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Contents

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Acts whose titles are printed in light type are those relating to day-to-day management of agricultural matters, and are generally valid for a limited period.

The titles of all other acts are printed in bold type and preceded by an asterisk.

II

(Non-legislative acts)

ACTS ADOPTED BY BODIES CREATED BY INTERNATIONAL AGREEMENTS

Only the original UN/ECE texts have legal effect under international public law. The status and date of entry into force of this Regulation should be checked in the latest version of the UN/ECE status document TRANS/WP.29/343, available at: http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29fdocstts.html

Regulation No 19 of the Economic Commission for Europe of the United Nations (UN/ECE) — Uniform provisions concerning the approval of power-driven vehicle front fog lamps

Incorporating all valid text up to:

Supplement 6 to the 04 series of amendments — Date of entry into force: 9 October 2014

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INTRODUCTION

This Regulation [1] applies to front fog lamps, which may incorporate lenses of glass or plastic material. It incorporates two distinct classes.

The original front fog lamp, class 'B' since inception, has been updated to incorporate the angular coordinate system with an amendment to the values in the relevant photometric table. With this class, only light sources as specified in Regulation No 37 are allowed.

The class 'F3' is designed to increase photometric performance. In particular the beam width and the minimum luminous intensities below the H-H line (paragraph 6.4.3) have been increased whilst controls on the maximum intensity in the foreground are introduced. Above the H-H line, the intensity of the veiling light is reduced to improve visibility. Additionally this class may provide adaptive beam patterns where the performance is varied according to the visibility conditions.

The introduction of the class 'F3' provides for requirements that are amended to be similar to those of a headlamp as follows:

(a) The photometric values are specified as luminous intensities using the angular coordinate system.

(b) Light sources can be selected according to the provisions of Regulation No 37 (Incandescent filament light sources) and Regulation No 99 (gas discharge light sources). Light emitting diode (LED) modules and distributed lighting systems may also be used.

The cut-off and the gradient definitions.

The photometric requirements permit the use of asymmetrical beam distributions.

SCOPE

This Regulation applies to front fog lamps for vehicles of categories L3, L4, L5, L7, M, N, and T [2].

1. DEFINITIONS

For the purpose of this Regulation,

[1] Nothing in this Regulation shall prevent a Party to the Agreement applying this Regulation from prohibiting the combination of a front fog lamp incorporating a plastic lens, approved under this Regulation, with a mechanical headlamp-cleaning device (with wipers).

[2] As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.), document ECE/TRANS/WP.29/78/Rev.2, para. 2.

1.1. The definitions given in Regulation No 48 and its series of amendments in force at the time of application for type approval shall apply to this Regulation.

1.2. 'Lens' means the outermost component of the front fog lamp (unit), which transmits light through the illuminating surface;

1.3. 'Coating' means any product or products applied in one or more layers to the outer face of a lens;

1.4. 'Front fog lamps of different types' are front fog lamps that differ in such essential respects as:

1.4.1. The trade name or mark;

1.4.2. Different 'classes' ('B' or 'F3') identified by particular photometric provisions:

1.4.3. The characteristics of the optical system; (basic optical design, type/category of light source, LED module, DLS etc.),

1.4.4. The inclusion of components capable of altering the optical effects by reflection, refraction, absorption and/or deformation during operation and the variable intensity control, if any:

1.4.5. The category of filament lamp(s) used, as listed in Regulation No 37, Regulation No 99 and/or the LED module or light generator specific identification code (s) (if applicable);

1.4.6. However, 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.

1.5. 'Colour of the light emitted from the device'. The definitions of the colour of the light emitted, given in Regulation No 48 and its series of amendments in force at the time of application for type approval, shall apply to this Regulation.

1.6. References made in this Regulation to standard (étalon) light sources and to Regulations Nos 37 and 99 shall refer to Regulations Nos 37 and 99 and their series of amendments in force at the time of application for type approval.

2. APPLICATION FOR APPROVAL

2.1. The application for approval shall be submitted by the holder of the trade name or mark or by his duly accredited representative.

2.2. The application relating to each type of front fog lamp shall be accompanied by:

2.2.1. Drawings in triplicate in sufficient detail to permit identification of the type and representing a frontal view of the front fog lamp, with the relevant details of the optical components if any, and the cross-section; the drawings shall indicate the space reserved for the approval mark.

2.2.1.1. If the front fog lamp is equipped with an adjustable reflector, an indication of the mounting position(s) of the front fog lamp in relation to the ground and the longitudinal median plane of the vehicle, if the front fog lamp is for use in that (those) position(s) only;

2.2.2. For the test of plastic material of which the lenses are made:

2.2.2.1. Thirteen lenses;

2.2.2.1.1. Six of these lenses may be replaced by six samples of material at least 60 × 80 mm size, having 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 × 15 mm);

2.2.2.1.2. Every such lens or sample of material shall be produced by the method to be used in mass production;

2.2.2.1.3. A reflector to which the lenses can be fitted in accordance with the manufacturer's instructions.

2.2.3. The materials making up the lenses and coatings, if any, shall be accompanied by the test report of the characteristics of these materials and coatings if they have already been tested.

2.3. In case of class 'B' front fog lamps:

2.3.1. A brief technical specification including the category of filament lamp used as listed in Regulation No 37 and its series of amendments in force at the time of application for type approval, even if the filament lamp cannot be replaced;

2.3.2. Two samples of each type of front fog lamp, one sample intended for the installation on the left side of the vehicle and one sample intended for the installation of the right side of the vehicle.

2.4. In case of class 'F3' front fog lamps:

2.4.1. A brief technical specification including the category of the light source(s) used; this (these) light source category(ies) shall be listed in regulation No 37 or regulation No 99 and their series of amendments in force at the time of application for type approval, even if the light source cannot be replaced;

2.4.2. In the case of LED module(s) or a light generator, the specific identification code of the module shall be stated. The drawing shall contain sufficient details to identify it and the position intended for the specific identification code and the trademark of the applicant.

2.4.3. The make and types of the ballast(s) and/or the light source control gear, where applicable, shall be specified:

2.4.3.1. In the case of an adaptive front fog lamp, a concise description of the variable intensity control.

2.4.3.2. In case of the use of a light source control gear not being part of the device, the voltage(s) with tolerances or the total voltage range at the terminals to that light source control gear.

2.4.4. If the front fog lamp is fitted with LED module(s) or a distributed lighting system, a brief technical specification shall be provided. This information shall include the part number assigned by the light source manufacturer, a drawing with dimensions and the basic electrical and photometric values, an indication whether the light source complies with the UV-radiation requirements of paragraph 4.6 of Annex 12 of this Regulation, an official test report related to paragraph 5.8 of this Regulation and the objective luminous flux.

2.4.5. In the case that a distributed lighting system is used, which part(s) is (are) to be intended to provide the front fog beam by this system. In addition, a brief technical specification includes the list of the light-guide(s) and related optical components and information describing the light-generator(s) sufficient to permit identification. This information shall include the part number assigned by the light-generator manufacturer, a drawing with dimensions and the basic electrical and photometric values and an official test report related to paragraph 5.8 of this Regulation.

2.4.6. In the case where a gas discharge light source is used:

2.4.6.1. and the ballast is not integrated with the light source, one ballast, which may be totally or partly integrated in the front fog lamp.

2.4.6.2. For approval of a distributed lighting system using a non-replaceable gas-discharge light source not approved under Regulation No 99, two samples of the system including the light-generator and one ballast of each type to be used, where applicable.

2.4.7. In the case of LED module(s) or a distributed lighting system and if no provisions are taken to shield the relevant front fog lamp or distributed lighting system components made of plastic material from UV-radiation of (gas-discharge) light sources, e.g. by UV-retaining glass filters:

One sample of each of the relevant materials. This shall have similar geometry to that of the front fog lamp or distributed lighting system being tested. Each material sample shall have the same appearance and surface treatment, if any, as intended for use in the front fog lamp to be approved.

2.4.8. In the case of an approval of a front fog lamp according to paragraph 2.4.8 and/or according to paragraph 5.8 containing plastic lenses and/or having inner optical parts made from plastic, which have already been tested:

The materials making up the lenses, coatings or optical inner parts, if any, shall be accompanied by the test report(s) on material testing against UV-radiation.

2.4.9. Two samples of each type of front fog lamp, one sample intended for the installation on the left side of the vehicle and one sample intended for the installation on the right side of the vehicle; or a matched pair of front fog lamps.

2.4.10. One light source control gear, if applicable.

2.4.11. One variable intensity control or a generator providing the same signals, if applicable.

2.5. The competent authority shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted.

3. MARKINGS

3.1. The samples of a type of front fog lamp or distributed lighting system which are submitted for approval shall clearly, legibly and indelibly bear:

(a) The trade name or mark of the applicant,

(b) Marking indicating the class of the front fog lamp, and in case of class 'F3' front fog lamps:

(c) The LED module or light generator specific identification code, if any.

3.2. They shall comprise, on the lens and on the main body ([1]), spaces of sufficient size for the approval mark and the additional symbols referred to in paragraph 3; these spaces shall be indicated on the drawings referred to in paragraph 2.2.1.

([1]) If the lens cannot be detached from the main body of the front fog lamp, a space on the lens or body shall be sufficient.

3.3. The approval marking shall be placed on an inner or outer part (transparent or not) of the device which can not be separated from the transparent part of the device emitting light; in the case of a distributed lighting system with outer lens built in the light-guide, this condition is deemed satisfied if the approval marking is placed at least on the light-generator and on the light-guide or on its protective shield. In any case the marking shall be visible when the device is fitted on the vehicle, at least when a movable part such as the hood or boot lid or a door is opened.

3.4. In case of class 'F3' front fog lamps:

3.4.1. In case of a distributed lighting system, the light-generator(s) shall bear the marking of the rated voltage and wattage and in the case that the electronic control gear is not part of the device the light-generator(s) shall bear the trade name or mark of its manufacturer and the part number.

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

3.5. The LED module(s) submitted along with the application for approval of the lamp:

3.5.1. Shall bear the trade name or mark of the applicant; this marking must be clearly legible and indelible;

3.5.2. Shall bear the specific identification code of the module; this marking must be clearly legible and indelible.

The specific identification code shall comprise the starting letters 'MD' for 'Module' followed by the approval marking without the circle as prescribed in paragraph 4.2.1; this specific identification code shall be shown in the drawings mentioned in paragraph 2.2.1 and in the case where several non-identical LED modules are used, followed by additional symbols or characters. The approval marking does not have to be the same as the one on the lamp in which the module is used, but both markings shall be from the same applicant.

3.6. If a light source control gear is used, which is not part of the LED module it shall be marked with its specific identification code(s), the rated input voltage and wattage.

4. APPROVAL

4.1. General

4.1.1. If all the samples of a type of front fog lamp submitted in pursuance of paragraph 2 satisfy the provisions of this Regulation, approval shall be granted.

4.1.2. Where grouped, combined or reciprocally incorporated lamps have been found to comply with the requirements of several Regulations, a single international approval mark may be applied provided that each of the grouped, combined or reciprocally incorporated lamps satisfies the provisions applicable to it.

4.1.3. An approval number shall be assigned to each type approved. Its first two digits (at present 04) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party may not assign the same number to another type of front fog lamp covered by this Regulation except in the case of an extension of the approval to a device differing only in the colour of the light emitted.

4.1.4. Notice of approval or of extension or refusal or withdrawal of approval or production definitely discontinued of a type of front fog lamp pursuant to this Regulation shall be communicated to the Parties to the 1958 Agreement applying this Regulation by means of a form conforming to the model in Annex 1 to this Regulation, with the indications according to paragraph 2.2 of this Regulation.

4.1.5. In addition to the mark prescribed in paragraph 3.1 an approval mark as described in paragraphs 4.2 and 4.3 shall be affixed in the spaces referred to in paragraph 3.2 to every fog lamp conforming to a type approved under this Regulation.

4.2. Composition of the approval mark

The approval mark shall consist of:

4.2.1. An international approval marking, comprising of:

4.2.1.1. A circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted approval ([1]) and;

4.2.1.2. The approval number prescribed in paragraph 4.1.3.

4.2.2. The following additional symbol (or symbols):

4.2.2.1. On front fog lamps meeting the requirements of this Regulation, in the case of:

(a) class 'B'; the letter 'B'

(b) class 'F3'; the symbol 'F3'

4.2.2.2. On front fog lamps incorporating a lens of plastic material the group of letters 'PL' to be affixed near the symbols prescribed in paragraph 4.2.2.1;

4.2.2.3. In every case the relevant operating mode used during the test procedure according to paragraph 1.1.1 of Annex 5 and the permitted voltages according to paragraph 1.1.2 of Annex 5 shall be stipulated on the approval forms and on the communication forms transmitted to the countries which are Contracting Parties to the Agreement and which apply this Regulation.

In the corresponding cases the device shall be marked as follows:

4.2.2.3.1. On units meeting the requirements of this Regulation which are so designed that the filament(s) of one function shall not be lit simultaneously with that of any function with which it may be reciprocally incorporated, an oblique stroke (/) shall be placed behind the symbol in the approval mark of such function.

4.2.2.3.2. However, if only the front fog lamp and the passing lamp shall not be lit simultaneously, the oblique stroke shall be placed behind the fog lamp symbol, this symbol being placed either separately or at the end of a combination of symbols.

4.2.2.3.3. On units meeting the requirements of Annex 5 to this Regulation only when supplied with a voltage of 6 V or 12 V, a symbol consisting of the number 24 crossed out by an oblique cross (x) shall be placed near the filament lamp holder.

4.2.2.4. The reciprocal lamp incorporation of passing beam lamp and front fog lamp is possible if it is in compliance with Regulation No 48;

([1]) The distinguishing numbers of the Contracting Parties to the 1958 Agreement are reproduced in Annex 3 to Consolidated Resolution on the Construction of Vehicles (R.E.3), document TRANS/WP.29/78/Rev.2.

4.2.2.5. Front fog lamps of class 'F3' having asymmetric light distribution and which must not be indiscriminately mounted on either side of the vehicle, shall bear an arrow pointing to the outside of the vehicle.

4.2.2.6. The two digits of the approval number (at present 04) which indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval may be marked close to the above additional symbols;

4.2.2.7. The marks and symbols referred to in paragraphs 4.2.1 and 4.2.2 shall be clearly legible and be indelible even when the front fog lamp is fitted in the vehicle.

4.3. Arrangement of the approval mark

4.3.1. Independent lamps

Annex 3 to this Regulation gives examples of arrangements of the approval mark with the above-mentioned additional symbols.

4.3.2. Grouped, combined or reciprocally incorporated lamps

4.3.2.1. Where grouped, combined or reciprocally incorporated lamps have been found to comply with the requirements of several Regulations, a single international approval mark may be provided, consisting of a circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted the approval, and an approval number. This approval mark may be located anywhere on the grouped, combined or reciprocally incorporated lamps, provided that:

4.3.2.1.1. It is visible after their installation;

4.3.2.1.2. No part of the grouped, combined or reciprocally incorporated lamps that transmits light can be removed without at the same time removing the approval mark.

4.3.2.2. The identification symbol for each lamp appropriate to each Regulation under which approval has been granted, together with the corresponding series of amendments incorporating the most recent major technical amendments to the Regulation at the time of issue of the approval and, if necessary, the required arrow shall be marked:

4.3.2.2.1. Either on the appropriate light-emitting surface;

4.3.2.2.2. Or in a group, in such a way that each of the grouped, combined or reciprocally incorporated lamps may be clearly identified.

4.3.2.3. The size of the components of a single approval mark shall not be less than the minimum size required for the smallest of the individual marks by the Regulation under which approval has been granted.

4.3.2.4. An approval number shall be assigned to each type approved. The same Contracting Party may not assign the same number to another type of grouped, combined or reciprocally incorporated lamps covered by this Regulation.

4.3.2.5. Annex 3, Figure 3, to this Regulation gives examples of arrangements of approval marks for grouped, combined or reciprocally incorporated lamps with all the above-mentioned additional symbols.

4.3.3. In the case of lamps, the lens of which are used for different types of front fog lamps and which may be reciprocally incorporated or grouped with other lamps, the provisions in paragraph 4.3.2 are applicable.

4.3.3.1. In addition, where the same lens is used for different types of lamps, it may bear the different approval marks relating to the different types of front fog lamps or units of lamps, provided that the main body of the front fog lamp, even if it cannot be separated from the lens, also comprises the space described in paragraph 3.2 and bears the approval marks of the actual functions.

If different types of front fog lamps comprise the same main body, the latter may bear the different approval marks.

4.3.3.2. Annex 3, Figure 4, to this Regulation gives examples of arrangements of approval marks relating to the above case.

5. GENERAL SPECIFICATIONS

5.1. Each sample of front fog lamp submitted in conformity with paragraph 2.2 shall meet the specifications set forth in paragraphs 6 and 7 of this Regulation.

5.2. The front fog lamps shall be so designed and constructed that in normal use, despite the vibrations to which they may then be subjected, their satisfactory operation continues to be ensured and they retain the characteristics prescribed by this Regulation. The correct position of the lens shall be clearly marked and the lens and reflector shall be so secured as to prevent any rotation during use. Conformity with the requirements of this paragraph shall be verified by visual inspection and, where necessary, by a trial fitting.

5.2.1. Front fog lamps shall be fitted with a device enabling them to be so adjusted on the vehicles as to comply with the rules applicable to them. Such a device need not be fitted on units in which the reflector and the lens cannot be separated, provided the use of such units is confined to vehicles on which the front fog lamp setting can be adjusted by other means. Where a front fog lamp and another front lamp, each equipped with its own light source, are assembled to form a composite unit, the adjusting device shall enable each optical system to be individually adjusted.

5.2.2. These provisions shall not apply to front lamp assemblies whose reflectors are indivisible. For this type of assembly the requirements of paragraph 6.3.4 or 6.4.3 (as appropriate) shall apply.

5.3. Complementary tests shall be carried out according to the requirements of Annex 5 to ensure that in use there is no excessive change in photometric performance.

5.4. If the lens of the front fog lamp is of plastic material, tests shall be carried out according to the requirements of Annex 6.

5.5. In the case of the use of replaceable light sources:

(a) 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;

(b) The light source shall fit easily into the front fog lamp;

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

5.6. In the case of class 'B', the front fog lamp shall be equipped with one filament lamp approved according to Regulation No 37 even if the filament lamp cannot be replaced. Any Regulation No 37 filament lamp may be used provided that;

(a) Its objective luminous flux does not exceed 2 000 lumen, and

(b) No restriction on the use is made in Regulation No 37 and its series of amendments in force at the time of application for type approval.

5.6.1. Even if this filament lamp cannot be replaced it shall comply with the requirements in paragraph 5.6.

5.7. In the case of class 'F3', irrespective of whether the light sources can be replaced or not, they shall be:

5.7.1. One or more light sources approved according to:

5.7.1.1. Regulation No 37 and its series of amendments in force at the time of application for type approval, provided that no restriction on their use is made,

5.7.1.2. Or, Regulation No 99 and its series of amendments in force at the time of application for type approval,

5.7.2. And/or, one or more LED modules where the requirements of Annex 12 to this Regulation shall apply; compliance with these requirements shall be tested.

5.7.3. And/or light-generators where the requirements of Annex 12 to this Regulation shall apply. The compliance with the requirements shall be tested.

5.8. In the case of LED module or light generator it shall be checked, that:

5.8.1. 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.

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

5.8.3. The LED module(s) or light generator(s) shall be tamperproof.

5.9. 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 made in paragraph 10 of the communication form in Annex 1.

5.10. If the lens of the front fog lamp is made of plastic material tests shall be done according to the requirements in Annex 6.

5.10.1. The UV resistance of light transmitting components located inside the front fog lamp and made of plastic material shall be tested according to Annex 6, paragraph 2.7.

5.10.2. The test in paragraph 5.10.1 is not necessary if low-UV type light sources as specified in Regulation No 99 or in Annex 12 of this Regulation are used, or if provisions are taken, to shield the relevant lamp components from UV radiation, e.g. by glass filters.

5.11. 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 ([1]).

5.12. 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.

5.13. In the case of class 'F3' the sharpness and linearity of the cut-off shall be tested according to the requirements of Annex 9.

6. ILLUMINATION

6.1. Front fog lamps shall be so designed as to provide illumination with limited dazzle.

6.2. 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.

The point HV is the centre-point of the coordinate system with a vertical polar axis. Line h is the horizontal through HV (see Annex 4 to this Regulation).

6.3. In the case of class 'B' front fog lamps:

6.3.1. A colourless standard (étalon) filament lamp as specified in Regulation No 37, of the category specified by the manufacturer, which may be supplied by the manufacturer or applicant, shall be used.

6.3.1.1. 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 at 13,2 V as indicated in the relevant data sheet of Regulation No 37.

6.3.1.2. 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 13,2 V.

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

6.3.3. The aiming screen for visual adjustment (see Annex 4 to this Regulation) shall be positioned at either a distance of 10 m or a distance of 25 m in front of the front fog lamp.

6.3.3.1. The beam shall produce on this aiming screen, over a width of not less than 5,0° on both sides of the line v, a symmetrical and substantially horizontal cut-off to enable visual vertical adjustment.

6.3.3.2. The front fog lamp shall be so adjusted that the cut-off on the aiming-screen is 1,15° below the line h.

([1]) Compliance with the requirements for electromagnetic compatibility is relevant to the vehicle type.

6.3.4. When so adjusted, the front fog lamp shall meet the requirements in paragraph 6.3.5.

6.3.5. The illumination (see Annex 4, paragraph 2.1) shall meet the following requirements:

Designated lines or zones	Vertical position (*)	Horizontal position (*)	Luminous intensity	To comply
Line 1	15° U to 60° U	0°	145 cd max	All line
Zone A	0° to 1,75° U	5° L to 5°R	85 cd min	Whole zone
Zone B	0° to 3,5° U	26°L to 26°R	570 cd max	Whole zone
Zone C	3,5° U to 15° U	26°L to 26°R	360 cd max	Whole zone
Zone D	1,75° D to 3,5° D	12°L to 12°R	1 700 cd min 11 500 cd max	At least one point on each vertical line
Zone E	1,75° D to 3,5° D	12°L to 22°L and 12°R to 22°R	810 cd min 11 500 cd max	At least one point on each vertical line

(*) The coordinates are specified in degrees for an angular web with a vertical polar axis.

The luminous intensity shall be measured in either white or selective yellow light as prescribed by the manufacturer for use of the front fog lamp in normal service.

Variations detrimental to satisfactory visibility in either of the Zones B and C are not permitted.

6.3.6. In the light-distribution as specified in the table in paragraph 6.3.5, single narrow spots or stripes inside the area above 15° with not more than 230 cd are allowed, if not extending beyond a conical angle of 2° aperture or a width of 1°. If multiple spots or stripes are present they shall be separated by a minimum angle of 10°.

6.4. In the case of class 'F3' front fog lamps

6.4.1. Depending on the light source, the following conditions shall apply.

6.4.1.1. In the case of replaceable filament light sources:

6.4.1.1.1. The front fog lamp shall comply with the requirements of paragraph 6.4.3 of this Regulation with at least one complete set of appropriate standard (étalon) 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 Regulation No 37.

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 at 13,2 V as indicated on the relevant data sheet of Regulation No 37.

6.4.1.1.2. 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.

6.4.1.1.3. 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 communication form in Annex 1 of this Regulation.

6.4.1.2. In the case of a gas-discharge light source:

A standard light source shall be used as specified in Regulation No 99, which has been aged during at least 15 cycles, in accordance with Annex 4, paragraph 4 of Regulation No 99.

During testing of the front fog lamp the voltage at the terminals of the ballast or at the terminals of the light source in case the ballast is integrated with the light source shall be regulated to maintain 13,2 V for a 12 V system, or at the vehicle voltage as specified by the applicant, with a tolerance of ± 0,1 V.

The objective luminous flux of the gas-discharge light source may differ from that specified in Regulation No 99. In this case, the luminous intensity values shall be corrected accordingly.

6.4.1.3. 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.

6.4.1.4. 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 with the input voltage as specified by the applicant or with a supply and operating device which replace this control gear for the photometric test. The relevant input parameters (e.g. duty cycle, frequency, pulse shape, peak voltage) shall be specified and stated in the communication form, item 10.6, in Annex 1 to this Regulation.

6.4.1.5. Compliance with the requirement in paragraph 5.8.1 shall be verified at least with respect to the values in line 3 and 4 of table in paragraph 6.4.3.

6.4.2. Photometric adjustment and measuring conditions:

6.4.2.1. The aiming screen for visual adjustment (see Annex 4 paragraph 2.2) shall be positioned at either a distance of 10 m or a distance of 25 m in front of the front fog lamp.

6.4.2.2. 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. In the case that visual aim leads to problems or ambiguous positions, the measurement of the cut-off quality and the instrumental method as specified in paragraphs 4 and 5 of Annex 9 shall be applied.

6.4.2.3. The front fog lamp shall be adjusted so that the cut-off on the screen is 1° below the line h according to the requirements in paragraph 2 of Annex 9.

6.4.3. Photometric requirements:

When so adjusted, the front fog lamp shall meet the photometric requirements in the table below (refer also to Annex 4, paragraph 2.2 of this Regulation):

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°	± 45°	85 max	All points
Point 3, 4 (**)	+ 40°	± 30°		
Point 5, 6 (**)	+ 30°	± 60°		
Point 7, 10 (**)	+ 20°	± 40°		
Point 8, 9 (**)	+ 20°	± 15°		
Line 1 (**)	+ 8°	– 26° to + 26°	130 max	All line
Line 2 (**)	+ 4°	– 26° to + 26°	150 max	All line
Line 3	+ 2°	– 26° to + 26°	245 max	All line
Line 4	+ 1°	– 26° to + 26°	360 max	All line
Line 5	0°	– 10° to + 10°	485 max	All line
Line 6 (***)	– 2,5°	– 10° to + 10°	2 700 min	All line
Line 7 (***)	– 6,0°	– 10° to + 10°	< 50 per cent of max. on line 6	All line
Line 8L and R (***)	– 1,5° to – 3,5°	– 22° and + 22°	1 100 min	One or more points
Line 9L and R (***)	– 1,5° to – 4,5°	– 35° and + 35°	450 min	One or more points
Zone D (***)	– 1,5° to – 3,5°	– 10° to + 10°	12 000 max	Whole zone

(*) The coordinates are specified in degrees for an angular web with a vertical polar axis.
(**) See paragraph 6.4.3.4.
(***) See paragraph 6.4.3.2.

