so adjusted, the front fog lamp shall meet the photometric requirements in the table below (also refer to figure 2.):

Table 2.

Designated lines or zones	Vertical position* above h + below h -	Horizontal position* left of v: - right of v: +	Luminous intensity (in cd)	To comply
Point 1, 2**	+60 degrees	+/-45 degrees	85 max	All points
Point 3, 4**	+40 degrees	+/-30 degrees		
Point 5, 6**	+30 degrees	+/-60 degrees		
Point 7, 10**	+20 degrees	+/-40 degrees		
Point 8, 9**	+20 degrees	+/-15 degrees		
Line 1**	+8 degrees	-26 degrees to +26 degrees	130 max	All line
Line 2**	+4 degrees	-26 degrees to +26 degrees	150 max	All line
Line 3	+2 degrees	-26 degrees to +26 degrees	245 max	All line
Line 4	+1 degree	-26 degrees to +26 degrees	360 max	All line
Line 5	0 degrees	-10 degrees to +10 degrees	485 max	All line
Line 6	-2.5 degrees	from 5 degrees inwards to 10 degrees outwards	2,000 min	All line
Line 7	-6.0 degrees	from 5 degrees inwards to 10 degrees outwards	< 50 per cent of max. on line 6	All line
Line 8L and R***	-1.5 degrees to -3.5 degrees	-22 degrees and +22 degrees	1,100 min	One or more points
Line 9L and R***	-1.5 degrees to -4.5 degrees	-35 degrees and +35 degrees	450 min	One or more points
Zone D	-1.5 degrees to -3.5 degrees	-10 degrees to +10 degrees	12,000 max	Whole zone

*/ The co-ordinates are specified in degrees for an angular web with a vertical polar axis.

**/ See paragraph 32-1.5.4.3.4.

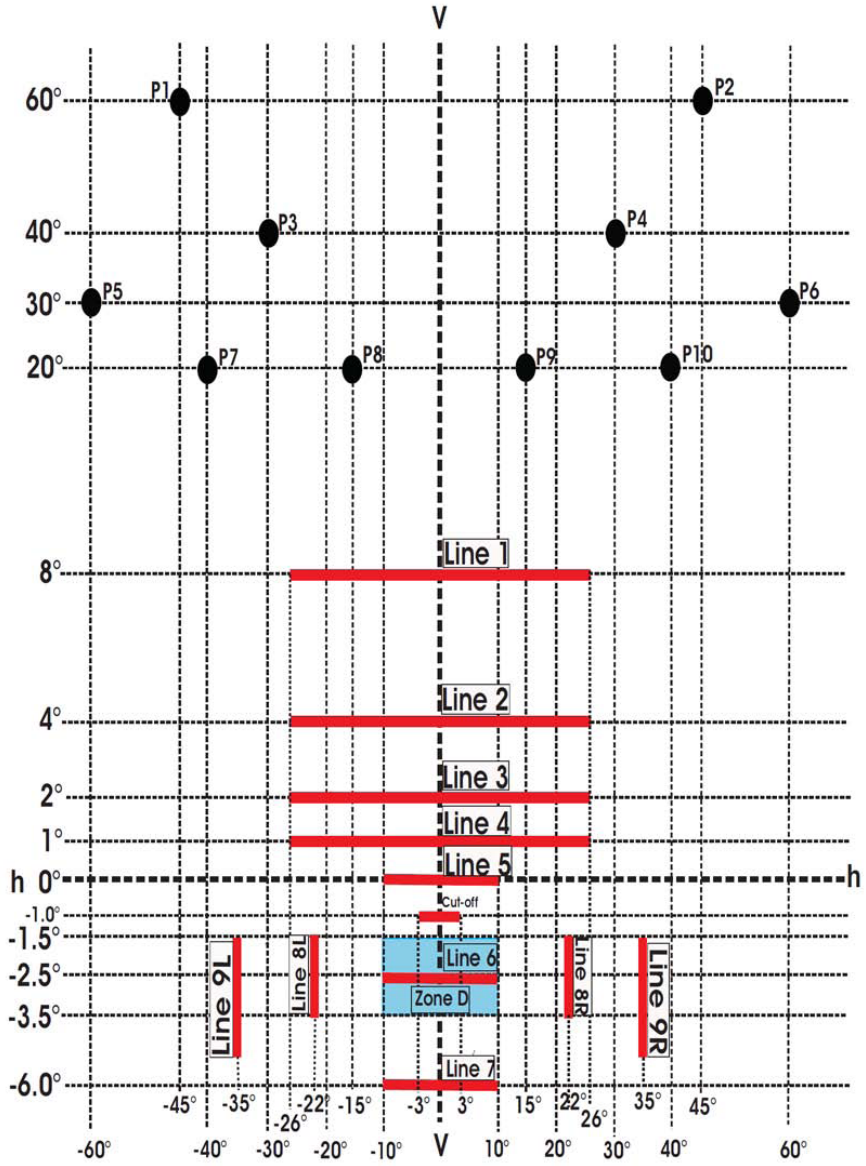
***/ See paragraph 32-1.5.4.3.2.