6.4.3.1. The luminous intensity 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.

6.4.3.2. At the request of the applicant, two front fog lamps constituting a matched pair corresponding to paragraph 4.2.2.5 may be tested separately. In this case the specified requirements for lines 6, 7, 8, 9 and the Zone D in the table in paragraph 6.4.3 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 corresponding to paragraph 4.2.2.5 are only required to meet the requirements of line 6 and line 7 from 5° inwards to 10° outwards.

6.4.3.3. Inside the field between lines 1 to 5 in Figure 3 of Annex 4, 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.

6.4.3.4. In the light-distribution as specified in the table in paragraph 6.4.3, 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 175 cd are allowed, if not extending beyond a conical angle of 2° aperture or a width of 1°. If multiple spots or stripes are present they shall be separated by a minimum angle of 10°.

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

6.4.4. Other photometric requirements

6.4.4.1. In the case of front fog lamps equipped with gas-discharge light sources with the ballast not integrated with the light source, the luminous intensity shall exceed 1 080 cd in the measuring point at 0° horizontal and 2° D vertical, four seconds after activation of the fog lamp which has not been operated for 30 minutes or more.

6.4.4.2. 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 6.4.1.1.3, is considered acceptable if the luminous intensities remain within 60 per cent and 100 per cent of the values specified in the table in paragraph 6.4.3.

6.4.4.2.1. An indication shall be inserted in the communication form (Annex 1, paragraph 10).

6.4.4.2.2. 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.

6.4.4.2.3. Photometric measurements shall be performed according to the applicant's description.

7. COLOUR

The colour of the light emitted by the front fog lamp shall be either white or selective yellow by choice of the applicant. The selective yellow colour, if any, of the beam may be obtained either by the colour of the light source or by the lens of the front fog lamp or by any other suitable means.

7.1. The colorimetric characteristics of the front fog lamp shall be measured with voltages as defined in paragraphs 6.3 and 6.4.

8. DETERMINATION OF DISCOMFORT (DAZZLE)

The discomfort dazzle caused by the front fog lamp shall be determined ([1]).

9. MODIFICATIONS OF THE TYPE OF FRONT FOG LAMP AND EXTENSION OF APPROVAL

9.1. Every modification of the type of front fog lamp shall be notified to the Type Approval Authority which approved the type of front fog lamp. The department may then either:

([1]) This determination will be the subject of a recommendation to Administrations.

9.1.1. Consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the front fog lamp still complies with the requirements;

or

9.1.2. Require a further test report from the technical service responsible for conducting the tests.

9.2. Confirmation or refusal of approval, specifying the alterations, shall be communicated by the procedure specified in paragraph 4.1.4 to the Parties to the Agreement which apply this Regulation.

9.3. The competent authority issuing the extension of approval shall assign a series number for such an extension and inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

10. CONFORMITY OF PRODUCTION

10.1. Front fog lamps approved under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set forth in paragraphs 6 and 7 of this Regulation and in Annex 7.

10.2. In order to verify that the requirements of paragraph 10.1 are met, suitable controls of the production shall be carried out.

10.3. The holder of the approval shall in particular:

10.3.1. Ensure the existence of procedures for the effective control of the quality of products;

10.3.2. Have access to the control equipment necessary for checking the conformity to each approved type;

10.3.3. Ensure that data of test results are recorded and that related documents shall remain available for a period to be determined in accordance with the Administrative Service;

10.3.4. Analyse the results of each type of test in order to verify and ensure the stability of the product characteristics making allowance for variation of an industrial production;

10.3.5. Ensure that for each type of product at least the tests prescribed in Annex 7 to this Regulation with the tolerances as prescribed in Annex 2 to this Regulation are carried out;

10.3.6. Ensure that any collecting of samples giving evidence of non-conformity with the type of test considered shall give rise to another sampling and another test. All the necessary steps shall be taken to re-establish the conformity of the corresponding production.

10.4. The competent authority which has granted type approval may at any time verify the conformity control methods applicable to each production unit.

10.4.1. In every inspection, the test books and production survey records shall be presented to the visiting inspector.

10.4.2. The inspector may take samples at random to be tested in the manufacturer's laboratory. The minimum number of samples may be determined in the light of the results of the manufacturer's own checks.

10.4.3. When the quality level appears unsatisfactory or when it seems necessary to verify the validity of the tests carried out in the application of paragraph 10.4.2, the inspector shall select samples, to be sent to the technical service that has conducted the type approval tests, using the criteria of Annex 7 to this Regulation with the tolerances as prescribed in Annex 2 to this Regulation.

10.4.4. The Competent Authority may carry out any test prescribed in this Regulation. These tests will be on samples selected at random without causing distortion of the manufacturer's delivery commitments and in accordance with the criteria of Annex 7 to this Regulation with the tolerances as prescribed in Annex 2 to this Regulation.

10.4.5. The Competent Authority shall strive to obtain a frequency of inspection of once every two years. However, this is at the discretion of the competent authority and their confidence in the arrangements for ensuring effective control of the conformity of production. In the case where negative results are recorded, the competent authority shall ensure that all necessary steps are taken to re-establish the conformity of production as rapidly as possible.

10.5. Front fog lamps with apparent defects are disregarded.

11. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

11.1. The approval granted in respect of a type of front fog lamp pursuant to this Regulation may be withdrawn if the requirements set forth above are not met, or if a front fog lamp bearing the approval mark does not conform to the type approved.

11.2. If a Contracting Party to the Agreement applying this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation, by means of a communication form conforming to the model in Annex 1 to this Regulation.

12. PRODUCTION DEFINITIVELY DISCONTINUED

If the holder of the approval completely ceases to manufacture a front fog lamp approved in accordance with this Regulation, he shall so inform the authority which granted the approval. Upon receiving the relevant communication that authority shall inform thereof the other Parties to the 1958 Agreement which apply this Regulation, by means of a communication form conforming to the model in Annex 1 to this Regulation.

13. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, AND OF TYPE APPROVAL AUTHORITIES

The Parties to the 1958 Agreement which apply this Regulation shall communicate to the United Nations Secretariat the names and addresses of the technical services responsible for conducting approval tests and of the Type Approval Authorities which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval, or production definitely discontinued, issued in other countries, are to be sent.

14. TRANSITIONAL PROVISIONS

14.1. As from the date of entry into force of the 04 series of amendments (9 December 2010) no Contracting Party applying this Regulation shall refuse to grant UNECE type approval under this Regulation as amended by the 04 series of amendments.

14.2. As from the date of entry into force of Supplement 2 to the 04 series of amendments, Contracting Parties applying this Regulation shall refuse to grant approvals for new types of class 'B' front fog lamps. However, Contracting Parties applying this Regulation shall continue to issue approvals for class 'B' front fog lamps on the basis of the 02, 03 and 04 series of amendments provided that these front fog lamps are only intended as replacements for fitting to vehicles in use.

14.3. Until 60 months from the date of entry into force of the 04 series of amendments (9 December 2015) with regard to the changes introduced by the 04 series of amendments concerning the photometric testing at reference luminous flux at approximately 13,2 volts, and in order to allow the Technical Services to update their testing equipment, no Contracting Party applying this Regulation shall refuse to grant approvals under this Regulation as amended by the 04 series of amendments where existing testing equipment is used, with suitable conversion of the values to the satisfaction of the authority responsible for type approval.

14.4. Existing approvals for front fog lamps already granted under the preceding series of amendments to this Regulation shall remain valid indefinitely.

14.5. As from 60 months after the date of entry into force of the 03 series of amendments (11 July 2013), Contracting Parties applying this Regulation shall refuse to grant any extensions of approvals for all class 'B' front fog lamps except those intended as replacements for fitting to vehicles in use. Contracting Parties applying this Regulation shall continue to grant extensions of approvals for all class 'F3' front fog lamps.

ANNEX 1

COMMUNICATION

(Maximum format: A4 (210 × 297 mm))

issued by: Name of administration
.....
.....
.....

Concerning (2): Approval granted
Approval extended
Approval refused
Approval withdrawn
Production definitively discontinued

of a type of front fog lamp pursuant to Regulation No 19

Approval No ..... Extension No .....

1. Trade name or mark of the device: .....

2. Type of the device: .....

3. Manufacturer's name for the type of device: .....

4. Manufacturer's name and address: .....

5. If applicable, name and address of the manufacturer's representative: .....

6. Submitted for approval on: .....

7. Technical Service responsible for conducting approval tests: .....

8. Date of report issued by that service: .....

9. Number of report issued by that service: .....

10. Concise description: .....

10.1. Class as described by the relevant marking:
'B', 'B/', 'BPL', 'B/PL', 'F3', 'F3/', 'F3PL', 'F3/PL'

10.2. Number and category(ies) of filament lamp(s): .....

10.3. LED module: yes/no (2)

10.4. Light generator: yes/no (2)

10.5. LED module or light generator specific identification code: .....

10.6. Application of electronic light source control gear ([3]): yes/no ([2])

Supply to the light source: .....

Specification of the light source control gear: .....

Input voltage ([4]): .....

In the case of an electronic light source control gear not being part of the lamp:

Output signal specification: .....

10.7. Colour of light emitted: ..... white/selective yellow ([2])

10.8. Luminous flux of the light source (see paragraph 5.9) greater than 2 000 lumen: ..... yes/no ([2])

10.9. Luminous intensity is variable: ..... yes/no ([2])

10.10. The determination of the cut-off gradient (if measured) was carried out at ..... 10 m/25 m^2

11. Position of the approval mark: .....

12. Reason(s) for extension (if applicable): .....

13. Approval granted/extended/refused/withdrawn ([2])

14. Place: .....

15. Date: .....

16. Signature: .....

17. The list of documents deposited with the Administrative Service, which has granted approval, is annexed to this communication and may be obtained on request.

([1]) Distinguishing number of the country which has granted/extended/refused/withdrawn an approval (see approval provisions in the Regulation).

([2]) Strike out what does not apply.

([3]) The voltage specifications shall include the tolerances or voltage range as specified by the manufacturer and verified by this approval.

([4]) The parameters of the input voltage including duty cycle, frequency, pulse shape and peak voltage shall be included.

ANNEX 2

TOLERANCE REQUIREMENTS FOR CONFORMITY OF PRODUCTION CONTROL PROCEDURE

1. In the case of class 'B' front fog lamps:

1.1. When testing photometric performances of any front fog lamp chosen at random and equipped with a standard filament lamp, no measured value may deviate unfavourably by more than 20 per cent from the value prescribed in this Regulation.

1.2. For the periodic records, the reading is limited to point B50 [1] and left and right bottom corners of zone D (see Figure 2 in Annex 4).

2. In the case of class 'F3' front fog lamps:

2.1. When testing the photometric performances of any front fog lamp chosen at random according to paragraph 6.4 of this Regulation, no measured value of the luminous intensity may deviate unfavourably by more than 20 per cent.

2.2. For the measured values in the table according to paragraph 6.4.3 of this Regulation the respective maximum deviations may be:

Designated lines or zones	Vertical position (*) above h + below h –	Horizontal position (*) left of v: – right of v: +	Luminous intensity candela		To comply
			Equivalent 20 per cent	Equivalent 30 per cent	
Point 1, 2 (**)	+ 60°	± 45°	115 max	130 max	All points
Point 3, 4 (**)	+ 40°	± 30°			
Point 5, 6 (**)	+ 30°	± 60°			
Point 7, 10 (**)	+ 20°	± 40°			
Point 8, 9 (**)	+ 20°	± 15°			
Line 1 (**)	+ 8°	– 26° to + 26°	160 max	170 max	All line
Line 2 (**)	+ 4°	– 26° to + 26°	180 max	195 max	All line
Line 3	+ 2°	– 26° to + 26°	295 max	320 max	All line
Line 4	+ 1°	– 26° to + 26°	435 max	470 max	All line
Line 5	0°	– 10° to + 10°	585 max	630 max	All line
Line 6 (***)	– 2,5°	from 5° inwards to 10° outwards	2 160 min	1 890 min	All line
Line 8 L and R (***)	– 1,5° to – 3,5°	– 22° and + 22°	880 min	770 min	One or more points
Line 9 L and R (***)	– 1,5° to – 4,5°	– 35° and + 35°	360 min	315 min	One or more points
Zone D	– 1,5° to – 3,5°	– 10° to + 10°	14 400 max	15 600 max	Whole zone

(*) The coordinates are specified in degrees for an angular web with a vertical polar axis.
(**) See paragraph 6.4.3.4 of this Regulation.
(***) See paragraph 6.4.3.2 of this Regulation.

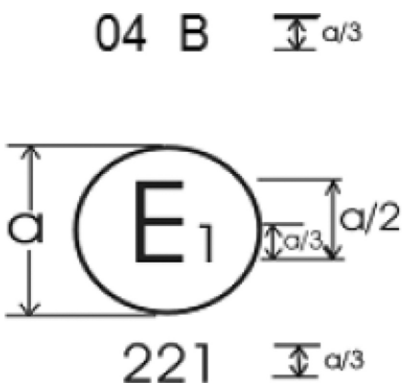
[1] The point B 50 corresponds to the coordinates horizontal 0°, vertical 0,86° U.

2.3. For the periodic records, the photometric measurements for verification of conformity shall at least yield data for the points 8 and 9, and the lines 1, 5, 6, 8 and 9 as specified in paragraph 6.4.3 of this Regulation.

ANNEX 3

EXAMPLES OF ARRANGEMENTS OF APPROVAL MARKS FOR FRONT FOG LAMPS OF CLASS 'B' AND CLASS 'F3'

Figure 1



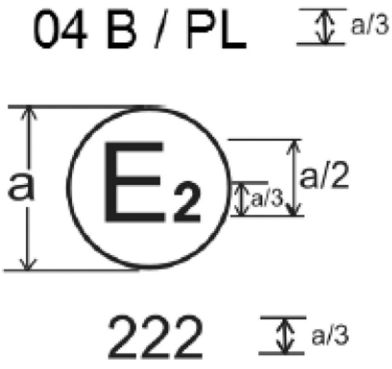
a ≥ 5 mm

The device bearing the above approval marking is a fog lamp of class 'B' approved in the Germany (E1) under number 221, in accordance with Regulation No 19.

The number mentioned close to the symbol 'B' indicates that the approval was granted in accordance with the requirements of Regulation No 19 as amended by the 04 series of amendments.

Figure 1 indicates that the device is a front fog lamp, which can be lit simultaneously with any other lamp with which it may be reciprocally incorporated.

Figure 2a



a ≥ 5 mm

Figure 2b

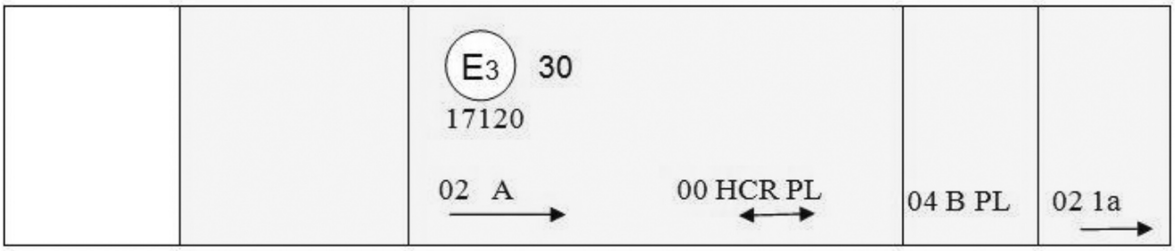
Figures 2a and 2b indicate that the device is a front fog lamp approved in the France (E2) under number 222, in accordance with Regulation No 19 incorporating a lens of plastic material and that it cannot be lit simultaneously with any other lamp with which it may be reciprocally incorporated.

Note: The approval number and the additional symbols shall be placed close to the circle and either above or below the letter 'E', or to the right or left of that letter. The digits of the approval number shall be on the same side of the letter 'E' and face the same direction. The use of Roman numerals as approval numbers should be avoided so as to prevent any confusion with other symbols.

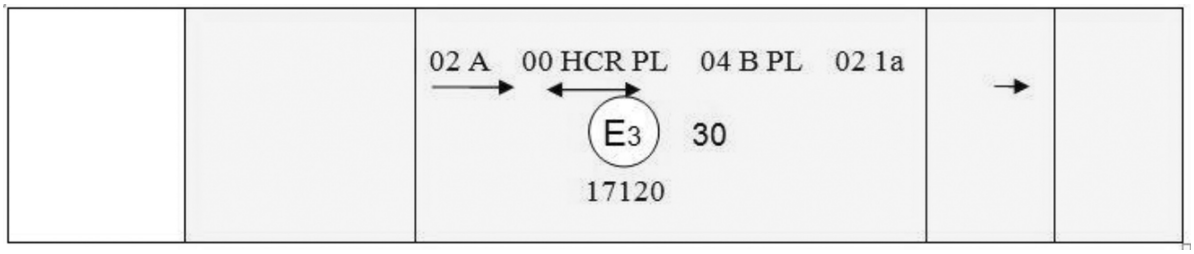
Figure 3

Examples of possible markings for grouped, combined or reciprocally incorporated lamps situated on the front of a vehicle

Model A

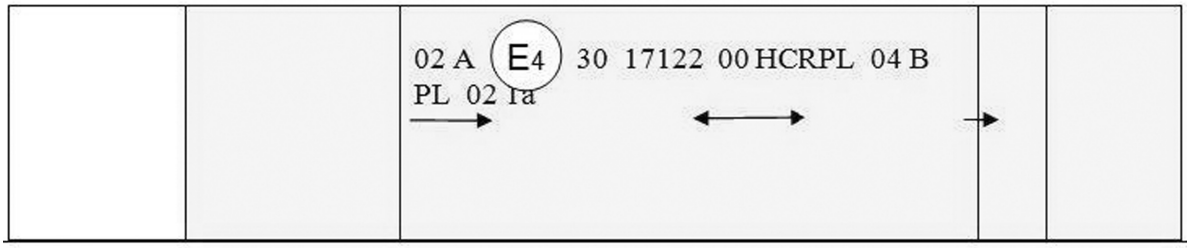


Model B



Model C

Model D



The vertical and horizontal lines indicate a schematic view of the shape of the light-signalling device. These are not part of the approval mark.

The devices shown in Model A and Model B of Figure 3 bear the approval markings for a fog lamp approved in Italy (E3) under number 17120, in accordance with Regulation No 19.

The devices shown in Model C and Model D of Figure 3 bear the approval markings for a fog lamp approved in the Netherlands (E4) under number 17122, in accordance with Regulation No 19.

Note: The four examples shown in Figure 3 correspond to a lighting device bearing an approval mark relating to:

A front position lamp approved in accordance with the 02 series of amendments to Regulation No 7;

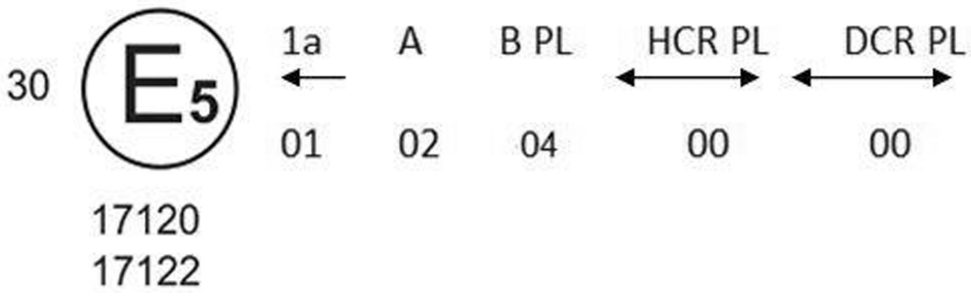
A headlamp with a passing beam designed for right-hand and left-hand traffic and a driving beam with a maximum intensity comprised between 86 250 and 101 250 candelas (as indicated by the number 30) approved in accordance with the 00 series of amendments to Regulation No 112 and incorporating a lens of plastic material;

A front fog lamp approved in accordance with the 04 series of amendments to Regulation No 19 and incorporating a lens of plastic material;

A front direction indicator lamp of category 1a approved in accordance with the 02 series of amendments to Regulation No 6.

Figure 4

Lamp reciprocally incorporated with a headlamp



The example in Figure 4 corresponds to the marking of a lens of plastic material intended for use in different types of headlamps, namely:

either:

A headlamp with a passing beam designed for right-hand and left-hand traffic and a driving beam with a maximum intensity comprised between 86 250 and 101 250 candelas, approved in Sweden (E5) in accordance with the requirements of Regulation No 112 as amended by the 00 series of amendments, which is reciprocally incorporated with a front fog lamp approved in accordance with the 04 series of amendments to Regulation No 19;

or:

A headlamp with a passing beam designed for right-hand and left-hand traffic and a driving beam, approved in Sweden (E5) in accordance with the requirements of Regulation No 98 as amended by the 00 series of amendments, which is reciprocally incorporated with the same front fog lamp as above;

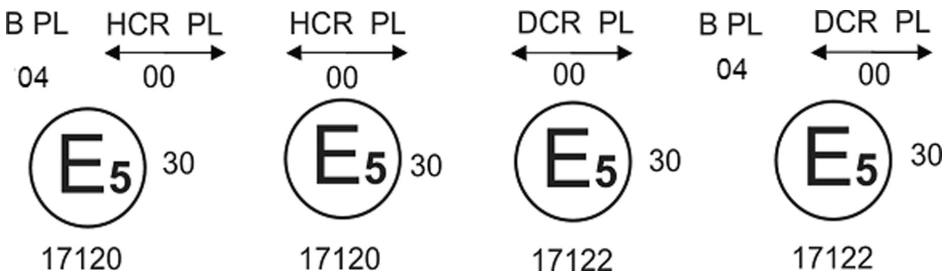
or even:

Either of the above-mentioned headlamps approved as a single lamp.

The main body of the headlamp shall bear only the valid approval number. Examples of such valid markings are shown in Figure 5.

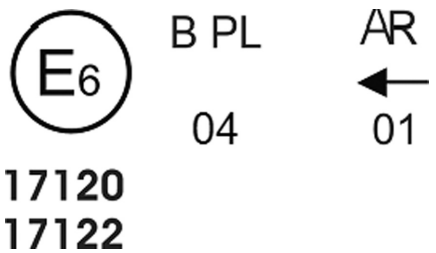
Figure 5

Lighting device used either as front fog lamp or as reversing lamp



The device bearing the approval marking in Figure 6 is a lamp approved in Belgium (E6) under number 17120 and 17122, in accordance with Regulation No 19 and, in accordance with Regulation No 23 (reversing lamps):

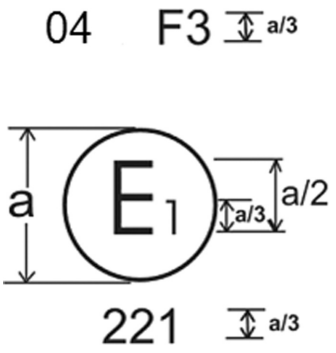
Figure 6



One of the above-mentioned lamps approved as a single lamp can be used only as a front fog lamp or as a reversing lamp.

Figure 7

Examples of arrangements of approval marks for front fog lamps of class 'F3'



a ≥ 5 mm

The device bearing the approval marking shown in Figure 7 is a fog lamp of class 'F3' approved in Germany (E1) under number 221, in accordance with Regulation No 19.

The number mentioned close to the symbol 'F3' indicates that the approval was granted in accordance with the requirements of Regulation No 19 as amended by the 03 series of amendments.

The marking in Figure 7 indicates that the device is a front fog lamp, which can be lit simultaneously with any other lamp with which it may be reciprocally incorporated.

Figure 8a

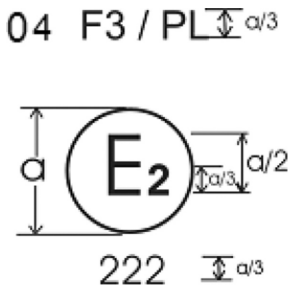


Figure 8b

a ≥ 5 mm

The device bearing the approval marking shown in Figures 8a and 8b is a fog lamp of class 'F3', having a plastic lens and approved in France (E2) under number 222, in accordance with Regulation No 19. The number mentioned close to the symbol 'F3' indicates that the approval was granted in accordance with the requirements of Regulation No 19 as amended by the 04 series of amendments

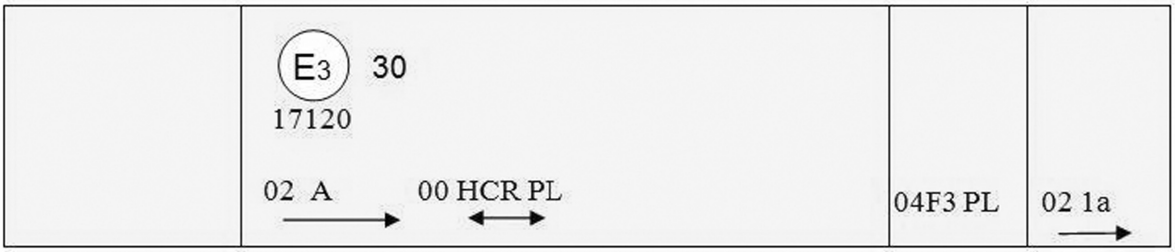
Figures 8a and 8b indicate that the device is a front fog lamp incorporating a lens of plastic material and that it cannot be lit simultaneously with any other lamp with which it may be reciprocally incorporated.

Note: The approval number and the additional symbols shall be placed close to the circle and either above or below the letter 'E', or to the right or left of that letter. The digits of the approval number shall be on the same side of the letter 'E' and face the same direction. The use of Roman numerals as approval numbers should be avoided so as to prevent any confusion with other symbols.