32-1.5.4.3.1 The illumination shall be measured either with white light or coloured light as prescribed by the applicant for use of the fog lamp in normal service. Variations in homogeneity detrimental to satisfactory visibility in the zone above the line 5 from 10 degrees left to 10 degrees right are not permitted.

32-1.5.4.3.2 At the request of the applicant, two front fog lamps constituting a matched pair (Front fog lamps of Class F3). may be tested separately. In this case the specified requirements for lines 6, 7, 8, 9 and the Zone D in the table 2. apply to half the sum of readings of the right-hand and left-hand side front fog lamp. However each of the two front fog lamps shall meet at least 50 per cent of the minimum value required for line 6. Additionally, each of the two front fog lamps that constitute the matched pair are only required to meet the requirements of line 6 and line 7 from 5 deg. inwards to 10 deg. outwards.

32-1.5.4.3.3 Inside the field between lines 1 to 5 in Figure 3, the beam pattern should be substantially uniform. Discontinuities in intensities detrimental to satisfactory visibility between the lines 6, 7, 8 and 9 are not permitted.

Figure 3: Light distribution of the Class F3 front fog lamp



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32-1.5.4.3.4 In the light-distribution as specified in the table 2, single narrow spots or stripes inside the area including the measuring points 1 to 10 and line 1 or inside the area of line 1 and line 2 with not more than 120 cd are allowed, if not extending beyond a conical angle of 2 degrees aperture or a width of 1 degree. If multiple spots or stripes are present they shall be separated by a minimum angle of 10 degrees.

32-1.5.4.3.5 If the specified luminous intensity requirements are not met, a re-aim of the cut-off position within + 0,5 degrees vertical and/or + 2 degrees horizontal is allowed. In the re-aimed position all photometric requirements shall be met.

32-1.5.4.4 Other photometric requirements

32-1.5.4.4.1 In the case of front fog lamps equipped with gas-discharge light sources the luminous intensity shall exceed 800 cd in the measuring point at 0 degrees horizontal and 2 degrees D vertical, four seconds after activation of the fog lamp which has not been operated for 30 minutes or more.

32-1.5.4.4.2 To adapt to dense fog or similar conditions of reduced visibility, it is permitted to automatically vary the luminous intensities provided that:

(a) An active electronic light source control gear is incorporated into the front fog lamp function system.

(b) All intensities are varied proportionately.

The system, when checked for compliance according to the provisions of paragraph 32-1.5.4.1.1.2 is considered acceptable if the luminous intensities remain within 60 per cent and 100 per cent of the values specified in the table 2.

32-1.5.4.4.2.1 The Technical Service responsible for type approval shall verify that the system provides automatic modifications, such that good road illumination is achieved and no discomfort is caused to the driver or to other road users.

32-1.5.4.4.2.2 Photometric measurements shall be performed according to the applicant's description.

32-1.6 COLOUR

Approval may be obtained for a type of front fog lamp emitting either white or selective yellow light. The colouring, if any, of the beam

may be obtained either through the filament lamp or through the lens of the front fog lamp or by any other suitable means.

32-1.6.1 The colorimetric characteristics of the front fog lamp shall be measured with voltages as defined in paragraphs 32-1.5.3. and 32-1.5.4.

32-1.7 Tests for stability of photometric performance:

(a) The tests shall be carried out in a dry and still atmosphere at an ambient temperature of 23 ± 5°C, the complete front fog lamps 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 has been aged for at least 48 hours and cooled down to ambient temperature before starting the tests as specified in this Regulation.

The LED modules supplied by the applicant shall be used.