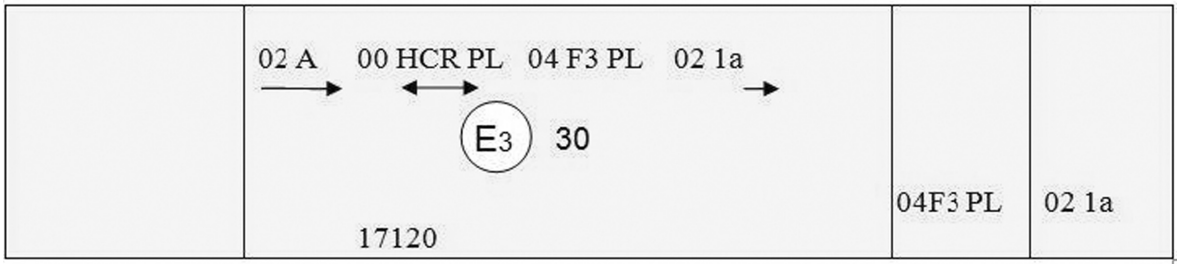
Figure 9

Examples of possible markings for grouped, combined or reciprocally incorporated lamps situated on the front of a vehicle

Model A

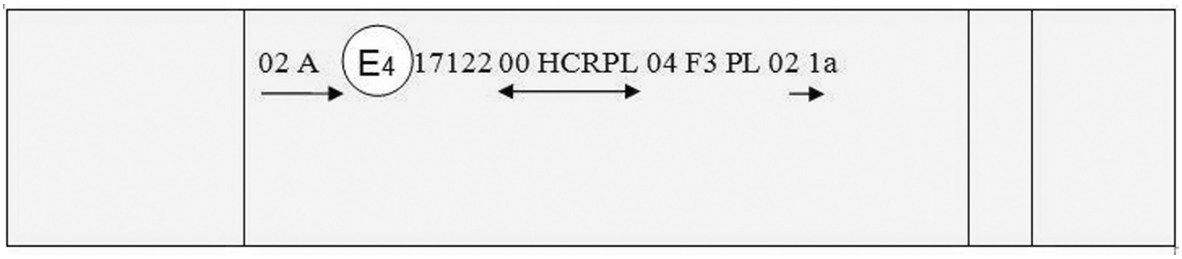


Model B



Model C

Model D



The vertical and horizontal lines indicate a schematic view of the shape of the light-signalling device. These are not part of the approval mark.

The device bearing the approval marking shown in Models A and B in Figure 9 is a fog lamp approved in Italy (E3) under number 17120 and comprising:

A front position lamp approved in accordance with the 02 series of amendments to Regulation No 7;

A headlamp with a passing beam designed for right-hand and left-hand traffic and a driving beam with a maximum intensity comprised between 86 250 and 101 250 candelas (as indicated by the number 30) approved in accordance with the 00 series of amendments to Regulation No 112 and incorporating a lens of plastic material;

A front fog lamp approved in accordance with the 04 series of amendments to Regulation No 19 and incorporating a lens of plastic material;

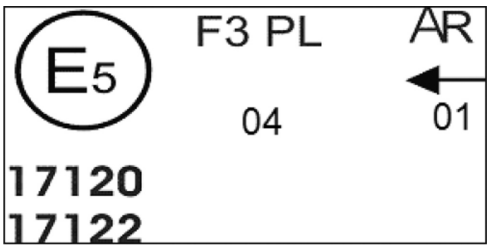
A front direction indicator lamp of category 1a approved in accordance with the 02 series of amendments to Regulation No 6.

The device bearing the approval marking in Models C and D in Figure 9 is a device approved in the Netherlands (E4) under number 17122, in accordance with Regulation used and shows a slightly different arrangement to that shown in Models A and B.

Lighting device used either as front fog lamp or as reversing lamp

The device bearing the approval marking shown in Figure 10 is a lamp approved in Sweden (E5) under number 17120 and 17122, in accordance with Regulation No 19 and, in accordance with Regulation No 23 (reversing lamps):

Figure 10

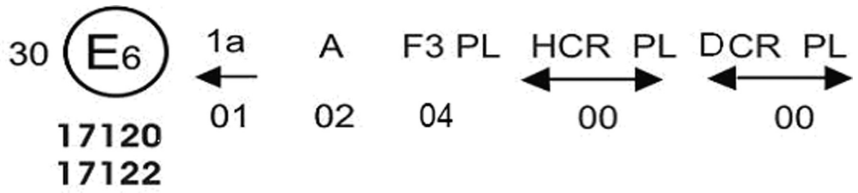


One of the above-mentioned lamps approved as a single lamp can be used only as a front fog lamp or as a reversing lamp.

Front fog lamp reciprocally incorporated with a headlamp

The devices bearing the approval marking shown in Figure 11 have been approved in Belgium (E6) under number 17120 or 17122, in accordance with the relevant Regulations.

Figure 11



The above example corresponds to the marking of a lens of plastic material to be used in different types of headlamps, namely:

either:

A headlamp with a passing beam designed for right-hand and left-hand traffic and a driving beam with a maximum intensity comprised between 86 250 and 101 250 candelas, approved in Belgium (E6) in accordance with the requirements of Regulation No 112 (Table B) as amended by the 00 series of amendments, which is reciprocally incorporated with a front fog lamp approved in accordance with the 04 series of amendments to Regulation No 19;

or:

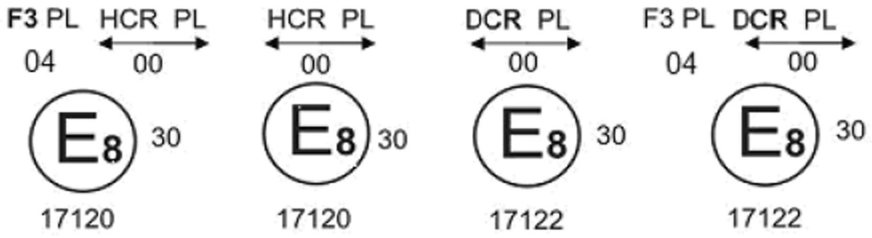
A headlamp with a passing beam designed for right-hand and left-hand traffic and a driving beam, approved in Belgium (E6) in accordance with the requirements of Regulation No 98 as amended by the 00 series of amendments, which is reciprocally incorporated with the same front fog lamp as above;

or even:

Either of the above-mentioned headlamps approved as a single lamp.

The main body of the headlamp shall bear only the valid approval number. Examples of such valid markings are shown in Figure 12.

Figure 12



The above example corresponds to devices approved in Czech Republic (E8).

LED modules

Figure 13

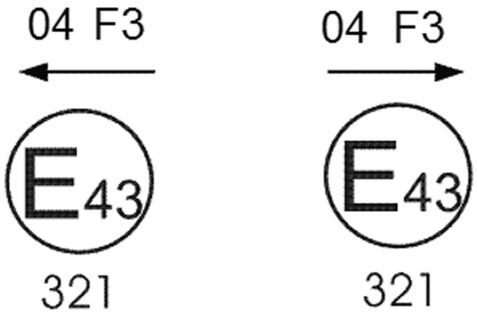
MD E8 17325

The LED module bearing the identification code shown in Figure 13 has been approved together with a lamp approved in Czech Republic (E8) under approval number 17325.

Front fog lamps as a matched pair

The approval marking shown below identifies a front fog lamp carried out as a matched pair and meeting the requirements of this Regulation. The device bearing the approval marking shown in Figure 14 is a front fog lamp approved in Japan (E43) under number 321.

Figure 14



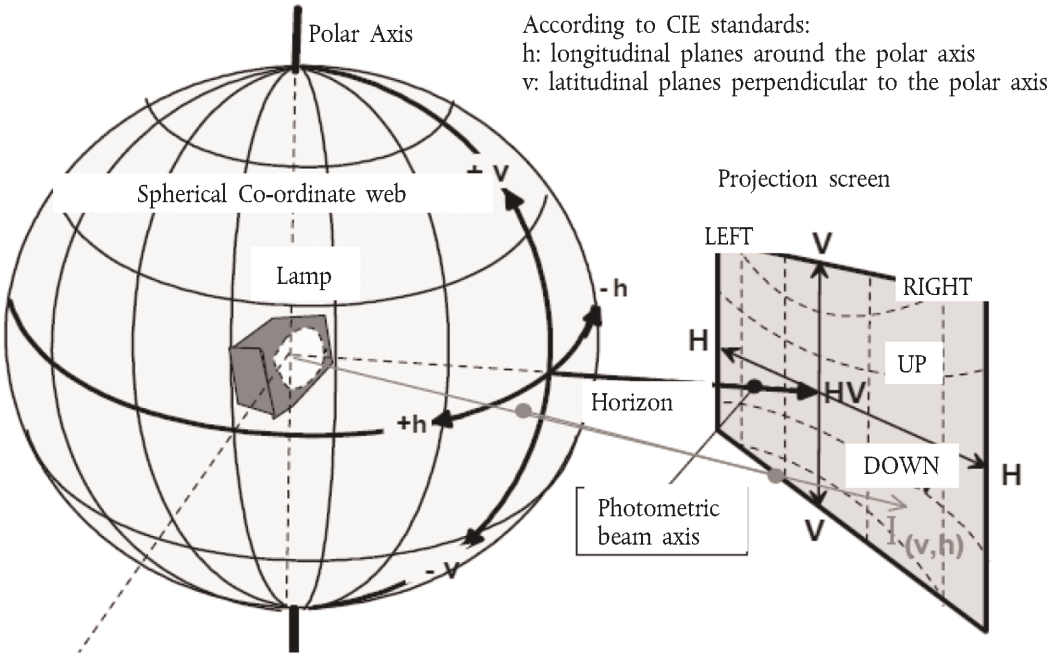
ANNEX 4

MEASURING SCREEN GEOMETRY AND MEASURING GRID

1. MEASURING SCREEN

The coordinates are specified in degrees for spherical angles in a web with a vertical polar axis (see Figure 1).

Figure 1



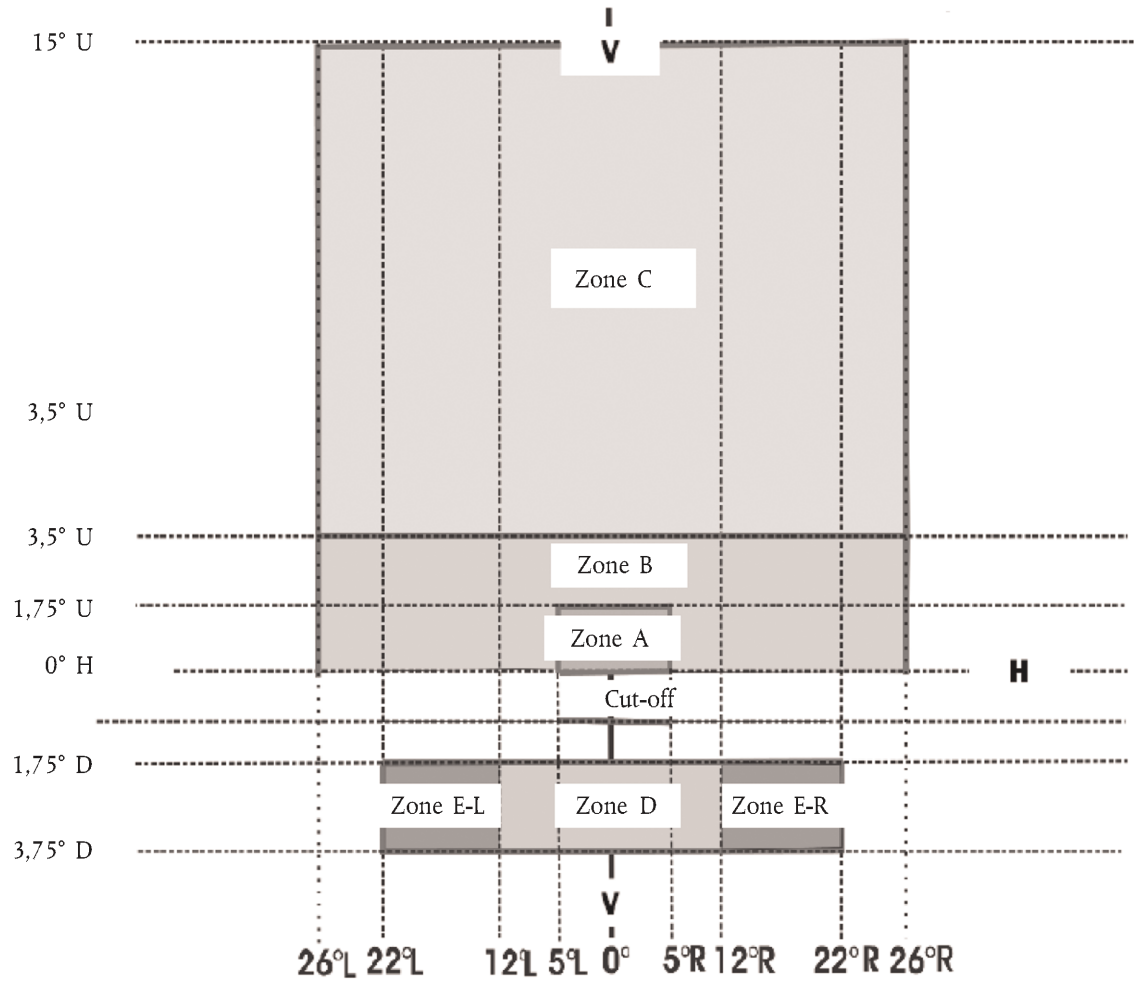
2. MEASURING GRID (see Figure 2)

The measuring grid is symmetrical about the v-v line (see table in paragraph 6.4.3 of this Regulation). For simplicity the angular web is shown in the form of a rectangular grid.

2.1. In the case of front fog lamps of class 'B', the measuring grid is shown in Figure 2.

Figure 2

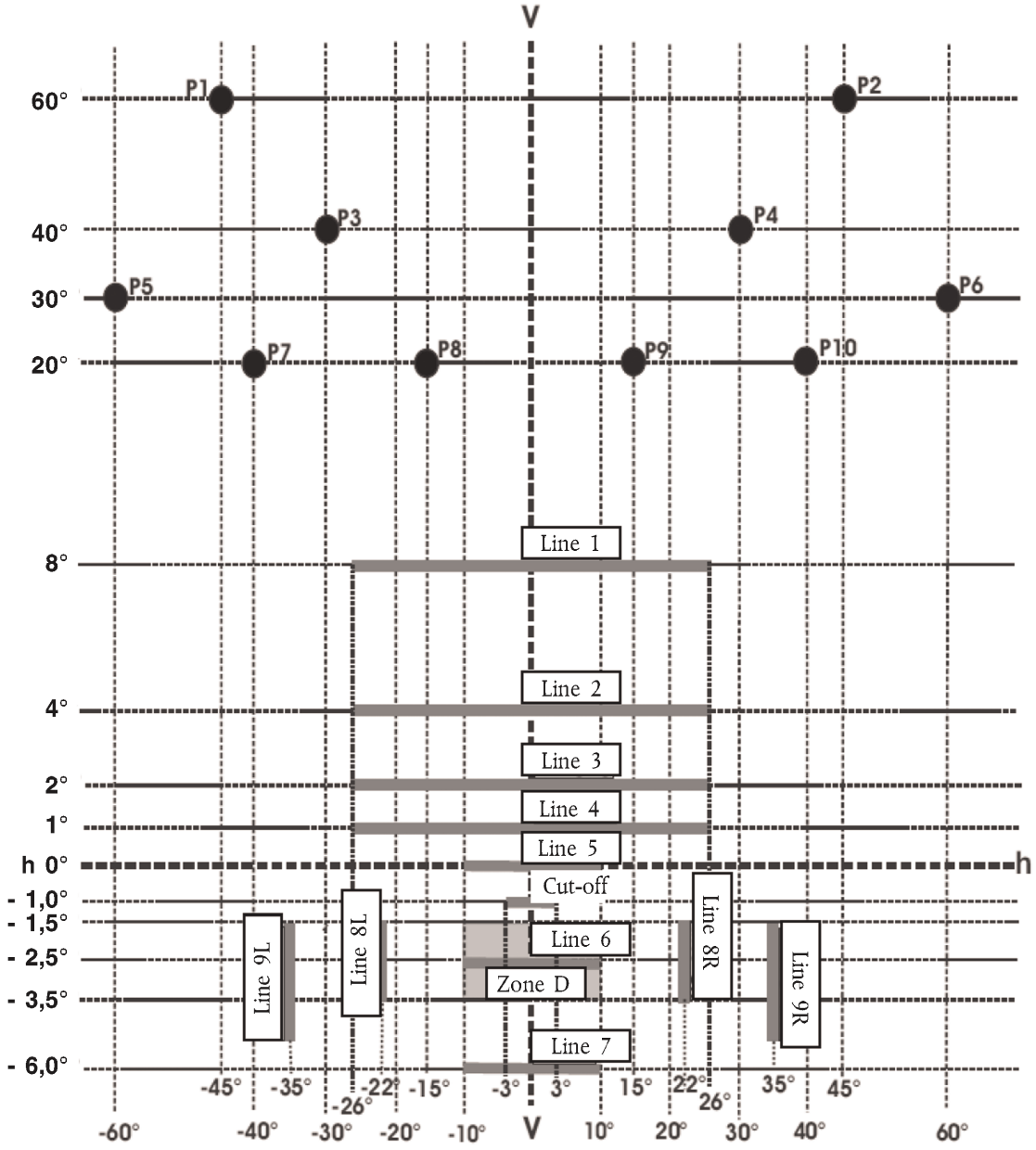
Light distribution of the class 'B' front fog lamp



2.2. In the case of front fog lamps of class 'F3', the measuring grid is shown in Figure 3.

Figure 3

Light distribution of the class 'F3' front fog lamp



ANNEX 5

TESTS FOR STABILITY OF PHOTOMETRIC PERFORMANCE OF FRONT FOG LAMPS IN OPERATION (TESTS ON COMPLETE FRONT FOG LAMPS)

Once the photometric values have been measured according to the prescriptions of this Regulation, in the point of maximum illumination in zone D (E_{max}) and in the point HV, a complete front fog lamp sample shall be tested for stability of photometric performance in operation. 'Complete front fog lamp' is the complete lamp itself including those surrounding body parts and lamps, which could influence its thermal dissipation.

The tests shall be carried out:

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

(b) In case of replaceable light sources: using mass production filament light sources, which have been aged for at least one hour, or mass production gas-discharge light sources, which have been aged for at least 15 hours or mass production LED modules which 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.

1. TEST FOR STABILITY OF PHOTOMETRIC PERFORMANCE

1.1. Clean front fog lamp

The front fog lamp shall be operated for 12 hours as described in paragraph 1.1.1 and checked as prescribed in paragraph 1.1.2.

1.1.1. Test procedure

The front fog lamp shall be operated as follows:

1.1.1.1. In the case where only one lighting function (front fog lamp) is to be approved, the corresponding light source is lit for the prescribed time [1],

1.1.1.2. In the case of more than one lighting function (e.g. a headlamp with one or more driving beams and/or a front fog lamp): the headlamp shall be subjected to the following cycle until the prescribed time is reached:

(a) 15 minutes, front fog lamp lit;

(b) 5 minutes, all filaments lit.

If the applicant declares that only one lighting function is to be used at a time (e.g. only the passing beam lit or only the driving beam(s) lit or only the front fog lamp lit [1], the test shall be carried out in accordance with this condition, successively activating the front fog lamp half of the time and one of the other lighting functions for half the time specified in paragraph 1.1.

[1] When the tested front fog lamp includes signaling lamps, the latter shall be lit for the duration of the test, except for a daytime running lamp. 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.

1.1.1.3. In the case of front fog lamp with a passing beam and one or more lighting functions (one of them is a front fog lamp):

(a) The front fog lamp shall be subjected to the following cycle until the time specified is reached:

(i) 15 minutes, passing-beam light source(s) lit;

(ii) 5 minutes, all light source(s) lit.

(b) If the applicant declares that the front fog lamp is to be used with only the passing beam lit or only the front fog lamp ([2]) lit at a time, the test shall be carried out in accordance with this condition, successively activating ([3]) the passing beam half of the time and the front fog lamp for half of the time specified in paragraph 1.1. 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;

(c) If the applicant declares that the front fog lamp can be used with only the passing beam or only the driving beam(s) ([2]) lit or only the front fog lamp ([2]) lit at a time, the test shall be carried out in accordance with this condition, successively activating ([2]) the passing beam one third of the time, the driving beam(s) one third of the time and the front fog lamp for one third of the time specified in paragraph 1.1.

1.1.2. Test voltage

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

(a) 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;

(b) 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;

(c) In the case of non-replaceable light source operated directly under vehicle voltage system conditions: all measurements on lighting units equipped with non-replaceable 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;

(d) 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);

(e) 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;

([2]) Should two or more lamp filaments be simultaneously lit when headlamp flashing is used, this shall not be considered as being normal use of the filaments simultaneously.

([3]) When the tested headlamp includes signalling 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 mode with an on/off time of approximately one to one.

(f) 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.

(g) For a gas-discharge light source, the test voltage for the ballast or for the light source in case the ballast is integrated with the light source is 13,2 ± 0,1 volts for 12 V network system, or otherwise specified in the application for approval.

1.1.3. Test results

1.1.3.1. Visual inspection

Once the front fog lamp has been stabilised to the ambient temperature, the front fog lamp lens and the external lens, if any, shall be cleaned with a clean, damp cotton cloth. It shall then be inspected visually; no distortion, deformation, cracking or change in colour of either the front fog lamp lens or the external lens, if any, shall be noticeable.

1.1.3.2. Photometric test

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

In case of class 'B' front fog lamps: at point HV and the point of I_{max} in zone D.

In case of class 'F3' front fog lamps: on line 5 at point h = 0 and the point of I_{max} 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 in paragraph 2).

A 10 per cent discrepancy between the photometric characteristics and the values measured prior to the test is permissible including the tolerances of the photometric procedure.

1.2. Dirty front fog lamp

The front fog lamp, having been tested as specified in paragraph 1.1 shall be operated for one hour as described in paragraph 1.1.1. Following preparation, as prescribed in paragraph 1.2.1, it shall be checked as prescribed in paragraph 1.1.3.

1.2.1. Preparation of the front fog lamp

1.2.1.1. Test mixture

1.2.1.1.1. For front fog lamps with the outside lens in glass:

The mixture of water and a polluting agent to be applied to the front fog lamp shall be composed of:

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

(b) 1 part by weight of vegetal carbon dust (beech wood) with a particle size of 0-100 µm;

(c) 0,2 part by weight of NaCMC ([4]), and

([4]) NaCMC represents the sodium salt of carboxymethylcellulose, customarily referred to as CMC. The NaCMC used in the dirt mixture shall have a degree of substitution (DS) of 0,6-0,7 and a viscosity of 200-300 µP for a 2 per cent solution at 20 °C.

(d) an appropriate quantity of distilled water, with a conductivity of S < l μS/m.

The mixture must not be more than 14 days old.

1.2.1.1.2. For front fog lamp with outside lens in plastic material:

The mixture of water and polluting agent to be applied to the front fog lamp shall be composed of:

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

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

(c) 0,2 part by weight of NaCMC ([4]),

(d) 13 parts by weight of distilled water with a conductivity of S < 1 μS/m, and

(e) ± 1 part by weight of surfactant ([5]).

The mixture must not be more than 14 days old.

1.2.1.2. Application of the test mixture to the front fog lamp

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 per cent of the values measured for the following point under the conditions described in this annex:

Point of E_{max} in zone D.

2. TEST FOR CHANGE IN VERTICAL POSITION OF THE CUT-OFF LINE UNDER THE INFLUENCE OF HEAT

This test consists of verifying that the vertical drift of the cut-off line under the influence of heat does not exceed the specified value for an operating front fog lamp.

The front fog lamp tested in accordance with paragraph 1, shall be subjected to the test described in paragraph 2.1, without being removed from or readjusted in relation to its test fixture.

2.1. Test

The test shall be carried out in a dry and still atmosphere at an ambient temperature of 23 °C ± 5 °C.

Using a mass production light source, which has been aged for at least one hour, the front fog lamp shall be operated without being dismounted from or readjusted in relation to its test fixture. (For the purpose of this test, the voltage shall be adjusted as specified in paragraph 1.1.2). The position of the cut-off line between a point situated 3,0 degrees left and a point situated 3,0 degrees right of the line v-v (see Annex 4 of the Regulation) shall be verified after three minutes (r_3) and 60 minutes (r_{60}) respectively of operation.

The measurement of the variation in the cut-off line position as described above shall be carried out by any method giving acceptable accuracy and reproducible results.

([5]) The tolerance on quantity is due to the necessity of obtaining a dirt that correctly spreads out on all the plastic lens.

2.2. Test results

2.2.1. The result expressed in milliradians (mrad) shall be considered acceptable when the absolute value $\Delta r_I = |r_3 - r_{60}|$ recorded on this front fog lamp is not more than 2 mrad ($\Delta r_I \leq 2$ mrad).

2.2.2. However, if this value is more than 2 mrad but not more than 3 mrad (2 mrad < $\Delta r_I \leq 3$ mrad) a second front fog lamp shall be tested as described in paragraph 2.1. This shall be done after the front fog lamp has been subjected to three consecutive cycles as described below, in order to stabilise the position of the mechanical parts of the front fog lamp that is mounted on a base representative of the correct installation on the vehicle:

(a) Operation of the front fog lamp for one hour. (The voltage shall be adjusted as specified in paragraph 1.1.2).

(b) Period of rest for one hour.

2.2.3. The front fog lamp type shall be considered acceptable if the mean value of the absolute values Δr_I measured on the first sample and Δr_{II} measured on the second sample is not more than 2 mrad.

$(\Delta r_I + \Delta r_{II})/2 \leq 2$ mrad.

ANNEX 6

REQUIREMENTS FOR LAMPS INCORPORATING LENSES OF PLASTIC MATERIAL — TESTING OF LENS OR MATERIAL SAMPLES AND OF COMPLETE LAMPS

1. GENERAL SPECIFICATIONS

1.1. The samples supplied pursuant to paragraph 2.2.2 of this Regulation shall satisfy the specifications indicated in paragraphs 2.1 to 2.5.

1.2. The two samples of complete lamps supplied pursuant to paragraph 2.3 of this Regulation (or paragraph 2.4 of this Regulation as applicable) and incorporating lenses of plastic material shall, with regard to the lens material, satisfy the specifications indicated in paragraph 2.6.

1.3. The samples of lenses of plastic material or samples of material shall be subjected, with the reflector to which they are intended to be fitted (where applicable), to approval tests in the chronological order indicated in table A reproduced in Appendix 1 to this annex.

However, if the lamp manufacturer can prove that the product has already passed the tests prescribed in paragraphs 2.1 to 2.5, or the equivalent tests pursuant to another Regulation, those tests need not be repeated; only the tests prescribed in Appendix 1, table B, shall be mandatory.

2. TESTS

2.1. Resistance to temperature changes

2.1.1. Tests

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 °C ± 2 °C and 85-95 per cent RH;

1 hour at 23 °C ± 5 °C and 60-75 per cent RH;

15 hours at – 30 °C ± 2 °C;

1 hour at 23 °C ± 5 °C and 60-75 per cent RH;

3 hours at 80 °C ± 2 °C;

1 hour at 23 °C ± 5 °C and 60-75 per cent RH;

Before this test, the samples shall be kept at 23 °C ± 5 °C and 60-75 per cent RH for at least four hours.

Note: The periods of one hour at 23 °C ± 5 °C shall include the periods of transition from one temperature to another which are needed in order to avoid thermal shock effects.

2.1.2. Photometric measurements

2.1.2.1. Method

Photometric measurements shall be carried out on the samples before and after the test. These measurements shall be made under the conditions as specified in paragraph 6.3 or 6.4 of this Regulation, at the following points:

In the case of class 'B' front fog lamps:

(a) At point HV and

(b) Point h = 0, v = 2° D in zone D.

In the case of class 'F3' front fog lamps:

(a) Intersection v-v line with line 6 and

(b) Intersection v-v line with line 4.

2.1.2.2. Results

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

2.2. Resistance to atmospheric and chemical agents

2.2.1. Resistance to atmospheric agents

Three new samples (lenses or samples of material) shall be exposed to radiation from a source having a spectral energy distribution similar to that of a black body at a temperature between 5 500 K and 6 000 K. Appropriate filters shall be placed between the source and the samples so as to reduce as far as possible radiations with wavelengths smaller than 295 nm and greater than 2 500 nm. The samples shall be exposed to an energetic illumination of 1 200 W/m^2 ± 200 W/m^2 for a period such that the luminous energy that they receive is equal to 4 500 MJ/m^2 ± 200 MJ/m^2. Within the enclosure, the temperature measured on the black panel placed on a level with the samples 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 of conductivity lower than 1 μS/m at a temperature of 23 °C ± 5 °C, in accordance with the following cycle:

Spraying: 5 minutes;

Drying: 25 minutes.

2.2.2. Resistance to chemical agents

After the test described in paragraph 2.2.1 and the measurement described in paragraph 2.2.3.1 have been carried out, the outer face of the said three samples shall be treated as described in paragraph 2.2.2.2 with the mixture defined in paragraph 2.2.2.1.

2.2.2.1. Test mixture

The test mixture shall be composed of 61,5 per cent n-heptane, 12,5 per cent toluene, 7,5 per cent ethyl tetrachloride, 12,5 per cent trichlorethylene and 6 per cent xylene (volume per cent).

2.2.2.2. Application of the test mixture

Soak a piece of cotton cloth (as per ISO 105) until saturation with the mixture defined in paragraph 2.2.2.1 and, within 10 seconds, apply it for 10 minutes to the outer face of the sample at a pressure of 50 N/cm^2, corresponding to a force of 100 N applied on a test surface of 14 × 14 mm.

During this 10-minute period, the cloth pad shall be soaked again with the mixture so that the composition of the liquid applied is continuously identical with that of the test mixture prescribed.

During the period of application, it is permissible to compensate the pressure applied to the sample in order to prevent it from causing cracks.

2.2.2.3. Cleaning

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 described in paragraph 2.3 (resistance to detergents) at 23 °C ± 5 °C.

Afterwards the samples shall be carefully rinsed with distilled water containing not more than 0,2 per cent impurities at 23 °C ± 5 °C and then wiped off with a soft cloth.

2.2.3. Results

2.2.3.1. 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 in transmission

$$\Delta t = (T_2 - T_3)/T_2,$$

measured on the three samples according to the procedure described in Appendix 2 to this annex shall not exceed 0,020 ($\Delta t_m \leq 0{,}020$).

2.2.3.2. 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, whose mean variation

$$\Delta d = (T_5 - T_4)/T_2,$$

measured on the three samples according to the procedure described in Appendix 2 to this annex shall not exceed 0,020 ($\Delta d_m \leq 0{,}020$).

2.3. Resistance to detergents and hydrocarbons

2.3.1. Resistance to detergents

The outer face of three samples (lenses or samples of material) 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 parts distilled water containing not more than 0,02 per cent impurities and one part alkylaryl sulphonate.

At the end of the test, the samples shall be dried at 50 °C ± 5 °C. The surface of the samples shall be cleaned with a moist cloth.

2.3.2. Resistance to hydrocarbons

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 per cent n-heptane and 30 per cent toluene (volume per cent), and shall then be dried in the open air.

2.3.3. Results

After the above two tests have been performed successively, the mean value of the variation in transmission:

$$\Delta t = (T_2 - T_3)/T_2,$$

measured on the three samples according to the procedure described in Appendix 2 to this annex shall not exceed 0,010 ($\Delta t_m \leq 0{,}010$).

2.4. Resistance to mechanical deterioration

2.4.1. Mechanical deterioration method

The outer face of the three new samples (lenses) shall be subjected to the uniform mechanical deterioration test by the method described in Appendix 3 to this annex.

2.4.2. Results

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 according to the procedure described in Appendix 2 in the area specified in paragraph 2.1.2.1. The mean value of the three samples shall be such that:

$$\Delta t_m \leq 0{,}010;$$

$$\Delta d_m \leq 0{,}050.$$

2.5. Test of adherence of coatings, if any

2.5.1. Preparation of the sample

A surface of 20 mm × 20 mm in area of the coating of a lens shall be grated with a razor blade or a needle into a grid of squares approximately 2 mm × 2 mm. The pressure on the blade or needle shall be sufficient to cut at least the coating.

2.5.2. Description of the test

Use an adhesive tape with a force of adhesion of 2 N/(cm of width) ± 20 per cent measured under the standardized conditions specified in Appendix 4 to this annex. This adhesive tape, which shall be at least 25 mm wide, shall be pressed for at least five minutes to the surface prepared as prescribed in paragraph 2.5.1.

Then the end of the adhesive tape shall be loaded in such a way that a force perpendicular to that surface balances the force of adhesion to the surface considered. At this stage, the tape shall be torn off at a constant speed of 1,5 m/s ± 0,2 m/s.

2.5.3. Results

There shall be no appreciable impairment of the grated 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 per cent of the grated surface.

2.6. Tests of the complete lamp incorporating a lens of plastic material

2.6.1. Resistance to mechanical deterioration of the lens surface

2.6.1.1. Tests

The lens of lamp sample No 1 shall be subjected to the test described in paragraph 2.4.1.

2.6.1.2. Results

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.

2.6.2. Test of adherence of coatings, if any

The lens of lamp sample No 2 shall be subjected to the test described in paragraph 2.5.

2.7. Resistance to light source radiation

2.7.1. In the case of gas-discharge light sources: for testing the resistance of light transmitting components made of plastic materials against UV radiation inside the front fog lamp:

2.7.1.1. Flat samples of each light transmitting plastic component of the front fog lamps are exposed to the light of the gas-discharge light source. The parameters such as angles and distances of these samples shall be the same as in the front fog lamp.

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

3. VERIFICATION OF THE CONFORMITY OF PRODUCTION

3.1. With regard to the materials used for the manufacture of lenses, the lamps of a series shall be recognized as complying with this Regulation if:

3.1.1. After the test for resistance to chemical agents and the test for resistance to detergents and hydrocarbons, the outer face of the samples exhibits no cracks, chipping or deformation visible to the naked eye (see paragraphs 2.2.2, 2.3.1 and 2.3.2);

3.1.2. After the test described in paragraph 2.6.1.1, the photometric values at the points of measurement considered in paragraph 2.6.1.2 are within the limits prescribed for conformity of production by this Regulation.

3.2. If the test results fail to satisfy the requirements, the tests shall be repeated on another sample of front fog lamps selected at random.

Appendix 1

CHRONOLOGICAL ORDER OF APPROVAL TESTS

A. Tests on plastic materials (lenses or samples of material supplied pursuant to paragraph 2.2.2 of this Regulation).

Tests	Samples	Lenses or samples of material						Lenses						
		1	2	3	4	5	6	7	8	9	10	11	12	13
1.1.	Limited photometry (para. 2.1.2)										X	X	X	
1.1.1.	Temperature change (para. 2.1.1)										X	X	X	
1.1.2.	Limited photometry (para. 2.1.2)										X	X	X	
1.2.1.	Transmission measurement	X	X	X	X	X	X	X	X	X				
1.2.2.	Diffusion measurement	X	X	X				X	X	X				
1.3.	Atmospheric agents (para. 2.2.1)	X	X	X										
1.3.1.	Transmission measurement	X	X	X										
1.4.	Chemical agents (para. 2.2.2)	X	X	X										
1.4.1.	Diffusion measurement	X	X	X										
1.5.	Detergents (para. 2.3.1)				X	X	X							
1.6.	Hydrocarbons (para. 2.3.2)				X	X	X							
1.6.1.	Transmission measurement				X	X	X							
1.7.	Deterioration (para. 2.4.1)							X	X	X				
1.7.1.	Transmission measurement							X	X	X				
1.7.2.	Diffusion measurement							X	X	X				
1.8.	Adherence (para. 2.5)													X

B. Tests on complete front fog lamps (supplied pursuant to paragraph 2.3.2 of this Regulation).

Tests	Complete headlamp	
	Sample No	
	1	2
2.1. Deterioration (para. 2.6.1.1)	X	
2.2. Photometry (para. 2.6.1.2)	X	
2.3. Adherence (para. 2.6.2)		X

Appendix 2

METHOD OF MEASUREMENT OF THE DIFFUSION AND TRANSMISSION OF LIGHT

1. EQUIPMENT (see figure)

The beam of a collimator K with a half divergence $\beta/2 = 17{,}4 \times 10^{-4}$ rd is limited by a diaphragm D_T with an opening of 6 mm against which the sample stand is placed.

A convergent achromatic lens L_2, corrected for spherical aberrations, links the diaphragm D_T with the receiver R; the diameter of the lens L_2 shall be such that it does not diaphragm the light diffused by the sample in a cone with a half top angle of ß/2 = 14°.

An annular diaphragm D_D with angles $a/2 = 1°$ and $a_{max}/2 = 12°$ is placed in an image focal plane of the lens L_2.

The non-transparent central part of the diaphragm is necessary in order to eliminate the light arriving directly from the light source. It shall be possible to remove the central part of the diaphragm from the light beam in such a manner that it returns exactly to its original position.

The distance L_2 D_T and the focal length F_2 [1] of the lens L_2 shall be so chosen that the image of D_T completely covers the receiver R.

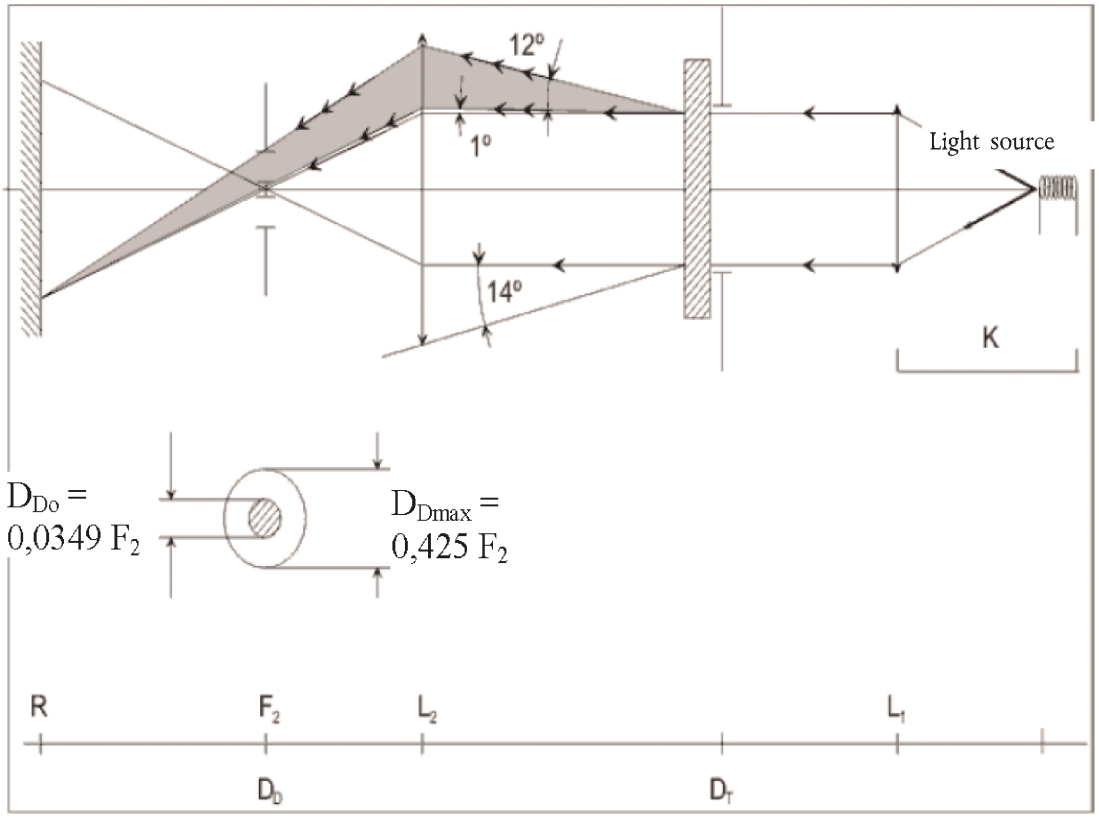
When the initial incident flux is referred to 1 000 units, the absolute precision of each reading shall be better than 1 unit.

2. MEASUREMENTS

The following readings shall be taken:

Reading	With sample	With central part of D_D	Quantity represented
T_1	no	no	Incident flux in initial reading
T_2	yes (before test)	no	Flux transmitted by the new material in a field of 24 degrees
T_3	yes (after test)	no	Flux transmitted by the tested material in a field of 24 degrees
T_4	yes (before test)	yes	Flux diffused by the new material
T_5	yes (after test)	yes	Flux diffused by the tested material

[1] For L_2 the use a focal distance of about 80 mm is recommended.


12°
1°
14°
Light source
K
D_{Do} = 0,0349 F_2
D_{Dmax} = 0,425 F_2
R
F_2
L_2
L_1
D_D
D_T

Appendix 3

SPRAY TESTING METHOD

1. TEST EQUIPMENT

Spray gun

The spray gun used 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.

Under these operation conditions the fan pattern obtained shall be 170 mm ± 50 mm in diameter on the surface exposed to deterioration, at a distance of 380 mm ± 10 mm from the nozzle.

Test mixture

The test mixture shall be composed of:

Silica sand of hardness 7 on the Mohs scale, with a grain size between 0 and 0,2 mm and an almost normal distribution, with an angular factor of 1,8 to 2;

Water of hardness not exceeding 205 g/m^3 for a mixture comprising 25 g of sand per litre of water.

2. TEST

The outer surface of the lamp lenses shall be subjected once or more than once to the action of the sand jet produced as described above. 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 described in Appendix 2, is such that:

$$\Delta\ d = (T_5 - T_4)/T_2 \leq 0{,}0250 \pm 0{,}0025$$

Several reference samples may be used to check that the whole surface to be tested has deteriorated homogeneously.

Appendix 4

ADHESIVE TAPE ADHERENCE TEST

1. PURPOSE

This method allows the determination under standard conditions of the linear force of adhesion of an adhesive tape to a glass plate.

2. PRINCIPLE

To measure the force necessary to un-stick an adhesive tape from a glass plate at an angle of 90°.

3. SPECIFIED ATMOSPHERIC CONDITIONS

The ambient conditions shall be at 23 °C ± 5 °C and 65 ± 15 per cent relative humidity (RH).

4. TEST PIECES

Before the test, the sample roll of adhesive tape shall be conditioned for 24 hours in the specified atmosphere (see paragraph 3).

Five test pieces each 400 mm long shall be tested from each roll. These test pieces shall be taken from the roll after the first three turns were discarded.

5. PROCEDURE

The test shall be carried out under the ambient conditions specified in paragraph 3.

Take the five test pieces while unrolling the tape radially at a speed of approximately 300 mm/s and then apply them within 15 seconds in the following manner:

Apply the tape to the glass plate progressively with a slight longitudinal rubbing movement of the finger, without excessive pressure to the tape and to the glass plate.

Leave the assembly in the specified atmospheric conditions for 10 minutes.

Unstuck about 25 mm of the test piece from the plate in a plane perpendicular to the axis of the test piece.

Fix the plate and fold back the free end of the tape at 90°. Apply force in such a manner that the separation line between the tape and the plate is perpendicular to this force and perpendicular to the plate.

Pull to un-stick the tape at a speed of 300 mm/s ± 30 mm/s and record the force required.

6. RESULTS

The five values obtained shall be arranged in order and the median value taken as the result of the measurement. This value shall be expressed in Newton per centimetre of width of the tape.

ANNEX 7

MINIMUM REQUIREMENTS FOR CONFORMITY OF PRODUCTION CONTROL PROCEDURE

1. GENERAL

1.1. The conformity requirements shall be considered to be satisfied from a mechanical and geometric standpoint, if the differences do not exceed inevitable manufacturing deviations within the requirements of this Regulation.

1.2. With respect to photometric performances, the conformity of mass-produced front fog lamps shall not be contested if the photometric performances according to the requirements in Annex 2 to this Regulation depending on the prevailing class of front fog lamps are satisfied.

If the results of the tests described above do not meet the requirements, tests on the front fog lamp shall be repeated using light sources as specified in paragraph 6.3 or 6.4 of this Regulation, as appropriate.

1.2.1. If the results of the tests described above do not meet the requirements, the alignment of the front fog lamp may be changed, provided that the axis of the beam is not displaced laterally by more than 0,5° to the right or left and not by more than 0,2° up or down. In the re-aimed position all photometric requirements shall be met.

1.3. With respect to the verification of the change in vertical position of the cut-off line under the influence of heat, the following procedure shall be applied:

1.3.1. One of the sampled front fog lamps shall be tested according to the procedure described in paragraph 2.1 of Annex 5 after being subjected three consecutive times to the cycle described in paragraph 2.2.2 of Annex 5.

1.3.2. The front fog lamp shall be considered as acceptable if Δr does not exceed 3,0 mrad. If this value exceeds 3,0 mrad but is not more than 4,0 mrad, a second front fog lamp shall be subjected to the test after which the mean of the absolute values recorded on both samples shall not exceed 3,0 mrad.

1.4. The chromaticity coordinates shall comply with paragraph 7 of this Regulation. The photometric performance of a front fog lamp emitting an enlarged selective yellow light when equipped with a colourless light source shall be the values contained in this Regulation multiplied by 0,84.

2. MINIMUM REQUIREMENTS FOR VERIFICATION OF CONFORMITY BY THE MANUFACTURER

For each type of front fog lamp the holder of the approval mark shall carry out at least the following tests, at appropriate intervals. The tests shall be carried out in accordance with the provisions of this Regulation. If any sampling shows non-conformity with regard to the type of test concerned, further samples shall be taken and tested. The manufacturer shall take steps to ensure the conformity of the production concerned.

2.1. Nature of tests

Tests of conformity in this Regulation shall cover the photometric characteristics and the verification of the change in vertical position of the cut-off line under the influence of heat.

2.2. Methods used in tests

2.2.1. Tests shall generally be carried out in accordance with the methods set out in this Regulation.

2.2.2. In any test of conformity carried out by the manufacturer, equivalent methods may be used with the consent of the competent authority responsible for approval tests. The manufacturer is responsible for proving that the applied methods are equivalent to those laid down in this Regulation.

2.2.3. The application of paragraphs 2.2.1 and 2.2.2 requires regular calibration of test apparatus and its correlation with measurements made by a competent authority.

2.2.4. In all cases the reference methods shall be those of this Regulation, particularly for the purpose of administrative verification and sampling.

2.3. Nature of sampling

Samples of front fog lamps shall be selected at random from the production of a uniform batch. A uniform batch means a set of front fog lamps of the same type, defined according to the production methods of the manufacturer.

The assessment shall in general cover series production from individual factories. However, a manufacturer may group together records concerning the same type from several factories, provided these operate under the same quality system and quality management.

2.4. Measured and recorded photometric characteristics

The sampled front fog lamp shall be subjected to photometric measurements at the points provided for in the Regulation, the reading being limited to points listed in Annex 2 to this Regulation depending on the prevailing class of front fog lamps.

2.5. Criteria governing acceptability

The manufacturer is responsible for carrying out a statistical study of the test results and for defining, in agreement with the competent authority, criteria governing the acceptability of his products in order to meet the specifications laid down for verification of conformity of products in paragraph 10.1 of this Regulation.

The criteria governing the acceptability shall be such that, with a confidence level of 95 per cent, the minimum probability of passing a spot check in accordance with Annex 8 (first sampling) would be 0,95.

ANNEX 8

MINIMUM REQUIREMENTS FOR SAMPLING BY AN INSPECTOR

1. GENERAL

The conformity requirements shall be considered to be satisfied from a mechanical and geometric standpoint, if the differences do not exceed inevitable manufacturing deviations within the requirements of this Regulation.

1.2.1. With respect to photometric performances, the conformity of mass-produced front fog lamps shall not be contested if the photometric performances according to the requirements in Annex 2 to this Regulation depending on the prevailing class of front fog lamps are satisfied.

If the results of the tests described above do not meet the requirements, tests on the front fog lamp shall be repeated using light sources as specified in paragraph 6.3 or 6.4 of this Regulation, as appropriate.

If the results of the tests described above do not meet the requirements, the alignment of the front fog lamp may be changed, provided that the axis of the beam is not displaced laterally by more than 0,5° to the right or left and not by more than 0,2° up or down. In the re-aimed position all photometric requirements shall be met.

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

If vertical adjustment cannot be performed repeatedly to the required position within the allowed tolerances, the instrumental method as specified in Annex 9 to this Regulation shall be applied and the quality of cut-off be tested on one sample.

1.2.2. Front fog lamps with obvious defects are disregarded.

1.3. The chromaticity coordinates shall comply with paragraph 7 of this Regulation. The photometric performance of a front fog lamp emitting an enlarged selective yellow light when equipped with a colourless light source shall be the values contained in this Regulation multiplied by 0,84.

2. FIRST SAMPLING

In the first sampling four front fog lamps shall be selected at random. The first sample of two is marked A, the second sample of two is marked B.

2.1. Conformity is not contested

2.1.1. Following the sampling procedure shown in Figure 1 of this annex the conformity of mass-produced front fog lamps shall not be contested if the deviation of the measured values of the front fog lamps in the unfavourable directions is:

2.1.1.1. Sample A

A1:	one front fog lamp		0 per cent
	one front fog lamp	not more than	20 per cent
A2:	both front fog lamps	more than	0 per cent
	but	not more than	20 per cent
	Go to sample B		

2.1.1.2. Sample B

B1:	both front fog lamps		0 per cent

2.2. Conformity is contested

2.2.1. Following the sampling procedure shown in Figure 1 of this annex the conformity of mass-produced front fog lamps shall be contested and the manufacturer requested to make his production meet the requirements (alignment) if the deviations of the measured values of the front fog lamps are:

2.2.1.1. Sample A

A3:	one front fog lamp	not more than	20 per cent
	one front fog lamp	more than	20 per cent
	but	not more than	30 per cent

2.2.1.2. Sample B

B2:	in the case of A2		
	one front fog lamp	more than	0 per cent
	but	not more than	20 per cent
	one front fog lamp	not more than	20 per cent
B3:	in the case of A2		
	one front fog lamp		0 per cent
	one front fog lamp	more than	20 per cent
	but	not more than	30 per cent

2.3. Approval withdrawn

Conformity shall be contested and paragraph 11 applied if, following the sampling procedure in Figure 1 of this annex, the deviations of the measured values of the front fog lamps are:

2.3.1. Sample A

A4:	one front fog lamp	not more than	20 per cent
	one front fog lamp	more than	30 per cent
A5:	both front fog lamps	more than	20 per cent

2.3.2. Sample B

B4:	in the case of A2		
	one front fog lamp	more than	0 per cent
	but	not more than	20 per cent
	one front fog lamp	more than	20 per cent

B5:	in the case of A2		
	both front fog lamps	more than	20 per cent
B6:	in the case of A2		
	one front fog lamp		0 per cent
	one front fog lamp	more than	30 per cent

3. REPEATED SAMPLING

In the cases of A3, B2, B3 a repeated sampling, third sample C of two front fog lamps and fourth sample D of two front fog lamps, selected from stock manufactured after alignment, is necessary within two months' time after the notification.