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

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

The light source used shall be a light source of the category specified for that front fog lamp.

32-1.7.1 Test voltage：according to 32-1.1.3 and 32-1.1.3.1 requirements shall comply with either 32-1.7.1.1 or 32-1.7.1.2 provisions are as follows:

32-1.7.1.1 The voltage of the filament lamp shall be adjusted so as to supply 90 % of the maximum wattage. 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 of which the wattage is the highest that can be used.

32-1.7.1.2 The voltage shall be applied to the terminals of the test sample as follows:

32-1.7.1.2.1 In case of replaceable filament light source(s) operated directly under vehicle voltage system conditions: The test

shall be performed at 6.3 V, 13.2 V or 28.0 V as applicable except if the applicant specifies that the test sample may be used at a different voltage. In this case, the test shall be carried out with the filament light source operated at the highest voltage that can be used;

32-1.7.1.2.2 In case of replaceable gas discharge light source(s): the test voltage for the electronic light source control-gear is 13.2 +/-0.1 volts for 12 V vehicle voltage system, or otherwise specified in the application for approval;

32-1.7.1.2.3 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;

32-1.7.1.2.4 In the case of light sources, replaceable or non-replaceable, being operated independently from vehicle supply voltage and fully controlled by the system, or, in the case of light sources supplied by a supply and operating device, the test voltages as specified above shall be applied to the input terminals of that device. The test laboratory may require from the manufacturer the supply and operating device or a special power supply needed to supply the light source(s);

32-1.7.1.2.5 LED module(s) shall be measured at 6.75 V, 13.2 V or 28.0 V respectively, if not otherwise specified within this Regulation. LED module(s) operated by an electronic light source control gear, shall be measured as specified by the applicant;

32-1.7.1.2.6 Where signalling lamps are grouped, combined or reciprocally incorporated into the test sample and operating at voltages other than the nominal rated voltages of 6 V, 12 V or 24 V respectively, the voltage shall be adjusted as declared by the manufacturer for the correct photometric functioning of that lamp.

32-1.7.1.2.7 For a gas-discharge light source, the test voltage for the ballast is 13.2 +/- 0.1 volts for 12 V network system, or

otherwise specified in the application for approval.

32-1.7.2 Clean front fog lamp:

32-1.7.2.1 Test Procedure: The headlamp shall be operated for 12 hours.

32-1.7.2.1.1 In the case where only a front fog lamp is to be approved, the corresponding filament lamp(s) is (are) lit for the prescribed time.

32-1.7.2.1.2 In the case of a front fog lamp reciprocally incorporated with another function:

32-1.7.2.1.2.1 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 above.

32-1.7.2.1.2.2 In all other cases, the headlamp shall be subjected to the following cycle until the time specified is reached: 15 minutes, front fog lamp filament(s) lit 5 minutes, all filaments (that can be lit simultaneously).

32-1.7.2.1.3 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, according to the manufacturer's specifications.

32-1.7.2.2 Test Results:

32-1.7.2.2.1 Visual Inspection: It shall be inspected visually, no distortion, deformation, cracking or change in color of either the front fog lamp lens or the external lens, if any, shall be noticeable.

32-1.7.2.2.2 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:

In case of Class "B" front fog lamps: at point HV and the point of Imax in zone D.

In case of Class"F3" front fog lamps: on line 5 at point h = 0 and the point of Imax in zone D.

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

32-1.7.3 Dirty headlamp: After being tested as specified in paragraph 32-1.7.2, the front fog lamp shall be operated for one hour as described paragraph 32-1.7.2, after being prepared as: The test mixture shall be uniformly applied to the entire light emitting surface of the front fog lamp 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: point of Emax in zone D.

32-1.7.4 Test for change in vertical position of the cut-off line under the influence of heat:

32-1.7.4.1 Using a mass production filament lamp which has been aged for at least one hour, the headlamp shall be operated. The position of the cut-off line between a point situated 2.25 m left and a point situated 2.25 m right of the line VV, a symmetrical cut-off approximating sufficiently closely to the horizontal to enable adjustment to be performed with its aid, shall be verified after 3 minutes (r3) and 60 minutes (r60) respectively of operation. The result expressed in milliradians (mrad) shall be considered as acceptable when the absolute value $\Delta rI = |r3 - r60|$ recorded on this headlamp is not more than 2.0 mrad ($\Delta rI \leq 2.0$ mrad).