3.1. Conformity is not contested

3.1.1. Following the sampling procedure shown in Figure 1 of this annex the conformity of mass-produced front fog lamps shall not be contested if the deviations of the measured values of the front fog lamps are:

3.1.1.1. Sample C

C1:	one front fog lamp		0 per cent
	one front fog lamp	not more than	20 per cent
C2:	both front fog lamps	more than	0 per cent
	but	not more than	20 per cent
	Go to sample D		

3.1.1.2. Sample D

D1:	in the case of C2		
	both front fog lamps		0 per cent

3.2. Conformity is contested

3.2.1. Following the sampling procedure shown in Figure 1 of this annex the conformity of mass-produced front fog lamps shall be contested and the manufacturer requested to make his production meet the requirements (alignment) if the deviations of the measured values of the front fog lamps are:

Sample D

D2:	in the case of C2		
	one front fog lamp	more than	0 per cent
	but	not more than	20 per cent
	one front fog lamp	not more than	20 per cent

3.3. Approval withdrawn

Conformity shall be contested and paragraph 12 applied if, following the sampling procedure in Figure 1 of this annex, the deviations of the measured values of the front fog lamps are:

3.3.1. Sample C

C3:	one front fog lamp	not more than	20 per cent
	one front fog lamp	more than	20 per cent
C4:	both front fog lamps	more than	20 per cent

3.3.2. Sample D

D3:	in the case of C2		
	one front fog lamp	0 or more than	0 per cent
	one front fog lamp	more than	20 per cent

4. CHANGE OF THE VERTICAL POSITION OF THE CUT-OFF LINE

With respect to the verification of the change in vertical positions of the cut-off line under the influence of heat, the following procedure shall be applied:

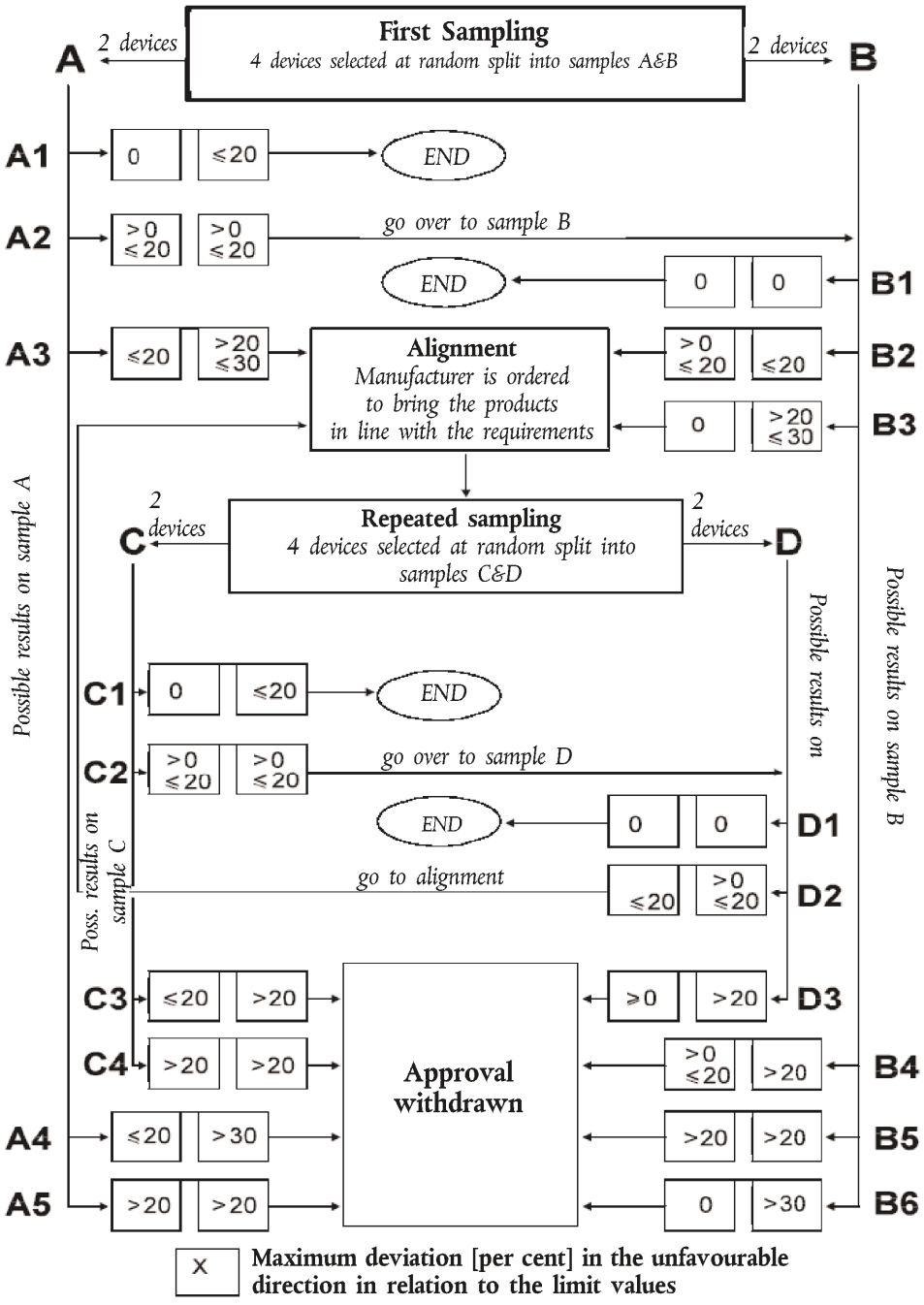
One of the front fog lamps of sample A after sampling procedure in Figure 1 of this annex shall be tested according to the procedure described in paragraph 2.1 of Annex 5 after being subjected three consecutive times to the cycle described in paragraph 2.2.2 of Annex 5.

The front fog lamp shall be considered as acceptable if Δr does not exceed 3,0 mrad.

If this value exceeds 3,0 mrad but is not more than 4,0 mrad, the second front fog lamp of sample A shall be subjected to the test after which the mean of the absolute values recorded in both samples shall not exceed 3,0 mrad.

However, if this value of 3,0 mrad on sample A is not complied with, the two front fog lamps of sample B shall be subjected to the same procedure and the value of Δr for each of them shall not exceed 3,0 mrad.

Figure 1


First Sampling
4 devices selected at random split into samples A&B
A
2 devices
2 devices
B
A1
0
≤20
END
A2
>0 ≤20
>0 ≤20
go over to sample B
END
0
0
B1
A3
≤20
>20 ≤30
Alignment
Manufacturer is ordered to bring the products in line with the requirements
>0 ≤20
≤20
B2
0
>20 ≤30
B3
Repeated sampling
4 devices selected at random split into samples C&D
C
2 devices
2 devices
D
Possible results on sample A
Possible results on sample B
Possible results on
C1
0
≤20
END
C2
>0 ≤20
>0 ≤20
go over to sample D
END
0
0
D1
go to alignment
≤20
>0 ≤20
D2
Poss. results on sample C
C3
≤20
>20
≥0
>20
D3
C4
>20
>20
Approval withdrawn
>0 ≤20
>20
B4
A4
≤20
>30
>20
>20
B5
A5
>20
>20
0
>30
B6
X
Maximum deviation [per cent] in the unfavourable direction in relation to the limit values

ANNEX 9

DEFINITION AND SHARPNESS OF THE CUT-OFF LINE AND AIMING PROCEDURE BY MEANS OF THIS CUT-OFF LINE FOR CLASS 'F3' FRONT FOG LAMPS

1. GENERAL

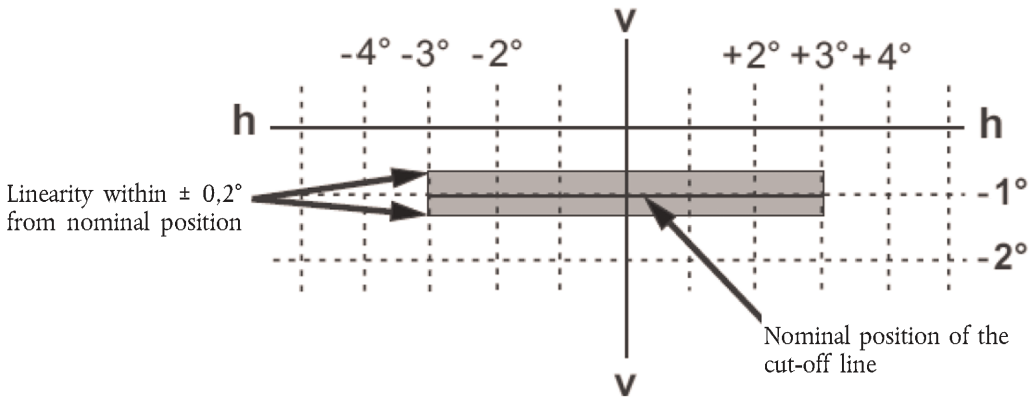
The luminous intensity distribution of the front fog lamp shall incorporate a cut-off line that enables the front fog lamp to be adjusted correctly for the photometric measurements and for the aiming on the vehicle. The characteristics of the cut-off line shall comply with the requirements set out in paragraphs 2 to 4.

2. SHAPE OF THE CUT-OFF LINE

For visual adjustment of the front fog beam the cut-off line shall provide: a horizontal line for vertical adjustment of the front fog lamp extending to 4° either side of the v-v line (see Figure 1).

Figure 1

Shape and position of the 'cut-off' line



3. ADJUSTMENT OF THE FRONT FOG LAMP

3.1. Horizontal adjustment

The cut-off line shall be so positioned that the projected beam pattern appears approximately symmetrical to the v-v line. When the front fog lamp is designed for use in pairs or has otherwise an asymmetric beam pattern, it shall be horizontally aligned according to the specification of the applicant, or otherwise in such a way that the cut-off line appears symmetrical to the v-v line.

3.2. Vertical adjustment

After horizontal adjustment of the front fog beam according to paragraph 3.1, the vertical adjustment shall be performed in such a way that the cut-off line is moved upwards from the lower position until it is situated on the v-v line at 1° below the h-h line. If the horizontal part is not straight but slightly curved or inclined, the cut-off line shall not exceed the vertical range formed by two horizontal lines which are situated between 3° left and right of the v-v line at 0,2° above and below the nominal position of the cut-off (see Figure 1).

3.2.1. When the vertical positions of three attempts to adjust the cut-off differ by more than 0,2°, the horizontal part of the cut-off line is assumed not to provide sufficient linearity or sharpness for performing visual adjustment. In this case the quality of cut-off shall be tested instrumentally for compliance with requirements as follows.

4. MEASUREMENT OF THE QUALITY OF CUT-OFF

4.1. Measurements shall be performed by vertically scanning through the horizontal part of the cut-off line in angular steps not exceeding 0,05°.

At either a measurement distance of 10 m and a detector with a diameter of approximately 10 mm.

Or at a measurement distance of 25 m and a detector with a diameter of approximately 30 mm.

The measurement of the cut-off quality shall be considered acceptable if the requirements of the paragraphs 4.1.1 to 4.1.3 of this annex shall comply with at least one measurement at 10 m or 25 m.

The measuring distance at which the test was determined shall be recorded in paragraph 9 of the communication form in Annex 2 of this Regulation.

The scanning is performed from downwards upwards through the cut-off line along the vertical lines at – 2,5° and + 2,5° from the v-v line. When so measured, the quality of the cut-off line shall meet the following requirements:

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

4.1.2. Sharpness of cut-off:

If scanned vertically through the horizontal part of the cut-off line along vertical lines at ± 1° 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:

$G = (\log E_V - \log E_{(V + 0{,}1°)})$

4.1.3. Linearity

The part of the cut-off line which serves vertical adjustment shall be horizontal from 3° left to 3° right of the v-v line. This requirement is satisfied, if the vertical positions of the inflection points according to paragraph 3.2 at 3° left and right of the v-v line do not deviate by more than ± 0,20°.

5. INSTRUMENTAL VERTICAL ADJUSTMENT

If the cut-off line complies with the above quality requirements, the vertical beam adjustment can be performed instrumentally. For this purpose the inflection point where $d^2 (\log E)/dv^2 = 0$ is positioned on the v-v line and below the h-h line. The movement for measuring and adjusting the cut-off line shall be upwards from below the nominal position.

ANNEX 10

OVERVIEW OF OPERATIONAL PERIODS CONCERNING TESTS FOR THE STABILITY OF PHOTOMETRIC PERFORMANCE

Abbreviations: P: passing beam lamp

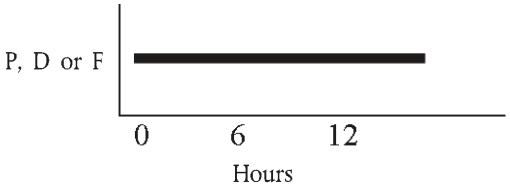
D: driving beam lamp (D_1 + D_2 means two driving beams)

F: front fog lamp

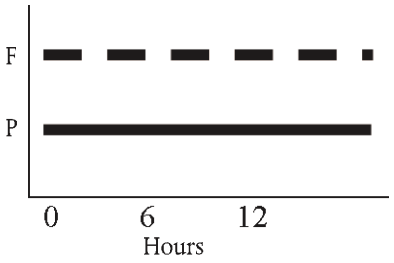
All following grouped headlamps and front fog lamps together with the added marking symbols are given as examples and are not exhaustive.

: means a cycle of 15 minutes off and 5 minutes lit.

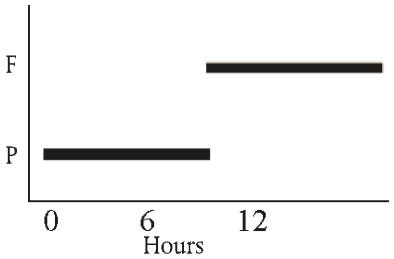
1. P or D or F (HC or HR or B or F3)



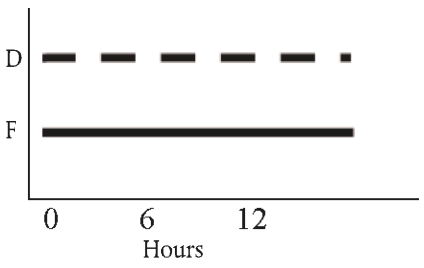
2. P+F (HC B or F3)



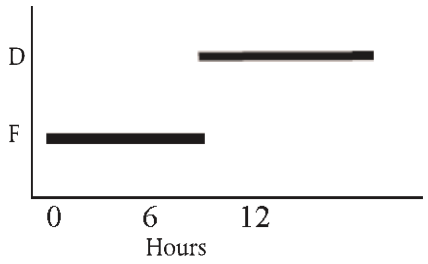
3. P+F (HC B or F3/) or HC/B or F3



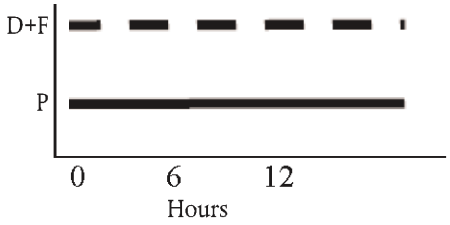
4. D+F (HR B or F3) or D_1+D_2+F (HR B or F3)



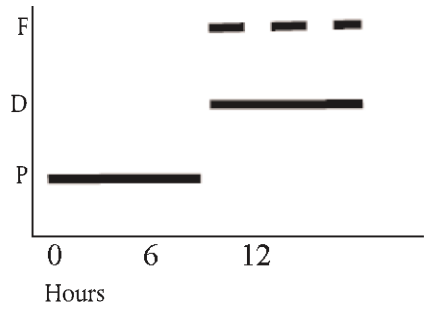
5. D+F (HR B or F3/) or D_1+D_2+F (HR B or F3/)



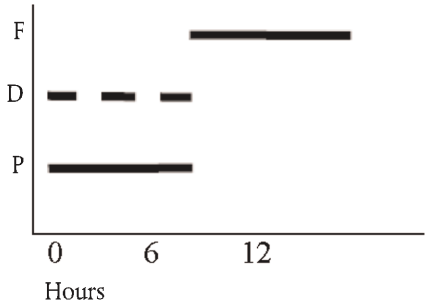
6. P+D+F (HCR B or F3) or P+D_1+D_2+F (HCR HR B or F3)



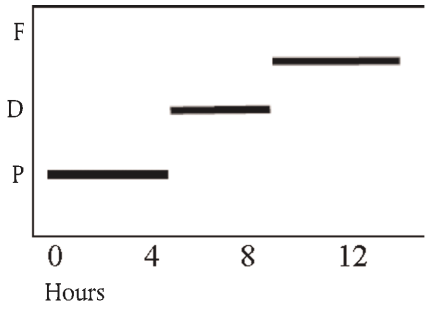
7. P+D+F (HC/R B or F3) or P+D_1+D_2+F (HC/R HR B or F3)



8. P+D+F (HCR B or F3/) or P+D_1+D_2+F (HCR HR B or F3/)



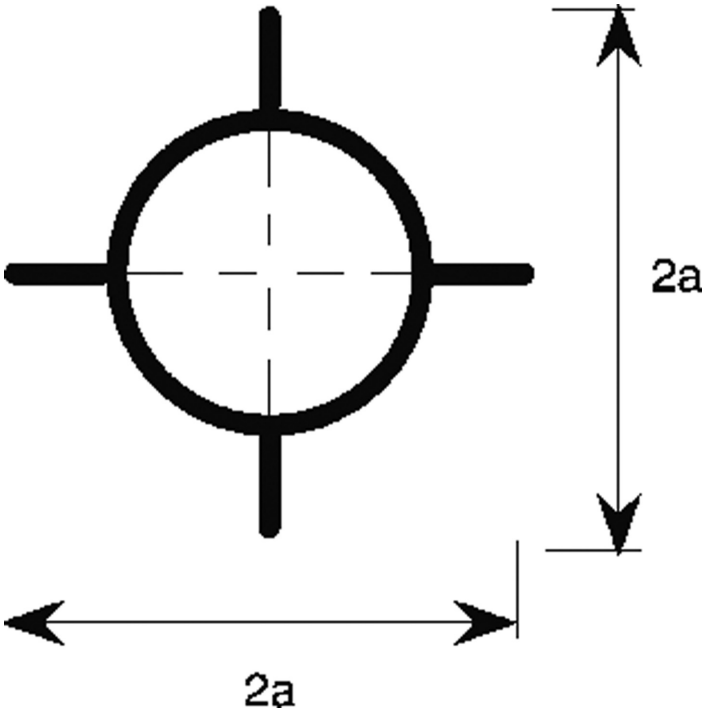
9. P+D+F (HC/R B or F3/) or P+D_1+D_2+F (HC/R HR B or F3/)



ANNEX 11

CENTRE OF REFERENCE

Diameter = a = 2 mm min.



This optional mark of the centre of reference shall be positioned on the lens at its intersection with the reference axis of the front fog lamp.

The above drawing represents the mark of the centre of reference as projected on a plane substantially tangential to the lens about the centre of the circle. The lines constituting this mark may either be solid or dotted.

ANNEX 12

REQUIREMENTS IN CASE OF USE OF LED MODULE(S) OR OF LIGHT-GENERATORS

1. GENERAL SPECIFICATIONS

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 control-gear(s) supplied, if any.

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.

1.3. LED modules or light-generators shall be tamperproof.

1.4. The design of removable LED modules shall be such that:

1.4.1. After removal and replacement of the module the photometric requirements of the headlamp shall still be met;

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

1.5. In the case of LED modules:

1.5.1. The geometric position and dimensions of the elements for optical radiation and shielding, if any, shall be as indicated on the submitted data sheet.

1.5.2. The measurement shall be made using optical methods through the transparent envelope, after ageing with the light source supplied by the electronic light source control-gear at test voltage.

1.5.3. The position and dimension and transmission of the stripes or shields, if any, shall be as indicated on the submitted data sheet.

2. MANUFACTURE

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.

2.2. In case of LED modules or light-generator(s):

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

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

2.2.3. The light source in the light generator shall be equipped with suitable fixation elements.

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

3. TEST CONDITIONS

3.1. Application and relaxation

3.1.1. All samples shall be tested as specified in paragraph 4.

3.1.2. The type of light sources shall be as defined in Regulation No 48 paragraph 2.7.1, in particular with regard to the element of visible radiation. Other types of light sources are not permitted.

3.1.3. Operating conditions

LED module or light-generator operating conditions:

3.1.3.1. All samples shall be tested under the conditions as specified in paragraph 6.4.1.4 of this Regulation.

3.1.3.2. 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.

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 °C ± 5 °C.

3.1.5. In case of light-generators:

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.

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.

3.2. Ageing

3.2.1. LED modules or light-generators shall be aged.

3.2.2. The tests below shall be carried out after ageing with the LED module(s) or light-generator(s) supplied by the submitted electronic light source control-gear at test voltage.

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.

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.

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.

4. SPECIFIC TESTS

Filament lamps approved according to Regulation No 37, gas-discharge light sources approved according to Regulation No 99 and LED modules are exempted from the tests indicated in paragraphs 4.3.1 and 4.3.2 below.

4.2. 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.

4.3. Run-up

4.3.1. Filament lamps are exempted from this test.

4.3.2. 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°, 2,5°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.

4.4. Hot re-strike

4.4.1. Filament lamps are exempted from this test.

4.4.2. Gas discharge light sources

The light source shall be started and be operated with the electronic light source control-gear 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.

4.5. Colour rendering

4.5.1. Red content

The minimum red content of the light of a LED module or light-generator shall be such that:

$$k_{red} = \frac{\int_{\lambda=610\ nm}^{780\ nm} E_e(\lambda)\ V(\lambda)\ d\lambda}{\int_{\lambda=380\ nm}^{780\ nm} E_e(\lambda)\ V(\lambda)\ d\lambda} \rightleftharpoons 0{,}05$$

where:

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

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

λ (unit: nm) is the wavelength.

This value shall be calculated using intervals of one nanometre.

4.6. UV-radiation

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

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

where:

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

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

(For definitions of the other symbols see paragraph 4.5.1)

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

λ	S(λ)	λ	S(λ)	λ	S(λ)
250	0,430	305	0,060	355	0,00016
255	0,520	310	0,015	360	0,00013
260	0,650	315	0,003	365	0,00011
265	0,810	320	0,001	370	0,00009
270	1,000	325	0,00050	375	0,000077
275	0,960	330	0,00041	380	0,000064
280	0,880	335	0,00034	385	0,000530
285	0,770	340	0,00028	390	0,000044
290	0,640	345	0,00024	395	0,000036
295	0,540	350	0,00020	400	0,000030
300	0,300				

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

4.7. Temperature stability

4.7.1. Luminous intensity

4.7.1.1. Filament lamps and gas discharge light sources are exempted from this test.

4.7.1.2. 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° vertical 2,5°D.

4.7.1.3. 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.

4.7.1.4. Calculate the ratio between the photometric test point values determined in paragraph 4.7.1.2 and the values determined in paragraph 4.7.1.3 once stability of photometry has been achieved.

4.7.1.5. Apply the ratio calculated in paragraph 4.7.1.4 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.

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

4.7.2. 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.

Only the original UN/ECE texts have legal effect under international public law. The status and date of entry into force of this Regulation should be checked in the latest version of the UN/ECE status document TRANS/WP.29/343, available at: http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29fdocstts.html.

Regulation No 112 of the Economic Commission for Europe of the United Nations (UN/ECE) — Uniform provisions concerning the approval of motor vehicle headlamps emitting an asymmetrical passing-beam or a driving-beam or both and equipped with filament lamps and/or light-emitting diode (LED) modules

Incorporating all valid text up to:

Supplement 4 to the 01 series of amendments – Date of entry into force: 15 July 2013

CONTENTS

7. Minimum requirements for sampling by an inspector

8. Overview of operational periods concerning tests for stability of photometric performance

9. Instrumental verification of the 'cut-off' for passing-beam headlamps

10. Requirements for LED modules and headlamps including LED modules

11. A general illustration for principal passing-beam and beam contributors and correlated light source options

A. **ADMINISTRATIVE PROVISIONS**

SCOPE ([1])

This Regulation applies to headlamps for vehicles of categories L, M, N and T ([2]).

1. DEFINITIONS

For the purpose of this Regulation,

1.1. 'Lens' means the outermost component of the headlamp (unit) which transmits light through the illuminating surface;

1.2. 'Coating' means any product or products applied in one or more layers to the outer face of a lens;

1.3. 'Headlamps of different types' means headlamps which differ in such essential respects as:

1.3.1. The trade name or mark;

1.3.2. The characteristics of the optical system;

1.3.3. The inclusion or elimination of components capable of altering the optical effects by reflection, refraction, absorption and/or deformation during operation;

1.3.4. Suitability for right-hand or left-hand traffic or for both traffic systems;

1.3.5. The kind of beam produced (passing beam, driving beam or both);

1.3.6. The category of filament lamp used and/or the LED module specific identification code(s);

1.3.7. However, a device intended for the installation on the left side of the vehicle and the corresponding device intended for the installation on the right side of the vehicle shall be considered to be of the same type.

1.4. Headlamps of different 'Classes' (A or B) mean headlamps identified by particular photometric provisions.

1.5. The definitions given in Regulation No 48 and its series of amendments in force at the time of application for type approval shall apply to this Regulation.

1.6. References made in this Regulation to standard (étalon) filament lamp(s) and to Regulation No 37 shall refer to Regulation No 37 and its series of amendments in force at the time of application for type approval.

([1]) Nothing in this Regulation shall prevent a Party to the Agreement applying this Regulation from prohibiting the combination of a headlamp incorporating a lens of plastic material approved under this Regulation with a mechanical headlamp-cleaning device (with wipers).

([2]) As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.), document ECE/TRANS/WP.29/78/Rev.2, para. 2.

2. APPLICATION FOR APPROVAL OF A HEADLAMP

2.1. The application for approval shall be submitted by the owner of the trade name or mark or by his duly accredited representative. It shall specify:

2.1.1. Whether the headlamp is intended to provide both a passing-beam and a driving-beam or only one of these beams;

2.1.2. Whether, if the headlamp is intended to provide a passing-beam, it is designed for both left-hand and right-hand traffic or for either left-hand or right-hand traffic only;

2.1.3. If the headlamp is equipped with an adjustable reflector, the mounting position(s) of the headlamp in relation to the ground and the longitudinal median plane of the vehicle;

2.1.4. Whether it concerns a Class A or B headlamp;

2.1.5. The category of the filament lamp(s) used, as listed in Regulation No 37 and its series of amendments in force at the time of application for type approval, and/or the light source module specific identification code(s) for LED modules, if available.

2.2. Every application for approval shall be accompanied by:

2.2.1. Drawings in triplicate in sufficient detail to permit identification of the type and representing a frontal view of the headlamp, with details of lens ribbing if any, and the cross section. The drawings shall indicate the space(s) reserved for the approval mark and in case of LED module(s) also the space reserved for the specific identification code(s) of the module(s);

2.2.1.1. If the headlamp is equipped with an adjustable reflector, an indication of the mounting position(s) of the headlamp in relation to the ground and the longitudinal median plane of the vehicle, if the headlamp is for use in that (those) position(s) only;

2.2.2. A brief technical description including, in the case where headlamps are used to produce bend lighting, the extreme positions according to paragraph 6.2.7 below. In the case of LED module(s) this shall include:

(a) A brief technical specification of the LED module(s);

(b) A drawing with dimensions and the basic electrical and photometric values and the objective luminous flux and for each LED module a statement whether it is replaceable or not;

(c) In case of electronic light source control gear, information on the electrical interface necessary for approval testing;

2.2.3. Two samples of each type of headlamp, one sample intended for the installation on the left side of the vehicle and one sample intended for the installation of the right side of the vehicle.

2.2.4. For the test of plastic material of which the lenses are made:

2.2.4.1. Fourteen lenses;

2.2.4.1.1. Ten of these lenses may be replaced by ten samples of material at least 60 × 80 mm in size, having 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 × 15 mm;

2.2.4.1.2. Every such lens or sample of material shall be produced by the method to be used in mass production;

2.2.4.2. A reflector to which the lenses can be fitted in accordance with the manufacturer's instructions.

2.2.5. For testing the ultraviolet (UV)-resistance of light transmitting components made of plastic material against UV radiation of LED modules inside the headlamp:

2.2.5.1. One sample of each of the relevant material as being used in the headlamp or one headlamp sample containing these. Each material sample shall have the same appearance and surface treatment, if any, as intended for use in the headlamp to be approved;

2.2.5.2. The UV-resistance testing of internal materials to light source radiation is not necessary if no LED modules other than low-UV-types as specified in Annex 10 of this Regulation are being applied or if provisions are taken, to shield the relevant headlamp components from UV radiation, e.g. by glass filters.

2.2.6. One electronic light source control gear, if applicable.

2.3. The materials making up the lenses and coatings, if any, shall be accompanied by the test report of the characteristics of these materials and coatings if they have already been tested.

3. MARKINGS

3.1. Headlamps submitted for approval shall bear the trade name or mark of the applicant.

3.2. They shall comprise, on the lens and on the main body ([1]), spaces of sufficient size for the approval mark and the additional symbols referred to in paragraph 4; these spaces shall be indicated on the drawings referred to in paragraph 2.2.1 above.

3.3. Headlamps equipped with passing-beam designed to satisfy the requirements both of right-hand and of left-hand traffic shall bear markings indicating the two settings of the optical unit or LED module on the vehicle or of the filament lamp on the reflector; these markings shall consist of the letters 'R/D' for the position for right-hand traffic and the letters 'L/G' for the position for left-hand traffic.

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

3.5. LED module(s) submitted along with the approval of the lamp:

3.5.1. Shall bear the trade name or mark of the applicant. This marking shall be clearly legible and indelible;

3.5.2. Shall bear the specific identification code of the module. This marking shall be clearly legible and indelible.

This specific identification code shall comprise the starting letters 'MD' for 'MODULE' followed by the approval marking without the circle as prescribed in paragraph 4.2.1 below and in the case several non-identical light source modules are used, followed by additional symbols or characters. This specific identification code shall be shown in the drawings mentioned in paragraph 2.2.1 above. The approval marking does not have to be the same as the one on the lamp in which the module is used, but both markings shall be from the same applicant.

3.5.3. If the LED module(s) are non-replaceable, the markings for LED module(s) are not required.

([1]) If the lens cannot be detached from the main body of the headlamp, a unique marking as per paragraph 4.2.5 shall be sufficient.

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

4. APPROVAL

4.1. General

4.1.1. If all the samples of a type of headlamp submitted pursuant to paragraph 2 above satisfy the provisions of this Regulation, approval shall be granted.

4.1.2. Where grouped, combined or reciprocally incorporated lamps satisfy the requirements of more than one Regulation, a single international approval mark may be affixed provided that each of the grouped, combined or reciprocally incorporated lamps satisfies the provisions applicable to it.

4.1.3. An approval number shall be assigned to each type approved. Its first two digits shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party may not assign the same number to another type of headlamp covered by this Regulation.

4.1.4. Notice of approval or of extension or refusal or withdrawal of approval or production definitely discontinued of a type of headlamp pursuant to this Regulation shall be communicated to the Parties to the 1958 Agreement applying this Regulation, by means of a form conforming to the model in Annex 1 to this Regulation, with the indications according to paragraph 2.2.1.1.

4.1.4.1. If the headlamp is equipped with an adjustable reflector and if this headlamp is to be used only in mounting positions according to the indications in paragraph 2.2.1.1 the applicant shall be obliged by the Type Approval Authority to inform the user in a proper way about the correct mounting position(s).

4.1.5. In addition to the mark prescribed in paragraph 3.1, an approval mark as described in paragraphs 4.2 and 4.3 below shall be affixed in the spaces referred to in paragraph 3.2 above to every headlamp conforming to a type approved under this Regulation.

4.2. Composition of the approval mark

The approval mark shall consist of:

4.2.1. An international approval mark, comprising:

4.2.1.1. A circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted approval [1];

4.2.1.2. The approval number prescribed in paragraph 4.1.3 above;

4.2.2. The following additional symbol (or symbols):

4.2.2.1. On headlamps meeting left-hand traffic requirements only, a horizontal arrow pointing to the right of an observer facing the headlamp, i.e. to the side of the road on which the traffic moves;

4.2.2.2. On headlamps designed to meet the requirements of both traffic systems by means of an appropriate adjustment of the setting of the optical unit or the filament lamp or LED module(s), a horizontal arrow with a head on each end, the heads pointing respectively to the left and to the right;

[1] The distinguishing numbers of the Contracting Parties to the 1958 Agreement are reproduced in Annex 3 to the Consolidated Resolution on the Construction of Vehicles (R.E.3), document ECE/TRANS/WP.29/78/Rev.2/Amend.1.

4.2.2.3. On headlamps meeting the requirements of this Regulation in respect of the passing-beam only, the letters 'C' for Class A headlamp or 'HC' for Class B headlamp;

4.2.2.4. On headlamps meeting the requirements of this Regulation in respect of the driving-beam only, the letters 'R' for Class A headlamp or 'HR' for Class B headlamp;

4.2.2.5. On headlamps meeting the requirements of this Regulation in respect of both the passing-beam and the driving-beam, the letters 'CR' for Class A headlamp or 'HCR' for Class B headlamp;

4.2.2.6. On headlamps incorporating a lens of plastic material, the group of letters 'PL' to be affixed near the symbols prescribed in paragraphs 4.2.2.3 to 4.2.2.5 above;

4.2.2.7. On headlamps meeting the requirements of this Regulation in respect of the driving-beam, an indication of the maximum luminous intensity expressed by a reference mark, as defined in paragraph 6.3.4 below, placed near the circle surrounding the letter 'E';

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

4.2.3. In every case the relevant operating mode used during the test procedure according to paragraph 1.1.1.1 of Annex 4 and the permitted voltage(s) according to paragraph 1.1.1.2 of Annex 4 shall be stipulated on the approval forms and on the communication forms transmitted to the countries which are Contracting Parties to the Agreement and which apply this Regulation.

In the corresponding cases the device shall be marked as follows:

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

4.2.3.2. On headlamps equipped with filament lamps and meeting the requirements of Annex 4 to this Regulation only when supplied with a voltage of 6 V or 12 V, a symbol consisting of the number 24 crossed out by an oblique cross (x), shall be placed near the filament lamp holder.

4.2.4. The two digits of the approval number which indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval and, if necessary, the required arrow may be marked close to the above additional symbols.

4.2.5. The marks and symbols referred to in paragraphs 4.2.1 to 4.2.3 above shall be clearly legible and be indelible. They may be placed on an inner or outer part (transparent or not) of the headlamp, which cannot be separated from the transparent part of the headlamp emitting the light. In any case they shall be visible when the headlamp is fitted on the vehicle or when a movable part such as the hood is opened.

4.3. Arrangement of the approval mark

4.3.1. Independent lamps

Figures 1 to 10 of Annex 2 to this Regulation give examples of arrangements of the approval mark with the above-mentioned additional symbols.

4.3.2. Grouped, combined or reciprocally incorporated lamps

4.3.2.1. Where grouped, combined or reciprocally incorporated lamps have been found to comply with the requirements of several Regulations, a single international approval mark may be affixed, consisting of a circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted the approval, and an approval number. This approval mark may be located anywhere on the grouped, combined or reciprocally incorporated lamps, provided that:

4.3.2.1.1. It is visible as per paragraph 4.2.5;

4.3.2.1.2. No part of the grouped, combined or reciprocally incorporated lamps that transmits light can be removed without at the same time removing the approval mark.

4.3.2.2. The identification symbol for each lamp appropriate to each Regulation under which approval has been granted, together with the corresponding series of amendments incorporating the most recent major technical amendments to the Regulation at the time of issue of the approval, and if necessary, the required arrow shall be marked:

4.3.2.2.1. Either on the appropriate light-emitting surface,

4.3.2.2.2. Or in a group, in such a way that each of the grouped, combined or reciprocally incorporated lamps may be clearly identified (see four possible examples in Annex 2).

4.3.2.3. The size of the components of a single approval mark shall not be less than the minimum size required for the smallest of the individual marks by the Regulation under which approval has been granted.

4.3.2.4. An approval number shall be assigned to each type approved. The same Contracting Party may not assign the same number to another type of grouped, combined or reciprocally incorporated lamps covered by this Regulation.

4.3.2.5. Figure 11 of Annex 2 to this Regulation gives examples of arrangements of approval marks for grouped, combined or reciprocally incorporated lamps with all the above-mentioned additional symbols.

4.3.3. Lamps, the lens of which are used for different types of headlamps and which may be reciprocally incorporated or grouped with other lamps

The provisions laid down in paragraph 4.3.2 above are applicable.

4.3.3.1. In addition, where the same lens is used, the latter may bear the different approval marks relating to the different types of headlamps or units of lamps, provided that the main body of the headlamp, even if it cannot be separated from the lens, also comprises the space described in paragraph 3.2 above and bears the approval marks of the actual functions.

If different types of headlamps comprise the same main body, the latter may bear the different approval marks.

4.3.3.2. Figure 12 of Annex 2 to this Regulation gives examples of arrangements of approval marks relating to the above case.

B. **TECHNICAL REQUIREMENTS FOR HEADLAMPS** [1]

5. GENERAL SPECIFICATIONS

5.1. Each sample shall conform to the specifications set forth in paragraphs 6 to 8 below.

[1] Technical requirements for filament lamps: see Regulation No 37.

5.2. Headlamps shall be so made as to retain their prescribed photometric characteristics and to remain in good working order when in normal use, in spite of the vibrations to which they may be subjected.

5.2.1. Headlamps shall be fitted with a device enabling them to be so adjusted on the vehicles as to comply with the rules applicable to them. Such a device need not be fitted on units in which the reflector and the diffusing lens cannot be separated, provided the use of such units is confined to vehicles on which the headlamp setting can be adjusted by other means.

Where a headlamp providing a principal passing-beam and a headlamp providing a driving-beam, each equipped with its own filament lamp or LED module(s), the adjusting device shall enable the principal passing-beam and the driving-beam to be adjusted individually.

5.2.2. However, these provisions shall not apply to headlamp assemblies whose reflectors are indivisible. For this type of assembly the requirements of paragraph 6.3 of this Regulation apply.

5.3. The headlamp shall be equipped with:

5.3.1. Filament lamp(s) approved according to Regulation No 37. Any filament lamp covered by Regulation No 37 may be used, provided that no restriction on the use is made in Regulation No 37 and its series of amendments in force at the time of application for type approval.

5.3.1.1. The design of the device shall be such that the filament lamp can be fixed in no other position but the correct one ([1]);

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

5.3.1.3. A means of controlling the voltage at the terminals of the device, within the limits as defined in Regulation No 48, may, for convenience, be located within the body of the headlamp. However, for the purposes of type approval of the passing and/or driving beam according to the provisions of this Regulation, such means of voltage control shall not be considered to be part of the headlamp and shall be disconnected during the testing to verify performance according to the requirements of this Regulation

5.3.2. And/or LED module(s):

5.3.2.1. Electronic light source control gear(s) associated with the operation of LED module(s), if applicable, shall be considered to be part of the headlamp; they may be part of the LED module(s);

5.3.2.2. The headlamp, if equipped with LED modules, and the LED module(s) themselves shall comply with the relevant requirements specified in Annex 10 to this Regulation. The compliance with the requirements shall be tested.

5.3.2.3. The total objective luminous flux of all LED modules producing the principal passing-beam and measured as described in paragraph 5. of Annex 10 shall be equal or greater than 1 000 lumens.

5.3.2.4. In the case of a replaceable LED module the removal and replacement of this LED module, as described in Annex 10, paragraph 1.4.1 shall be demonstrated to the satisfaction of the Technical Service.

([1]) A headlamp is regarded as satisfying the requirements of this paragraph if the filament lamp can be easily fitted into the headlamp and the positioning lugs can be correctly fitted into their slots even in darkness.

5.4. Headlamps designed to satisfy the requirements both of right hand and of left hand traffic may be adapted for traffic on a given side of the road either by an appropriate initial setting when fitted on the vehicle or by selective setting by the user. Such initial or selective setting may consist, for example, of fixing either the optical unit at a given angle on the vehicle or the filament lamp or LED module(s) producing the principal passing-beam at a given angle/position in relation to the optical unit. In all cases, only two different and clearly distinct settings, one for right hand and one for left-hand traffic, shall be possible, and the design shall preclude inadvertent shifting from one setting to the other or setting in an intermediate position. Where two different setting positions are provided for the filament lamp or LED module(s) producing the principal passing-beam, the components for attaching the filament lamp or LED module(s) producing the principal passing-beam to the reflector must be so designed and made that, in each of its two settings, this filament lamp or LED module(s) will be held in position with the precision required for headlamps designed for traffic on only one side of the road. Conformity with the requirements of this paragraph shall be verified by visual inspection and, where necessary, by a test fitting.

5.5. Complementary tests shall be done according to the requirements of Annex 4 to ensure that in use there is no excessive change in photometric performance.

5.6. Light transmitting components made of plastic material shall be tested according to the requirements of Annex 6.

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

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

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

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

5.7.2. In the case of failure, the luminous intensity above the line H-H shall not exceed the values of a passing-beam according to paragraph 6.2.4; in addition, on headlamps designed to provide a passing and/or a driving-beam to become a bend lighting, a minimum luminous intensity of at least 2 500 cd. shall be fulfilled in test point 25 V (V-V line, 1,72 D).

When performing the tests to verify compliance with these requirements, the Technical Service responsible for approval tests shall refer to the instructions supplied by the applicant.

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

5.7.4. The user cannot, with ordinary tools, change the shape or position of the moving parts.

5.8. Illumination configuration for different traffic conditions

5.8.1. In the case of headlamps designed to meet the requirements of traffic moving on one side of the road (either right or left) only, appropriate measures shall be taken to prevent discomfort to road-users in a country where traffic moves on the side of the road opposite to that of the country for which the headlamp was designed [1]. Such measures may be:

[1] Instructions on the installation of lamps fitted with the measures are given in Regulation No 48.

(a) Occulting a part of the outer headlamp lens area;

(b) Downward movement of the beam. Horizontal movement is allowed;

(c) Any other measure to remove or reduce the asymmetrical part of the beam.

5.8.2. Following the application of this (these) measure(s) the following requirements regarding the luminous intensity of the headlamp shall be met with the adjustment left unchanged compared to that for the original traffic direction:

5.8.2.1. Passing-beam designed for right-hand traffic and adapted to left-hand traffic:

at 0,86D-1,72L at least 2 500 cd;

at 0,57U-3,43R not more than 880 cd.

5.8.2.2. Passing-beam designed for left-hand traffic and adapted to right-hand traffic:

at 0,86D-1,72R at least 2 500 cd;

at 0,57U-3,43L not more than 880 cd.

5.9. In case of a passing-beam headlamp incorporating a light source or LED module(s) producing the principal passing-beam and having a total objective luminous flux which exceeds 2 000 lumens, a reference shall be made in item 9. of the communication form in Annex 1. The objective luminous flux of LED modules shall be measured as described in paragraph 5. of Annex 10.

5.10. The definitions in paragraphs 2.7.1.1.3 and 2.7.1.1.7 in Regulation No 48 allow the use of LED modules, which may contain holders for other light sources. Notwithstanding this provision a mixture of LED'(s) and other light sources for the principal dipped beam or the contributor to the bend lighting or each driving-beam, as specified by this Regulation is not allowed.

5.11. A LED module shall be:

(a) Only removable from its device with the use of tools, unless it is stated in the communication sheet that the LED module is non-replaceable, and

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

6. ILLUMINATION

6.1. General provisions

6.1.1. Headlamps shall be so made that they give adequate illumination without dazzle when emitting the passing-beam, and good illumination when emitting the driving-beam. Bend lighting may be produced by activating one additional filament light source or one or more LED module(s) being part of the passing-beam headlamp.

6.1.2. The luminous intensity produced by the headlamp shall be measured at 25 m distance by means of a photoelectric cell having a useful area comprised within a square of 65 mm side. The point HV is the centre-point of the coordinate system with a vertical polar axis. Line h is the horizontal through HV (see Annex 3 to this Regulation).

6.1.3. Apart from LED module(s), the headlamps shall be checked by means of an uncoloured standard (étalon) filament lamp designed for a rated voltage of 12 V.

6.1.3.1. During the checking of the headlamp, the voltage at the terminals of the filament lamp shall be regulated as to obtain the reference luminous flux at 13,2 V as indicated for each filament lamp at the relevant data sheet of Regulation No 37.

However, if a filament lamp of category H9 or H9B is used for the principal passing-beam, the applicant may choose the reference luminous flux at 12,2 V or 13,2 V as indicated in the relevant data sheet of Regulation No 37 and a reference stating which voltage was chosen for type approval shall be made in item 9 in the communication form of Annex 1.

6.1.3.2. In order to protect the standard (étalon) filament lamp during the process of photometric measurement it is permissible to carry out the measurements at a luminous flux that differs from the reference luminous flux at 13,2 V. If the Technical Service chooses to carry out measurements in such a manner, the luminous intensity shall be corrected by multiplying the measured value by the individual factor F_{lamp} of the standard (étalon) filament lamp in order to verify the compliance with the photometric requirements where:

$$F_{lamp} = \Phi_{reference}/\Phi_{test}$$

$\Phi_{reference}$ is the reference luminous flux at 13,2 V as specified in the relevant data sheet of Regulation No 37

Φ_{test} is the actual luminous flux used for the measurement.

However, where the reference luminous flux of 12,2 V as specified in the data sheet for the category H9 or H9B is chosen, this procedure is not permitted.

6.1.3.3. The headlamp shall be considered acceptable if it meets the requirements of paragraph 6. with at least one standard (étalon) filament lamp, which may be submitted with the headlamp.

6.1.4. LED module(s) shall be measured at 6,3 V, 13,2 V or 28,0 V respectively, if not otherwise specified within this Regulation. LED module(s) operated by an electronic light source control gear, shall be measured as specified by the applicant.

6.1.5. In the case of headlamps equipped with LED module(s) and filament lamps, the part of the headlamp with filament lamp(s) shall be tested according to paragraph 6.1.3 and the part of the headlamp with LED module(s) shall be evaluated according to the provisions of paragraph 6.1.4 and then added to the previous result obtained from the filament lamp(s) tested.

6.2. Provisions concerning passing-beams

6.2.1. The luminous intensity distribution of the principal passing-beam headlamp shall incorporate a 'cut-off' (see Figure 1), which enables the headlamp to be adjusted correctly for the photometric measurements and for the aiming on the vehicle.

The 'cut-off' shall provide:

(a) For right hand traffic beams:

(i) A straight 'horizontal part' towards the left;

(ii) A raised 'elbow – shoulder' part towards the right.

(b) For left hand traffic beams:

(i) A straight 'horizontal part' towards the right;

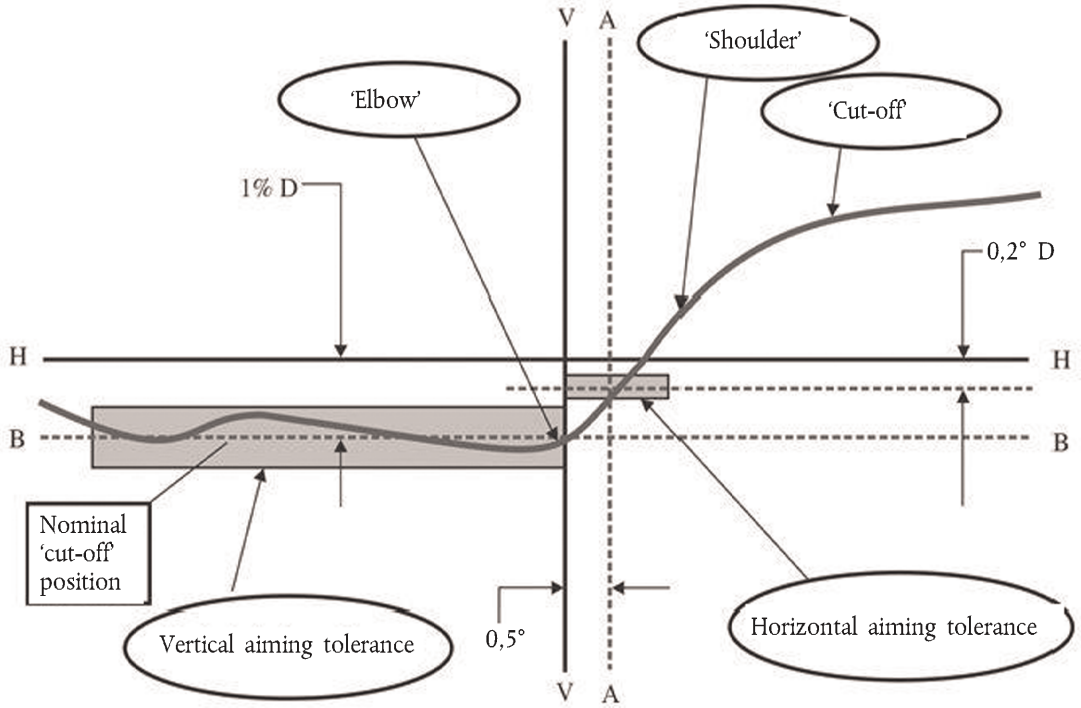
(ii) A raised 'elbow — shoulder' part towards the left.

In each case the 'elbow-shoulder' part shall have a sharp edge.

6.2.2. The headlamp shall be visually aimed by means of the 'cut-off' (see Figure 1) as follows. The aiming shall be carried out using a flat vertical screen set up at a distance of 10 m or 25 m (as indicated in item 9 of Annex 1) forward of the headlamp and at right angles to the H-V axis as shown in Annex 3 to this Regulation. The screen shall be sufficiently wide to allow examination and adjustment of the 'cut-off' of the passing-beam over at least 5° on either side of the V-V line.

6.2.2.1. For vertical adjustment: the horizontal part of the 'cut-off' is moved upward from below line B and adjusted to its nominal position one per cent (0,57 degrees) below the H-H line;

Figure 1



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

6.2.2.2. For horizontal adjustment: the 'elbow – shoulder' part of the 'cut-off' shall be moved:

For right hand traffic from right to left and shall be horizontally positioned after its movement so that:

(a) Above the line 0,2° D its 'shoulder' shall not exceed the line A to the left;

(b) The line 0,2° D or below its 'shoulder' should cross the line A; and

(c) The kink of the 'elbow' is basically located within +/– 0,5 degrees to the left or right of the V-V line;

or

For left hand traffic from left to right and shall be horizontally positioned after its movement so that:

(a) Above the line 0,2° D its 'shoulder' shall not exceed the line A to the right;

(b) On the line 0,2° D or below its 'shoulder' cross the line A; and

(c) The kink of the 'elbow' should be primarily on the V-V line;

6.2.2.3. Where a headlamp so aimed does not meet the requirements set out in paragraphs 6.2.4 to 6.2.6 and 6.3, its alignment may be changed, provided that the axis of the beam is not displaced:

Horizontally from line A by more than:

(a) 0,5° to the left or 0,75° to the right, for right hand traffic; or

(b) 0,5° to the right or 0,75° to the left, for left hand traffic; and

Vertically not more than 0,25° up or down from line B.

6.2.2.4. If, however, vertical adjustment cannot be performed repeatedly to the required position within the tolerances described in paragraph 6.2.2.3 above, the instrumental method of Annex 9, paragraphs 2. and 3. shall be applied to test compliance with the required minimum quality of the 'cut-off' and to perform the vertical and horizontal adjustment of the beam.

6.2.3. When so aimed, the headlamp, if its approval is sought solely for provision of a passing-beam ([1]), need comply only with the requirements set out in paragraphs 6.2.4 to 6.2.6 below; if it is intended to provide both a passing-beam and a driving-beam, it shall comply with the requirements set out in paragraphs 6.2.4 to 6.2.6 and 6.3.

6.2.4. The passing-beam shall meet the luminous intensities at the test points referred to in the tables below and in Annex 3 Figure B (or mirrored about the V-V line for left-hand traffic):

Headlamps for RH Traffic (**)		Class A Headlamp		Class B Headlamp	
Test point designation	Test point angular coordinates — Degrees	Required luminous intensity cd		Required luminous intensity cd	
		Max	Min	Max	Min
B 50 L	0,57U, 3,43L	350		350	
BR	1,0 U, 2,5R	1 750		1 750	
75 R	0,57D, 1,15R		5 100		10 100
75 L	0,57D, 3,43L	10 600		10 600	
50 L	0,86D, 3,43L	13 200 (***)		13 200 (***)	
50 R	0,86D, 1,72R		5 100		10 100

([1]) Such a special 'passing-beam' headlamp may incorporate a driving-beam not subject to requirements.

Headlamps for RH Traffic (**)								Class A Headlamp		Class B Headlamp	
Test point designation	Test point angular coordinates — Degrees							Required luminous intensity cd		Required luminous intensity cd	
								Max	Min	Max	Min
50 V	0,86D, 0										5 100
25 L	1,72D, 9,0L								1 250		1 700
25 R	1,72D, 9,0R								1 250		1 700
Any point in zone III (bounded by the following coordinates in degrees)								625		625	
8 L	8 L	8 R	8 R	6 R	1,5 R	V-V	4 L				
1 U	4 U	4 U	2 U	1,5 U	1,5 U	H-H	H-H				
Any point in zone IV (0,86D to 1,72D, 5,15 L to 5,15 R)									1 700		2 500
Any point in zone I (1,72D to 4D, 9 L to 9 R)								17 600		< 2I (*)	

Note: In the table:

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

Letter R means that the point is located on the right of V-V line.