32-1.7.4.2 However, if this value is more than 2.0 mrad but not more than 3.0 mrad, a second front fog lamp shall be tested as described in paragraph 32-1.7.4.1 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 front fog lamp for one hour, Period of rest for one hour.

The headlamp type shall be considered acceptable if the mean value of the absolute values ΔrI measured on the first sample and ΔrII measured on the second sample is not more than 2 mrad.

32-1.8 Requirements for lamps incorporating lenses of plastic material -Testing of lens or material samples and of complete:

Thirteen 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：

32-1.8.1 Resistance to temperature changes

32-1.8.1.1 Before the test, the samples shall be kept at 23 ± 5°C and 60% ~ 75% RH (RH = relative humidity) for at least four hours. Then three new samples (lens) shall be subject to five cycles of temperature and humidity change in accordance with the following program：

3 hours at 40 ± 2°C and 85% ~95% RH,

1 hour at 23 ± 5°C and 60% ~75% RH,

15 hours at -30 ± 2°C,

1 hour at 23 ± 5°C and 60% ~75% RH,

3 hours at 80 ± 2°C,

1 hour at 23 ± 5°C and 60% ~75% RH.

32-1.8.1.2 Photometric measurements shall be carried out on the samples before and after the test that shall comply with 32-1.4.2. These measurements shall be made by using a standard lamp, at the following points：

32-1.8.1.2.1 In the case of Class "B" front fog lamps: At point HV and point h = 0, v = 2 degrees D in zone D.

32-1.8.1.2.2 In the case of Class "F3" front fog lamps: Intersection VV line with line 6 and intersection VV line with line 4.

32-1.8.1.3 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.

32-1.8.2 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

32-1.8.2.1 Three samples shall be exposed to an energetic illumination of 1200 W/m^2 ± 200 W/m^2 for a period such that the luminous energy that they receive is equal to 4500 MJ/m^2 ± 200 MJ/m^2. Within the enclosure, the temperature measured on the black panel placed on a level with the sample shall be 50 °C ± 5°C. In order to ensure a regular exposure, the samples shall revolve around the source of radiation at a speed between 1 and 5 1/min. The samples shall be sprayed with distilled water at a temperature of 23 °C ± 5°C in accordance with the following cycle：

Spraying：5 minutes,

Drying：25 minutes

32-1.8.2.2 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.

32-1.8.2.3 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/cm2. At the end of the application of the test mixture, the samples shall be dried in the open air and then washed with the solution-detergents at 23 °C ± 5°C. Afterward the samples shall be carefully rinsed with distilled water at 23 °C ± 5°C and then wiped off with a soft cloth.

32-1.8.2.4 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.

32-1.8.3 Resistance to detergents and hydrocarbons

32-1.8.3.1 The outer face of three samples shall be heated to 50 °C ± 5°C and then immersed for five minutes in a mixture maintained at 23 °C ± 5°C and composed of 99% distilled water and 1% of alkylaryl sulphonate. At the end of the test, the samples shall be dried in a test chamber at 50 °C ± 5°C. The surface of the samples shall be cleaned with a moist cloth

32-1.8.3.2 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.

32-1.8.3.3 After the above two tests have been performed successively, the mean value (Δtm) of the variation in transmission Δt = (T2-T3)/T2 measured on the three samples shall not exceed 0.010.

32-1.8.4 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 1/minute at an operating pressure of 6.0 bars -0, +0.5 bar, at a distance of 380 mm+/-10 mm from the nozzle. The jet shall be sprayed almost perpendicular to the surface to be tested. The deterioration shall be checked by means of one or more samples of glass placed as a reference near the lenses to be tested. The mixture shall be sprayed until the variation in the diffusion of light on the sample or samples measured by the method, is such that: $\Delta d = (T_5-T_4)/T_2 = 0.025 \pm 0.0025$.

32-1.8.4.1 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: $\Delta t_m \leq 0.100$, $\Delta d_m \leq 0.050$.

32-1.8.5 Test of adherence of coatings, if any

32-1.8.5.1 The lens with coating shall be conducted by the test of the adherence of coating, if any.