Letter U means the point is located above H-H line

Letter D means the point or segment is located below H-H line

(*) Actual measured value at points 50R/50L respectively

(**) For left-hand traffic, the letter R shall be replaced by letter L and vice versa.

(***) In case where a headlamp in which LED modules are producing a passing-beam in conjunction with an electronic light source control gear, the measured value shall not be more than 18 500 cd.

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

6.2.5. There shall be no lateral variations detrimental to good visibility in any of the zones I, II, III and IV.

6.2.6. Headlamps designed to meet the requirements of both right-hand and left-hand traffic must, in each of the two setting positions of the optical unit or LED module(s) producing the principal passing-beam or of the filament lamp, meet the requirements set forth above for the corresponding direction of traffic.

6.2.7. The requirements in paragraph 6.2.4 above shall also apply to headlamps designed to provide bend lighting and/or that include the additional light source or LED module(s) referred to in paragraph 6.2.8.2. In the case of a headlamp designed to provide bend lighting its alignment may be changed, provided that the axis of the beam is not displaced vertically by more than 0,2°.

6.2.7.1. If bend lighting is obtained by:

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

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

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

6.2.8. Only one filament light source or one or more LED module(s) are permitted for the principal passing-beam. Additional light sources or LED modules are permitted only as follows (see Annex 10):

6.2.8.1. One additional light source according to Regulation No 37 or one or more additional LED module(s) may be used inside the passing-beam headlamp to contribute to bend lighting;

6.2.8.2. One additional light source according to Regulation No 37 and/or one or more LED module(s), inside the passing-beam headlamp, may be used for the purposes of generating infrared radiation. It/they shall only be activated at the same time as the principal light source or LED module(s). In the event that the principal light source or (one of) the principal LED module(s) fails, this additional light source and/or LED module(s) shall be automatically switched off;

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

6.3. Provisions concerning driving-beams

6.3.1. In the case of a headlamp designed to provide a driving-beam and a passing-beam, measurements of the luminous intensity of the driving-beam shall be taken with the same headlamp alignment as for measurements under paragraphs 6.2.4 to 6.2.6. above; in the case of a headlamp providing a driving-beam only, it shall be so adjusted that the area of maximum luminous intensity is centred on the point of intersection of lines H-H and V-V; such a headlamp need meet only the requirements referred to in paragraph 6.3. Where more than one light source is used to provide the driving-beam, the combined functions shall be used to determine the maximum value of the luminous intensity (I_M).

6.3.2. Irrespective of the type of light source (LED module(s) or filament light source(s)) used to produce the principal passing-beam, several light sources:

(a) Either filament light sources listed in Regulation No 37; or

(b) LED module(s) may be used for each individual driving-beam.

6.3.3. Referring to Annex 3, Figure C and the table below, the luminous intensity distribution of the driving-beam shall meet the following requirements:

		Class A Headlamp	Class B Headlamp
Test point	Angular coordinates - Degrees	Required luminous intensity cd	Required luminous intensity cd
		Min	Min
I_{max}		27 000	40 500
H-5L	0,0, 5,0 L	3 400	5 100
H-2,5L	0,0, 2,5 L	13 500	20 300
H-2,5R	0,0, 2,5 R	13 500	20 300
H-5R	0,0, 5,0 R	3 400	5 100

6.3.3.1. The point of intersection (HV) of lines H-H and V-V shall be situated within the isolux 80 per cent of maximum luminous intensity (I_{max})

6.3.3.2. The maximum value (I_M) shall in no circumstances exceed 215 000 cd.

6.3.4. The reference mark (I'_M) of the maximum luminous intensity, referred to in paragraph 6.3.3.2 above, shall be obtained by the ratio:

$$I'_M = I_M/4\,300$$

This value shall be rounded off to the value 7,5 - 10 – 12,5 – 17,5 - 20 - 25 – 27,5 - 30 – 37,5 - 40 - 45 - 50.

6.4. In the case of headlamps with adjustable reflector the requirements of paragraphs 6.2 and 6.3 are applicable for each mounting position indicated according to paragraph 2.1.3. For verification the following procedure shall be used:

6.4.1. Each applied position is realized on the test goniometer with respect to a line joining the centre of the light source and point HV on a aiming screen. The adjustable reflector is then moved into such a position that the light pattern on the screen corresponds to the aiming prescriptions of paragraphs 6.2.1 to 6.2.2.3 and/or 6.3.1;

6.4.2. With the reflector initially fixed according to paragraph 6.4.1, the headlamp must meet the relevant photometric requirements of paragraphs 6.2 and 6.3;

6.4.3. Additional tests are made after the reflector has been moved vertically ± 2° or at least into the maximum position, if less than 2°, from its initial position by means of the headlamps adjusting device. Having re-aimed the headlamp as a whole (by means of the goniometer for example) in the corresponding opposite direction the light output in the following directions shall be controlled and lie within the required limits:

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

driving-beam: I_M and point HV (percentage of I_M).

6.4.4. If the applicant has indicated more than one mounting position, the procedure of paragraphs 6.4.1 to 6.4.3 shall be repeated for all other positions;

6.4.5. If the applicant has not asked for special mounting positions, the headlamp shall be aimed for measurements of paragraphs 6.2 and 6.3 with the headlamps adjusting device in its mean position. The additional test of paragraph 6.4.3 shall be made with the reflector moved into its extreme positions (instead of ± 2°) by means of the headlamps adjusting device.

7. COLOUR

7.1. The colour of the light emitted shall be white.

8. GAUGING OF DISCOMFORT

The discomfort caused by the passing-beam of headlamps shall be gauged ([1]).

C. **FURTHER ADMINISTRATIVE PROVISIONS**

9. MODIFICATION OF THE HEADLAMP TYPE AND EXTENSION OF APPROVAL

9.1. Every modification of the headlamp type shall be notified to the Type Approval Authority which approved the headlamp type. The said Authority may then either:

9.1.1. Consider that the modifications made are unlikely to have appreciable adverse effects and that in any event the headlamp still complies with the requirements; or

9.1.2. Require a further test report from the Technical Service responsible for conducting the tests.

9.2. Confirmation or refusal of approval, specifying the alterations, shall be communicated by the procedure specified in paragraph 4.1.4 above to the Parties to the Agreement which apply this Regulation.

9.3. The competent Authority issuing the extension of approval shall assign a series number to each communication form drawn up for such an extension and inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

10. CONFORMITY OF PRODUCTION

The conformity of production procedures shall comply with those set out in the Agreement, Appendix 2 (E/ECE/324-E/ECE/TRANS/505/Rev.2) with the following requirements:

10.1. Headlamps approved under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set forth in paragraphs 6. and 7.

10.2. The minimum requirements for conformity of production control procedures set forth in Annex 5 to this Regulation shall be complied with.

10.3. The minimum requirements for sampling by an inspector set forth in Annex 7 to this Regulation shall be complied with.

10.4. The authority which has granted type approval may at any time verify the conformity control methods applied in each production facility. The normal frequency of these verifications shall be once every two years.

10.5. Headlamps with apparent defects are disregarded.

([1]) This requirement will be the subject of a recommendation to administrations.

10.6. The reference mark is disregarded.

10.7. The measuring points 1 to 8 from paragraph 6.2.4 of this Regulation are disregarded.

11. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

11.1. The approval granted in respect of a type of headlamp pursuant to this Regulation may be withdrawn if the requirements are not complied with or if a headlamp bearing the approval mark does not conform to the type approved.

11.2. If a Contracting Party to the Agreement applying this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

12. PRODUCTION DEFINITIVELY DISCONTINUED

If the holder of the approval completely ceases to manufacture a type of headlamp approved in accordance with this Regulation, he shall so inform the authority which granted the approval. Upon receiving the relevant communication, that authority shall inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

13. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS AND OF TYPE APPROVAL AUTHORITIES

The Parties to the 1958 Agreement applying this Regulation shall communicate to the United Nations Secretariat the names and addresses of the Technical Services responsible for conducting approval tests and of the Type Approval Authorities which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval, or production definitively discontinued, issued in other countries, are to be sent.

14. TRANSITIONAL PROVISIONS

14.1. From the date of entry into force of the 01 series of amendments to this Regulation, no Contracting Party applying it shall refuse to grant approvals under this Regulation as amended by the 01 series of amendments.

14.2. Until 60 months after the date of entry into force of the 01 series of amendments to this Regulation with regard to the changes introduced by the 01 series of amendments concerning the photometric testing procedures involving the use of the spherical coordinate system and the specification of luminous intensity values, and in order to allow the Technical Services to update their testing equipment, no Contracting Party applying this Regulation shall refuse to grant approvals under this Regulation as amended by the 01 series of amendments where existing testing equipment is used with suitable conversion of the values, to the satisfaction of the authority responsible for type approval.

14.3. As from 60 months after the date of entry into force of the 01 series of amendments, Contracting Parties applying this Regulation shall grant approvals only if the headlamp meets the requirements of this Regulation as amended by the 01 series of amendments.

14.4. Existing approvals for headlamps already granted under this Regulation before the date of entry into force of the 01 series of amendments shall remain valid indefinitely.

14.5. Contracting Parties applying this Regulation shall not refuse to grant extensions of approvals to the preceding series to this Regulation.

ANNEX 1

COMMUNICATION

(Maximum format: A4 (210 × 297 mm))

issued by: Name of administration
.....
.....
.....

Concerning (2): Approval granted
Approval extended
Approval refused
Approval withdrawn
Production definitively discontinued

of a type of headlamp pursuant to Regulation No 112

Approval No ..... Extension No .....

1. Trade name or mark of the device: .....
2. Manufacturer's name for the type of device: .....
3. Manufacturer's name and address: .....
4. If applicable, name and address of the manufacturer's representative: .....
5. Submitted for approval on: .....
6. Technical Service responsible for conducting approval tests: .....
7. Date of report issued by that service: .....
8. Number of report issued by that service: .....
9. Brief description:

   Category as described by the relevant marking (3): .....

   Number and category(s) of filament lamp(s): .....

   Reference luminous flux used for the principal passing-beam (lm): .....

   Principal passing-beam operated at approximately (V): .....

   Measures according to paragraph 5.8 of this Regulation: .....

   Number and specific identification code(s) of LED module(s) and for each LED module a statement whether it is replaceable or not: yes/no (2)

Number and specific identification code(s) of electronic light source control gear(s) .....

Total objective luminous flux as described in paragraph 5.9 exceeds 2 000 lumens: yes/no/does not apply ([2])

The adjustment of the cut-off has been determined at: 10 m/25 m/does not apply ([2])

The determination of the minimum sharpness of the 'cut-off' has been carried out at: 10 m/25 m/does not apply ([2])

10. Approval mark position: .....

11. Reason(s) for extension of approval: .....

12. Approval granted/extended/refused//withdrawn ([2])

13. Place: .....

14. Date: .....

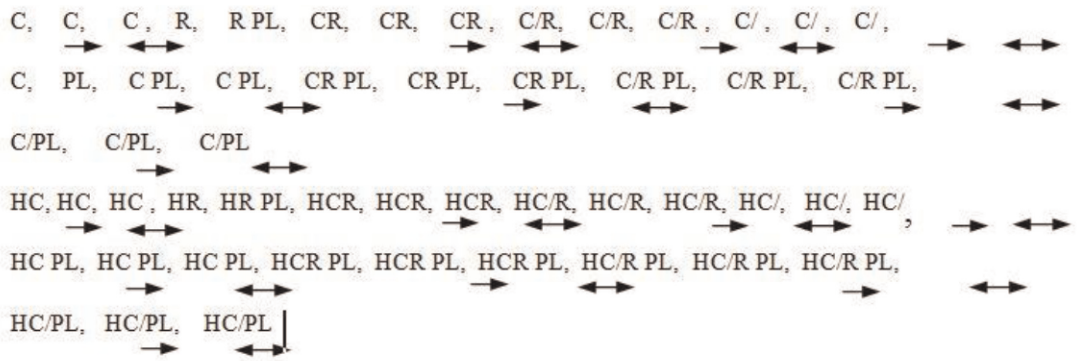
15. Signature: .....

16. The list of documents deposited with the Type Approval Authority which has granted approval is annexed to this communication and may be obtained on request.

([1]) Distinguishing number of the country which has granted/refused/withdrawn approval (see the provisions of the Regulation concerning approval).

([2]) Strike out which does not apply.

([3]) Indicate the appropriate marking selected from the list below:



ANNEX 2

EXAMPLES OF ARRANGEMENT OF APPROVAL MARKS

Figure 1

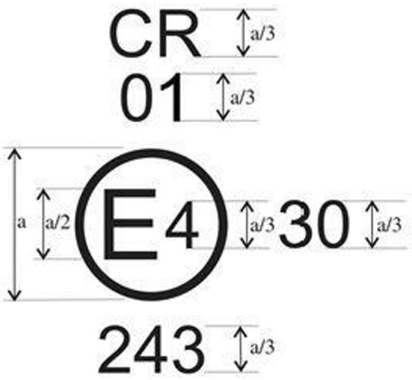
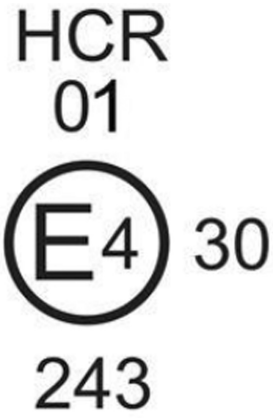


Figure 2



a ≥ 8 mm (on glass)

a ≥ 5 mm (on plastic material)

The headlamp bearing one of the above approval marks has been approved in the Netherlands (E4) pursuant to Regulation No 112 under approval number 243, meeting the requirements of this Regulation, as amended by the 01 series of amendments. The passing-beam is designed for right-hand traffic only. The letters CR (Figure 1) indicate that it concerns a Class A passing and driving-beam and the letters HCR (Figure 2) indicate that it concerns a Class B passing and driving-beam.

The figure 30 indicates that the maximum luminous intensity of the driving-beam is between 123 625 and 145 125 candelas.

Note: The approval number and additional symbols shall be placed close to the circle and either above or below the letter 'E', or to the right or left of that letter. The digits of the approval number shall be on the same side of the letter 'E' and face in the same direction.

The use of Roman numerals as approval numbers should be avoided so as to prevent any confusion with other symbols.

Figure 3

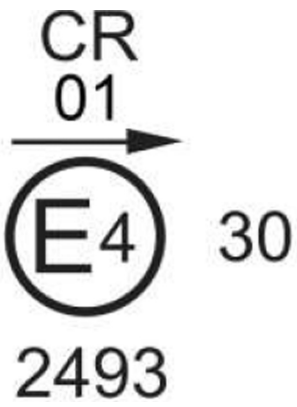


Figure 4a

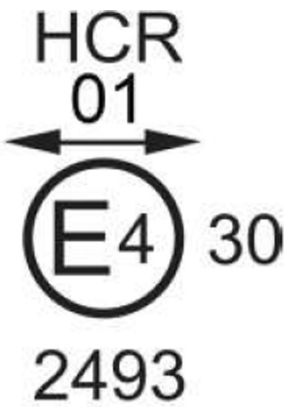


Figure 4b

The headlamp bearing the above approval mark meets the requirements of this Regulation in respect of both the passing-beam and the driving-beam and is designed:

Figure 3: Class A for left hand traffic only.

Figures 4a and 4b: Class B for both traffic systems by means of an appropriate adjustment of the setting of the optical unit or the filament lamp on the vehicle.

Figure 5

Figure 6

The headlamp bearing the above approval mark is a headlamp incorporating a lens of plastic material meeting the requirements of this Regulation in respect of the passing-beam only and is designed:

Figure 5: Class A for both traffic systems.

Figure 6: Class B for right-hand traffic only.

Figure 7

Figure 8

The headlamp bearing the above approval mark is a headlamp meeting the requirements of this Regulation:

Figure 7: Class B in respect of the passing-beam only and is designed for left-hand traffic only.

Figure 8: Class A in respect of the driving-beam only.

Figure 9

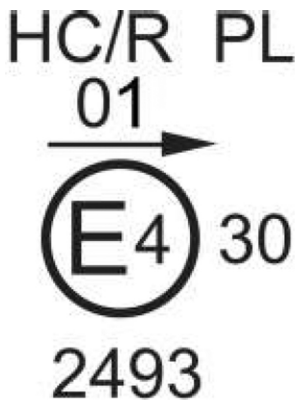


Figure 10

Identification of a headlamp incorporating a lens of plastic material meeting the requirements of this Regulation:

Figure 9: Class B in respect to both the passing-beam and driving-beam and designed for right-hand traffic only.

Figure 10: Class B in respect to the passing-beam only and designed for right-hand traffic only.

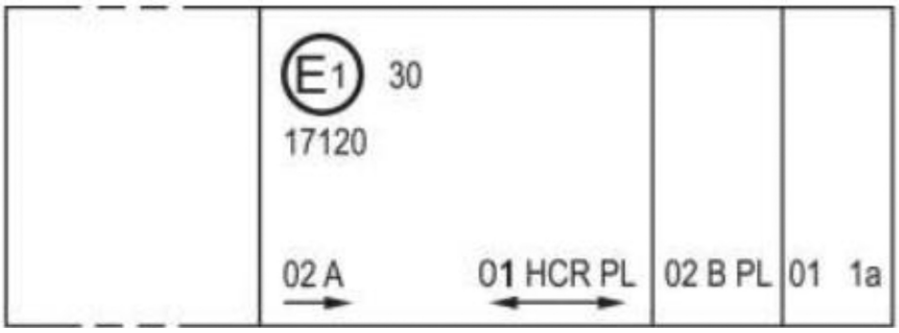
The passing-beam shall not be operated simultaneously with the driving-beam and/or another reciprocally incorporated headlamp.

Figure 11

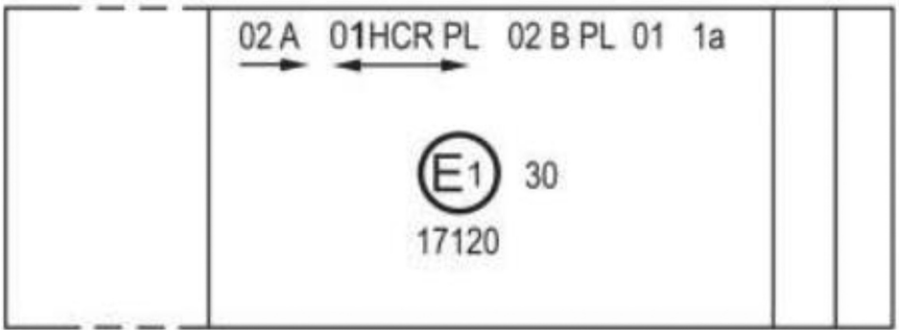
Simplified marking for grouped, combined or reciprocally incorporated lamps

(The vertical and horizontal lines schematize the shape of the light-signalling device. They are not part of the approval mark).

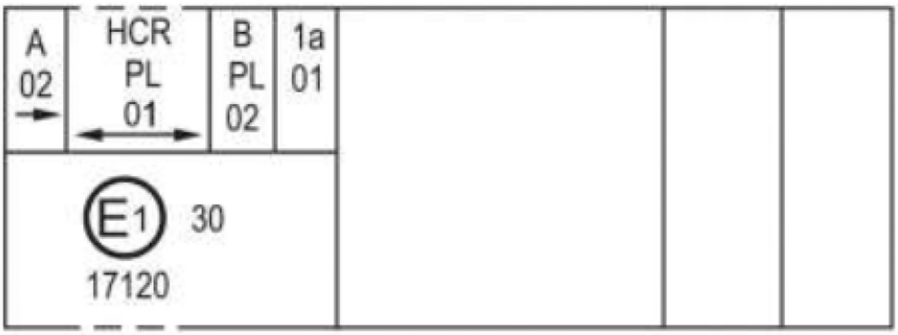
Model A



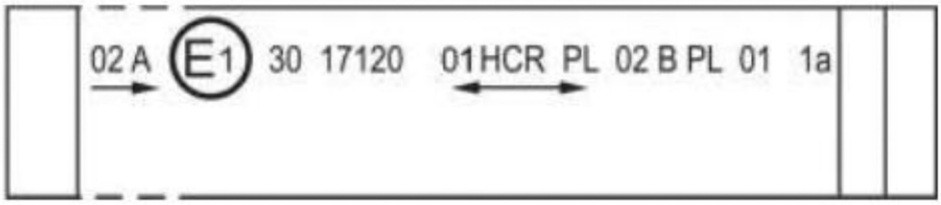
Model B



Model C



Model D



Note: The four examples above correspond to a lighting device bearing an approval mark comprising:

A front position lamp approved in accordance with the 02 series of amendments to Regulation No 7,

A headlamp, Class B, with a passing-beam designed for right- and left-hand traffic and a driving-beam with a maximum intensity comprised between 123 625 and 145 125 candelas (as indicated by the number 30), approved in accordance with the requirements of this Regulation, as amended by the 01 series of amendments and incorporating a lens of plastic material,

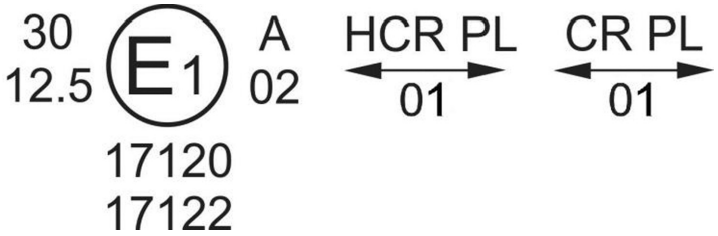
A front fog lamp approved in accordance with the 02 series of amendments to Regulation No 19 and incorporating a lens of plastic material,

A front direction indicator lamp of category 1a approved in accordance with the 01 series of amendments to Regulation No 6.

Figure 12

Lamp reciprocally incorporated with a headlamp

Example 1



The above example corresponds to the marking of a lens of plastic material intended to be used in different types of headlamps, namely:

Either A headlamp, Class B, with a passing beam designed for both traffic systems and a driving-beam with a maximum luminous intensity comprised between 123 625 and 145 125 candelas (as indicated by the number 30), approved in Germany (E1) in accordance with the requirements of this Regulation, as amended by the 01 series of amendments,

Which is reciprocally incorporated with

A front position lamp approved in accordance with the 02 series of amendments to Regulation No 7;

or A headlamp, Class A, with a passing beam designed for both traffic systems and a driving-beam with a maximum luminous intensity comprised between 48 375 cd and 64 500 cd (as indicated by the number 12,5), approved in Germany (E1) in accordance with the requirements of this Regulation, as amended by the 01 series of amendments,

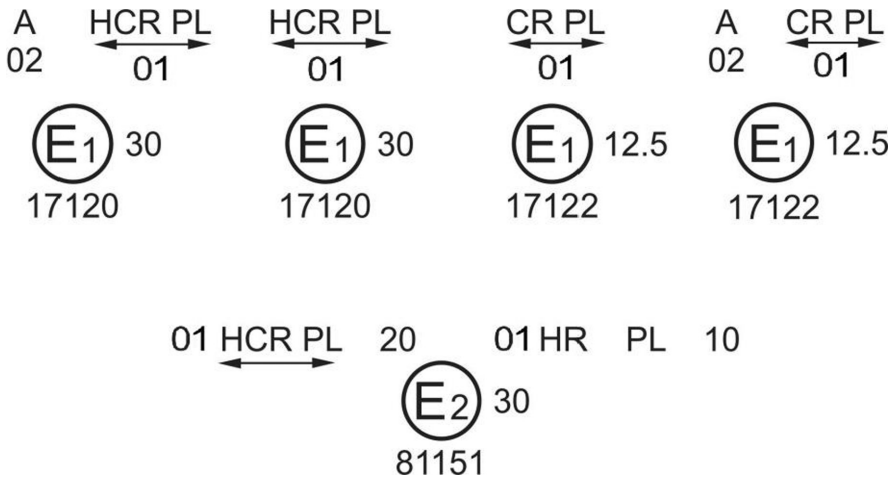
Which is reciprocally incorporated with:

The same front position lamp as above;

or Even either of the above mentioned headlamps approved as a single lamp.

The main body of the headlamp shall bear the only valid approval number, for instance:

Example 2



The above example corresponds to the marking of a lens of plastic material used in a unit of two headlamps approved in France (E2) under approval number 81151, consisting of:

A headlamp, Class B, emitting a passing-beam and a driving-beam with a maximum luminous intensity between x and y candelas, meeting the requirements of this Regulation, and

A headlamp, Class B, emitting a driving-beam designed for both traffic systems with a maximum luminous intensity between w and z candelas, meeting the requirements of this Regulation, the maximum luminous intensities of the driving-beams as a whole being comprised between 123 625 and 145 125 candelas.

Figure 13

LED modules

MD E3 17325

The LED module bearing the light source module identification code shown above has been approved together with a headlamp initially approved in Italy (E3) under approval number 17325.