32-1.8.5.2 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 N/cm ± 20%, at least 25mm wide, shall be pressed for at least 5 minutes to the surface. Then the end of the adhesive tape shall be loaded in such a way that the force of adhesion to the surface considered is balanced by a force perpendicular to that surface. At this stage, the tape shall be torn off at a constant speed of 1.5 m/s +/- 0.2 m/s.

32-1.8.5.3 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.

32-1.8.6 Tests of the complete lamp incorporating a lens of plastic material

32-1.8.6.1 Resistance to mechanical deterioration (the lens of lamp sample No. 1 shall be subjected to the test)

32-1.8.6.1.1 The lens of lamp sample No. 1 shall be subjected to the test described in paragraph 32-1.8.4.1.

32-1.8.6.1.2 After the test, the results of photometric measurements prescribed in zone B for Class B front fog lamp and lines 2 and 5 for Class F3 front fog lamp shall not exceed the maximum values prescribed by more than 30 per cent.

32-1.8.6.2 Test of adherence of coating (the sample of complete lamp 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 32-1.6.5.

Table 3. Tests on plastic material (lenses or samples)

Sample No.	Lenses or samples	Lenses

Tests	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 4. Tests on complete lamps

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

32-1.9 Requirements in case of use of LED module(s) or of light generators

32-1.9.1 General specifications

32-1.9.1.1 Each LED module or light-generator sample submitted shall conform to the relevant specifications of this Regulation when tested with the electronic light source controlgear(s) supplied, if any.

32-1.9.1.2 LED modules or light-generators 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.

32-1.9.1.3 LED modules or light-generators shall be tamperproof.

32-1.9.1.4 The design of removable LED modules shall be such that:

32-1.9.1.4.1 After removal and replacement of the module the photometric requirements of the headlamp shall still be met;

32-1.9.1.4.2 Non-identical LED modules within the same lamp housing cannot be interchanged.

32-1.9.2 Manufacture

32-1.9.2.1 The transparent envelope (e.g. bulb) of the light source shall exhibit no marks or spots, which might impair their efficiency and their optical performance.

32-1.9.2.2 In case of LED modules or light-generator(s):

32-1.9.2.2.1 The LED(s) on the LED module shall be equipped with suitable fixation elements.

32-1.9.2.2.2 The fixation elements shall be strong and firmly secured to the light source(s) and the LED module.

32-1.9.2.2.3 The light source in the light generator shall be equipped with suitable fixation elements.

32-1.9.2.2.4 The fixation elements shall be strong and firmly secured to the light source(s) and the light generator.

32-1.9.3 Test conditions

32-1.9.3.1 Application and relaxation

32-1.9.3.1.1 All samples shall be tested as specified in paragraph 32-1.10.;

32-1.9.3.1.2 The type of light sources shall be as defined in 「03 The installation of lighting and light-signaling devices」, in particular

with regard to the element of visible radiation. Other types of light sources are not permitted.

32-1.9.3.1.3 Operating conditions

32-1.9.3.1.3.1 LED module or light-generator operating conditions:

32.9.3.1.3.1.1 All samples shall be tested under the conditions as specified in paragraph 32-1.5.4.1.4. of this Regulation.

32.9.3.1.3.1.2 If not specified differently in this annex, LED modules or light-generators shall be tested inside the front fog lamp as submitted by the manufacturer.

32-1.9.3.1.4 Ambient temperature

For the measurement of electrical and photometric characteristics, the front fog lamp shall be operated in dry and still atmosphere at an ambient temperature of 23 degrees C +/- 5 degrees C.

32-1.9.3.1.5 In case of light-generators:

32-1.9.3.1.5.1 Power supply

The power supply used for the starting and run-up tests shall be sufficient to secure the quick rise of the high current pulse.

32-1.9.3.1.5.2 Burning position

The burning position shall be as indicated by the applicant. Ageing and testing positions shall be identical. If the lamp is accidentally operated in the wrong direction, it shall be re-aged before measurements begin. During ageing and measurements no electrically conducting objects shall be allowed within a space as indicated by the applicant. Moreover stray magnetic fields shall be avoided.

32-1.9.3.2 Ageing

32-1.9.3.2.1 LED modules or light-generators shall be aged.

32-1.9.3.2.2 The tests below shall be carried out after ageing with the LED module(s) or lightgenerator(s) supplied by the submitted

electronic light source control-gear at test voltage.

32-1.9.3.2.3 LED module(s)

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.

32-1.9.3.2.4 Filament lamps

Filament lamps shall first be aged at their test voltage for approximately one hour. For dual-filament lamps, each filament shall be aged separately.

32-1.9.3.2.5 Gas discharge light sources

With the exception of the starting test, all tests shall be carried out with light sources which have been aged for a minimum of 15 cycles having the following switching cycle: 45 minutes on, 15 seconds off, 5 minutes on, 10 minutes off.

32-1.10 Specific tests

32-1.10.1 Filament lamps and gas-discharge light sources approved according to 「29 Filament lamps」 and LED modules are exempted from the tests indicated in paragraphs 32-1.10.3. and 32-1.10.3.2. below.

32-1.10.2 Gas discharge light sources

The starting test shall be applied to light sources which have not been aged and have not been used for a period of at least 24 hours prior to the test. The light source shall start directly and remain alight.

32-1.10.3 Run-up

32-1.10.3.1 Filament lamps are exempted from this test.

32-1.10.3.2 Gas discharge light sources

The run-up test shall be applied to light sources which have not been used for a period of at least 1 hour prior to the test. The

front fog lamp shall reach at least in the point 0 degrees, 2.5 degrees D on the line 6 a luminous intensity:

After 1 second: 25 per cent of its objective luminous flux;

After 4 seconds: 80 per cent of its objective luminous flux.

The objective luminous flux is indicated on the submitted data sheet.

32-1.10.4 Hot re-strike

32-1.10.4.1 Filament lamps are exempted from this test.

32-1.10.4.2 Gas discharge light sources

The light source shall be started and be operated with the electronic light source controlgear at test voltage for a period of 15 minutes. The supply voltage to the electronic light source control-gear shall then be switched off for a period of 10 seconds, and be switched on again. The light source shall restart directly after being switched-off for a period of 10 seconds. After one second the light source shall emit at least 80 per cent of its objective luminous flux.

32-1.10.5 Colour rendering

32-1.10.5.1 Red content

In addition to measurements as described in paragraph 32-1.6 to this Regulation, the minimum red content of the light of a LED module or light-generator shall be such that:

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

where:

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

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

lambda (unit: nm) is the wavelength.

This value shall be calculated using intervals of one nanometre.

32-1.10.6 UV-radiation

The UV-radiation of the LED module or light-generator shall be such that:

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

where:

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

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

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

UV Table

lambda	S(lambda)	lambda	S(lambda)
250	0.430	330	0.000 41
255	0.520	335	0.000 34
260	0.650	340	0.000 28
265	0.810	345	0.000 24
270	1.000	350	0.000 20
275	0.960	355	0.000 16
280	0.880	360	0.000 13
285	0.770	365	0.000 11
290	0.640	370	0.000 09
295	0.540	375	0.000 077
300	0.300	380	0.000 064
305	0.060	385	0.000 530
310	0.015	390	0.000 044
315	0.003	395	0.000 036
320	0.001	400	0.000 030
325	0.000 50		

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

32-1.10.7 Temperature stability

32-1.10.7.1 Luminous intensity

32-1.10.7.1.1 Filament lamps and gas discharge light sources are exempted from this test.

32-1.10.7.1.2 A photometric measurement shall be made after 1 minute of operation with the device at room temperature. The test point to be measured is horizontal 0 degrees vertical 2.5 degrees D.

32-1.10.7.1.3 The lamp shall continue operation until photometric stability has occurred. The moment at which the photometry is stable is defined as the point in time at which the variation of the photometric value is less than 3 per cent within any 15-minute period. After stability has occurred, aiming for complete photometry shall be performed in accordance with requirements of the specific device. Photometry at all test points is required for the specific device.

32-1.10.7.1.4 Calculate the ratio between the photometric test point values determined in paragraph 32-1.10.7.1.2 and the values determined in paragraph 32-1.10.7.1.3 once stability of photometry has been achieved.

32-1.10.7.1.5 Apply the ratio calculated in paragraph 32-1.10.7.1.4 to each of the remainder of the test points to create a new photometric table that describes the complete photometry based on 1 minute of operation.

32-1.10.7.1.6 The illuminance values measured after one minute and until photometric stability has occurred, shall comply with the minimum and maximum requirements.

32-1.10.7.2 Colour

The colour of the light emitted, measured after 1 minute and measured after 30 minutes of operation, shall be within the required colour boundaries in both instances.