ANNEX 3

SPHERICAL COORDINATE MEASURING SYSTEM AND TEST POINT LOCATIONS

Figure A

Spherical coordinate measuring system

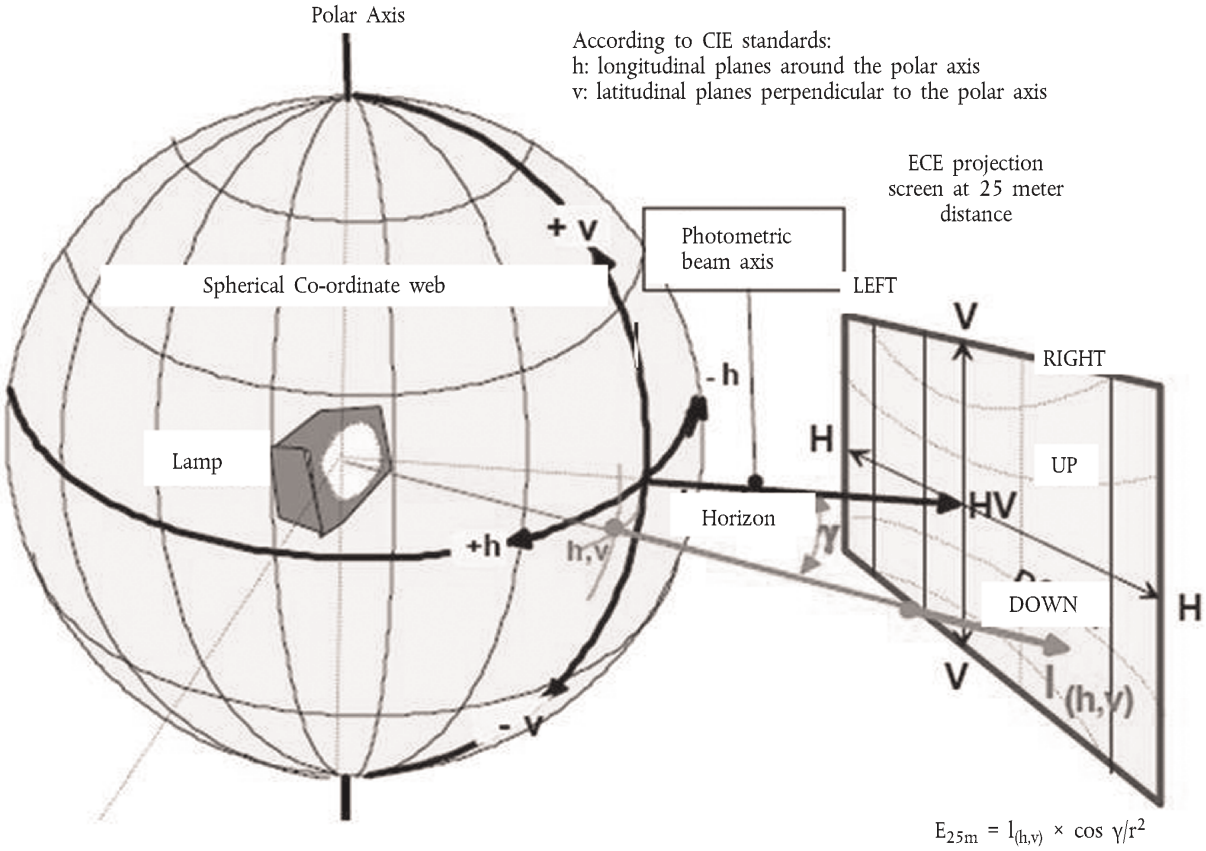
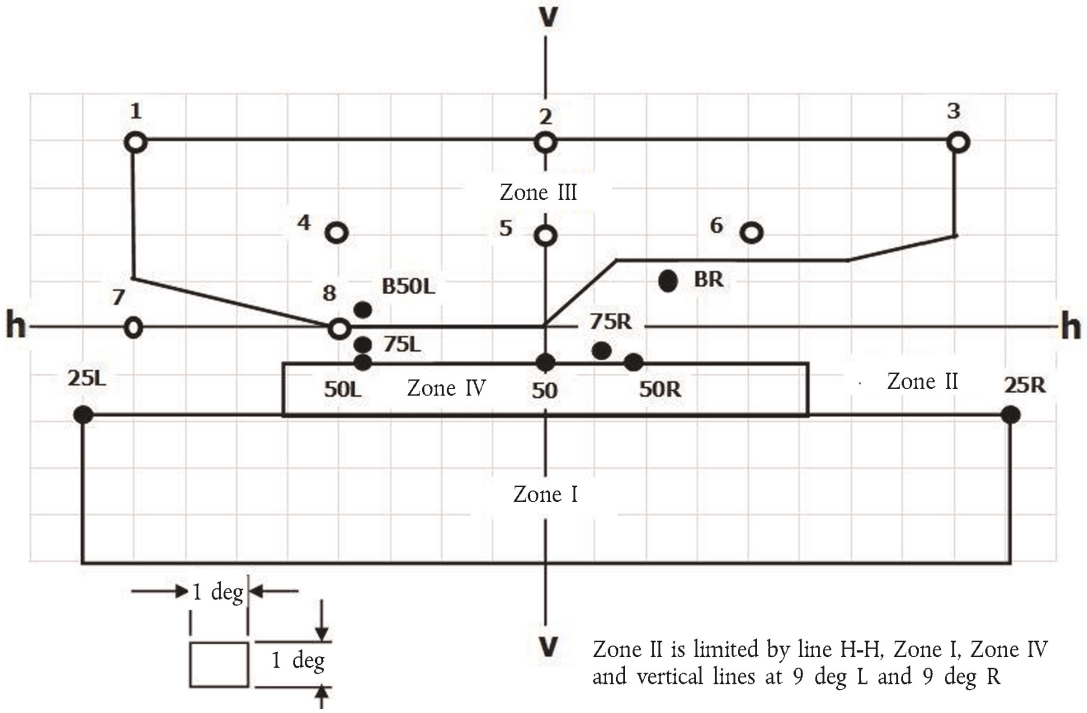


Figure B

Passing-beam for right-hand traffic

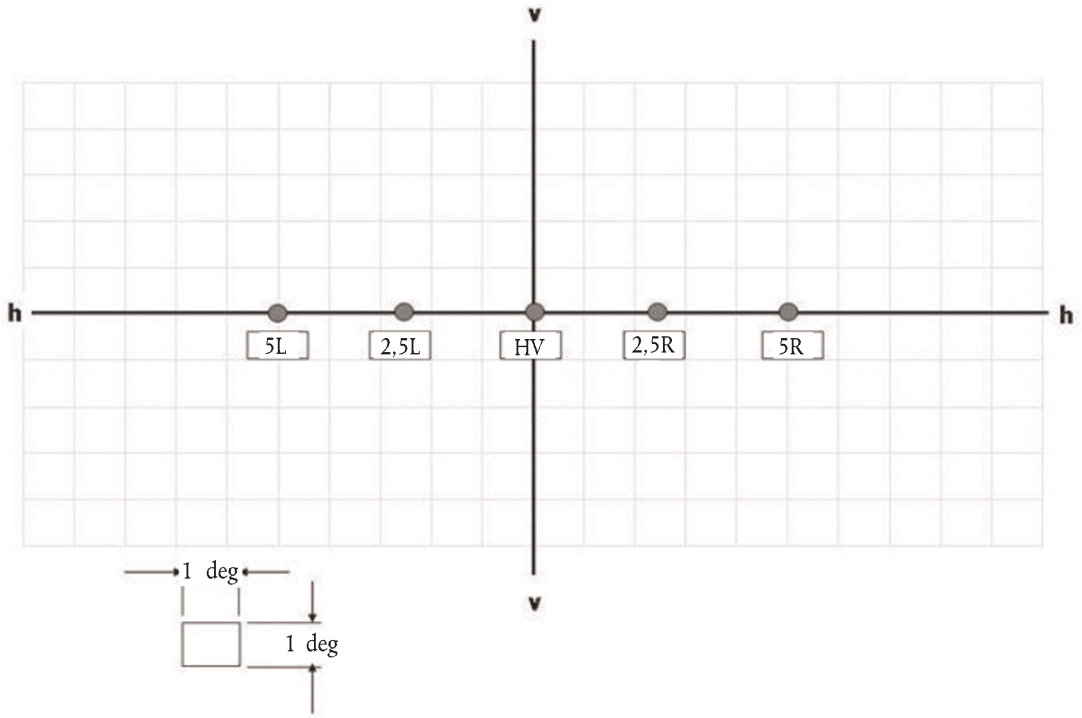


h-h = horizontal plane, v-v = vertical plane passing through the optical axis of the headlamp

The test point locations for left-hand traffic are mirrored about the V-V line

Figure C

Driving-beam test points



ANNEX 4

TESTS FOR STABILITY OF PHOTOMETRIC PERFORMANCE OF HEADLAMPS IN OPERATION

Tests on complete headlamps

Once the photometric values have been measured according to the prescriptions of this Regulation, in the point for I_{max} for driving-beam and in points HV, 50 R, B 50 L for passing-beam (or HV, 50 L, B 50 R for headlamps designed for left-hand traffic) a complete headlamp sample shall be tested for stability of photometric performance in operation. 'Complete headlamp' shall be understood to mean the complete lamp itself including those surrounding body parts and lamps which could influence its thermal dissipation.

The tests shall be carried out:

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

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

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

The test sample shall be operated without being dismounted from or readjusted in relation to its test fixture. The light source used shall be a light source of the category specified for that headlamp.

1. Test for stability of photometric performance

1.1. Clean headlamp

The headlamp shall be operated for 12 hours as described in paragraph 1.1.1 and checked as prescribed in paragraph 1.1.2.

1.1.1. Test procedure [1]

The headlamp shall be operated for a period according to the specified time, so that:

1.1.1.1. (a) In the case where only one lighting function (driving or passing-beam or front fog lamp) is to be approved, the corresponding filament and/or LED module(s) is (are) lit for the prescribed time [2];

(b) In the case of a headlamp with a passing-beam and one or more driving-beams or in the case of a headlamp with a passing-beam and a front fog lamp:

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

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

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

[1] For the test schedule see Annex 8 to this Regulation.

[2] When the tested headlamp includes signalling lamps, the latter shall be lit for the duration of the test, except for a daytime running lamp. In the case of a direction indicator lamp, it shall be lit in flashing mode with an on/off time of approximately one to one.

(ii) If the applicant declares that the headlamp is to be used with only the passing-beam lit or only the driving-beam(s) lit ([3]) at a time, the test shall be carried out in accordance with this condition, activating ([2]) successively the passing-beam half of the time and the driving-beam(s) (simultaneously) for half the time specified in paragraph 1.1 above.

(c) In the case of a headlamp with a front fog lamp and one or more driving-beams:

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

15 minutes, front fog lamp lit;

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

(ii) If the applicant declares that the headlamp is to be used with only the front fog lamp lit or only the driving-beam(s) lit ([3]) at a time, the test shall be carried out in accordance with this condition, activating ([2]) successively the front fog lamp half of the time and the driving-beam(s) (simultaneously) for half the time specified in paragraph 1.1 above.

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

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

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

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

(ii) If the applicant declares that the headlamp is to be used with only the passing-beam lit or only the driving-beam(s) ([3]) lit at a time, the test shall be carried out in accordance with this condition, activating ([2]) successively the principal passing-beam half of the time and the driving-beam(s) for half the time specified in paragraph 1.1 above, 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;

(iii) If the applicant declares that the headlamp is to be used with only the passing-beam lit or only the front fog lamp ([3]) lit at a time, the test shall be carried out in accordance with this condition, activating ([2]) successively the principal passing-beam half of the time and the front fog lamp for half of the time specified in paragraph 1.1 above, 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 principal passing-beam;

(iv) If the applicant declares that 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, the test shall be carried out in accordance with this condition, activating ([2]) successively the principal passing-beam one third of the time, the driving-beam(s) one third of the time and the front fog lamp for one third of the time specified in paragraph 1.1 above.

(e) In the case of a passing-beam designed to provide bend lighting with the addition of a filament light source and/or one or more LED module(s), this light source and/or LED module(s) shall be switched on for one minute, and switched off for nine minutes during the activation of the passing-beam only (see Annex 4 – Appendix 1).

([3]) Should two or more lamp filaments and/or LED module(s) be simultaneously lit when headlamp flashing is used, this shall not be considered as being normal use of the filaments and/or LED module(s).

1.1.1.2. Test voltage

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

(a) 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.

(b) 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.

(c) In the case of non-replaceable light source operated directly under vehicle voltage system conditions: All measurements on lighting units equipped with non-replaceable 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.

(d) 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).

(e) 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.

(f) 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.

1.1.2. Test results

1.1.2.1. Visual inspection

Once the headlamp has been stabilized to the ambient temperature, the headlamp lens and the external lens, if any, shall be cleaned with a clean, damp cotton cloth. It shall then be inspected visually; no distortion, deformation, cracking or change in colour of either the headlamp lens or the external lens, if any, shall be noticeable.

1.1.2.2. Photometric test

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

Passing-beam:

50 R — B 50 L – 25 L for headlamps designed for right-hand traffic,

50 L — B 50 R – 25 R for headlamps designed for left-hand traffic.

Driving-beam: Point I_{max}

Another aiming may be carried out to allow for any deformation of the headlamp base due to heat (the change of the position of the cut-off line is covered in paragraph 2. of this annex).

Except for point B 50 L, a 10 per cent discrepancy between the photometric characteristics and the values measured prior to the test is permissible including the tolerances of the photometric procedure. The value measured at point B 50 L shall not exceed the photometric value measured prior to the test by more than 170 cd.

1.2. Dirty headlamp

After being tested as specified in paragraph 1.1 above, the headlamp shall be operated for one hour as described in paragraph 1.1.1, after being prepared as prescribed in paragraph 1.2.1, and checked as prescribed in paragraph 1.1.2.

1.2.1. Preparations of the headlamp

1.2.1.1. Test mixture

1.2.1.1.1. For headlamp with the outside lens in glass:

The mixture of water and a polluting agent to be applied to the headlamp shall be composed of:

9 parts by weight of silica sand with a particle size of 0-100 μm,

1 part by weight of vegetal carbon dust (beechwood) with a particle size of 0-100 μm,

0,2 parts by weight of NaCMC ([4]), and

An appropriate quantity of distilled water, with a conductivity of ≤ 1 mS/m.

The mixture must not be more than 14 days old.

1.2.1.1.2. For headlamp with outside lens in plastic material:

The mixture of water and polluting agent to be applied to the headlamp shall be composed of:

9 parts by weight of silica sand with a particle size of 0-100 μm,

1 part by weight of vegetal carbon dust (beechwood) with a particle size of 0-100 μm,

0,2 part by weight of NaCMC ([4]),

13 parts by weight of distilled water with a conductivity of ≤ 1 mS/m, and

2 ± 1 parts by weight of surface-actant ([5])

The mixture must not be more than 14 days old.

1.2.1.2. Application of the test mixture to the headlamp

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 per cent of the values measured for each following point under the conditions described in this annex:

Point of E_{max} in passing-beam/driving-beam and in driving-beam only,

([4]) NaCMC represents the sodium salt of carboxymethylcellulose, customarily referred to as CMC. The NaCMC used in the dirt mixture shall have a degree of substitution (DS) of 0,6-0,7 and a viscosity of 200-300 cP for a 2 per cent solution at 20 °C.

([5]) The tolerance on quantity is due to the necessity of obtaining a dirt that correctly spreads out on all the plastic lens.

50 R and 50 V [6] for a headlamp producing only a passing-beam, designed for right-hand traffic,

50 L and 50 V [6] for a headlamp producing only a passing-beam, designed for left-hand traffic.

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

This test consists of verifying that the vertical drift of the cut-off line under the influence of heat does not exceed a specified value for an operating headlamp producing a passing-beam.

The headlamp tested in accordance with paragraph 1, shall be subjected to the test described in paragraph 2.1, without being removed from or readjusted in relation to its test fixture.

2.1. Test

The test shall be carried out in a dry and still atmosphere at an ambient temperature of 23 °C ± 5 °C.

Using a mass production filament lamp or the LED module(s) as submitted with the headlamp, which has (have) been aged for at least one hour, the headlamp shall be operated on the principal passing-beam without being dismounted from or readjusted in relation to its test fixture. (For the purpose of this test, the voltage shall be adjusted as specified in paragraph 1.1.1.2). The position of the cut-off line in its horizontal part (between V-V and the vertical line passing through point B 50 L for right-hand traffic or B 50 R for left-hand traffic) shall be verified 3 minutes (r_3) and 60 minutes (r_{60}) respectively after operation.

The measurement of the variation in the cut-off line position as described above shall be carried out by any method giving acceptable accuracy and reproducible results.

2.2. Test results

2.2.1. The result expressed in milliradians (mrad) shall be considered as acceptable for a passing-beam headlamp when the absolute value $\Delta r_1 = |r_3 - r_{60}|$ recorded on the headlamp is not more than 1,0 mrad ($\Delta r_1 \leq 1{,}0$ mrad) upward and not more than 2,0 mrad ($\Delta r_1 \leq 2{,}0$ mrad) downwards.

2.2.2. However, if this value is:

Movement	
upward	more than 1,0 mrad but not more than 1,5 mrad ($1{,}0 \text{ mrad} < \Delta r_1 \leq 1{,}5 \text{ mrad}$)
downward	more than 2,0 mrad but not more than 3,0 mrad ($2{,}0 \text{ mrad} < \Delta r_1 \leq 3{,}0 \text{ mrad}$)

a further sample of a headlamp shall be tested as described in paragraph 2.1 after being subjected three consecutive times to the cycle as described below, in order to stabilize the position of mechanical parts of the headlamp on a base representative of the correct installation on the vehicle:

Operation of the passing-beam for one hour, (the voltage shall be adjusted as specified in paragraph 1.1.1.2),

After this period of one hour, the headlamp type shall be considered as acceptable if the absolute value Δr measured on this sample meets the requirements in paragraph 2.2.1 above.

[6] Point 50 V is situated 375 mm below HV on the vertical line V-V on the screen at 25 m distance.

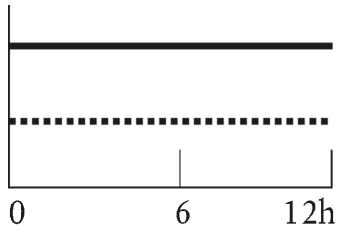
Appendix 1

OVERVIEW OF OPERATIONAL PERIODS CONCERNING TEST FOR STABILITY OF PHOTOMETRIC PERFORMANCE

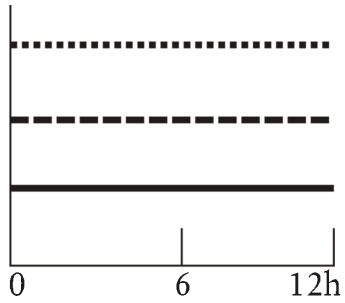
Abbreviations:
P : passing-beam lamp
D : driving-beam lamp (D_1 + D_2 means two driving-beams)
F : front fog lamp
– – – –: means a cycle of 15 minutes off and 5 minutes lit
▪▪▪▪▪▪▪▪▪▪▪▪: means a cycle of 9 minutes off and 1 minute lit

All following grouped headlamps and front fog lamps together with the added marking symbols are given as examples and are not exhaustive.

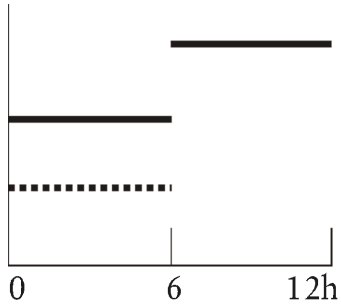
1. P or D or F (HC or HR or B)



2. P+F (HC B) or P+D (HCR)



3. P+F (HC/B) or HC/B or P+D (HC/R)



ANNEX 5

MINIMUM REQUIREMENTS FOR CONFORMITY OF PRODUCTION CONTROL PROCEDURES

1. General

1.1. The conformity requirements shall be considered satisfied from a mechanical and a geometrical standpoint, if the differences do not exceed inevitable manufacturing deviations within the requirements of this Regulation. This condition also applies to colour.

1.2. With respect to photometric performances, the conformity of mass-produced headlamps shall not be contested if, when testing photometric performances of any headlamp chosen at random and equipped with a standard (étalon) filament lamp and/or LED module(s), as present in the lamp:

1.2.1. No measured value deviates unfavourably by more than 20 per cent from the value prescribed in this Regulation. For values B 50 L (or R) ([1]) and zone III, the maximum unfavourable deviation may be respectively:

B 50 L (or R):	170 cd	equivalent 20 per cent
	255 cd	equivalent 30 per cent
Zone III	255 cd	equivalent 20 per cent
	380 cd	equivalent 30 per cent

1.2.2. Or if

1.2.2.1. For the passing-beam, the values prescribed in this Regulation are met at HV (with a tolerance of + 170 cd) and related to that aiming at least one point within a circle of 0,35 degrees around points B 50 L (or R) (with a tolerance of 85 cd), 75 R (or L), 50 V, 25 R, 25 L, and in the entire area of zone IV which is not more than 0,52 degrees above line 25 R and 25 L;

1.2.2.2. And if, for the driving-beam, HV being situated within the isolux 0,75 I_{max} a tolerance of + 20 per cent for maximum values and – 20 per cent for minimum values is observed for the photometric values at any measuring point specified in paragraph 6.3.2 of this Regulation.

1.2.3. If the results of the test described above do not meet the requirements, the alignment of the headlamp may be changed, provided that the axis of the beam is not displaced laterally by more than 1° to the right or left.

1.2.4. If in the case of a lamp equipped with a replaceable filament light source the results of the tests described above do not meet the requirements, tests shall be repeated using another standard (étalon) filament lamp.

1.3. With respect to the verification of the change in vertical position of the cut-off line under the influence of heat, the following procedure shall be applied:

One of the sampled headlamps shall be tested according to the procedure described in paragraph 2.1 of Annex 4 after being subjected three consecutive times to the cycle described in paragraph 2.2.2 of Annex 4.

The headlamp shall be considered as acceptable if Δr does not exceed 1,5 mrad.

If this value exceeds 1,5 mrad but is not more than 2,0 mrad, a second sample shall be subjected to the test after which the mean of the absolute values recorded on both samples shall not exceed 1,5 mrad.

1.4. If, however, vertical adjustment cannot be performed repeatedly to the required position within the tolerances described in paragraph 6.2.2.3 of this Regulation, one sample shall be tested according to the procedure described in paragraphs 2. and 3. of Annex 9.

([1]) Letters in brackets refer to headlamps intended for right-hand traffic.

2. Minimum requirements for verification of conformity by the manufacturer

For each type of headlamp the holder of the approval mark shall carry out at least the following tests, at appropriate intervals. The tests shall be carried out in accordance with the provision of this Regulation.

If any sampling shows non-conformity with regard to the type of test concerned, further samples shall be taken and tested. The manufacturer shall take steps to ensure the conformity of the production concerned.

2.1. Nature of tests

Tests of conformity in this Regulation shall cover the photometric characteristics and the verification of the change in vertical position of the cut-off line under the influence of heat.

2.2. Methods used in tests

2.2.1. Tests shall generally be carried out in accordance with the methods set out in this Regulation.

2.2.2. In any test of conformity carried out by the manufacturer, equivalent methods may be used with the consent of the competent Authority responsible for approval tests. The manufacturer is responsible for proving that the applied methods are equivalent to those laid down in this Regulation.

2.2.3. The application of paragraphs 2.2.1 and 2.2.2 requires regular calibration of test apparatus and its correlation with measurement made by a competent Authority.

2.2.4. In all cases the reference methods shall be those of this Regulation, particular for the purpose of administrative verification and sampling.

2.3. Nature of sampling

Samples of headlamps shall be selected at random from the production of a uniform batch. A uniform batch means a set of headlamps of the same type, defined according to the production methods of the manufacturer.

The assessment shall, in general, cover series production from individual factories. However, a manufacturer may group together records concerning the same type from several factories provided these operate under the same quality system and quality management.

2.4. Measured and recorded photometric characteristics

The sampled headlamps shall be subjected to photometric measurements at the points provided for in the Regulation, the reading being limited at the points I_{max}, HV [1], HL, HR [2] in the case of a driving-beam, and to points B 50 L (or R), HV, 50 V, 75 R (or L) and 25 L (or R) in the case of the passing-beam (see figure in Annex 3).

2.5. Criteria governing acceptability

The manufacturer is responsible for carrying out a statistical study of the test results and for defining, in agreement with the Competent Authority, criteria governing acceptability of his products in order to meet the specification laid down for verification of conformity of products in paragraph 10.1 of this Regulation.

The criteria governing acceptability shall be such that, with a confidence level of 95 per cent, the minimum probability of passing a spot check in accordance with Annex 7 (first sampling) would be 0,95.

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[1] When the driving-beam is reciprocally incorporated with the passing-beam, HV in the case of the driving-beam shall be the same measuring point as in the case of the passing-beam.

[2] HL and HR: points 'H-H' located at 2,5 degrees to the left and to the right of point HV respectively.

ANNEX 6

REQUIREMENTS FOR LAMPS INCORPORATING LENSES OF PLASTIC MATERIAL – TESTING OF LENS OR MATERIAL SAMPLES AND OF COMPLETE LAMPS

1. General specifications

1.1. The samples supplied pursuant to paragraph 2.2.4 of this Regulation shall satisfy the specifications indicated in paragraphs 2.1 to 2.5 below.

1.2. The two samples of complete lamps supplied pursuant to paragraph 2.2.3 of this Regulation and incorporating lenses of plastic material shall, with regard to the lens material, satisfy the specifications indicated in paragraph 2.6 below.

1.3. The samples of lenses of plastic material or samples of material shall be subjected, with the reflector to which they are intended to be fitted (where applicable), to approval tests in the chronological order indicated in Table A reproduced in Appendix 1 to this annex.

1.4. However, if the lamp manufacturer can prove that the product has already passed the tests prescribed in paragraphs 2.1 to 2.5 below, or the equivalent tests pursuant to another regulation, those tests need not be repeated; only the tests prescribed in Appendix 1, Table B, shall be mandatory.

2. Tests

2.1. Resistance to temperature changes

2.1.1. Tests

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 °C ± 2 °C and 85-95 per cent RH;

1 hour at 23 °C ± 5 °C and 60-75 per cent RH;

15 hours at – 30 °C ± 2 °C;

1 hour at 23 °C ± 5 °C and 60-75 per cent RH;

3 hours at 80 °C ± 2 °C;

1 hour at 23 °C ± 5 °C and 60-75 per cent RH;

Before this test, the samples shall be kept at 23 °C ± 5 °C and 60-75 per cent RH for at least four hours.

Note: The periods of one hour at 23 °C ± 5 °C shall include the periods of transition from one temperature to another which are needed in order to avoid thermal shock effects.

2.1.2. Photometric measurements

2.1.2.1. Method

Photometric measurements shall be carried out on the samples before and after the test.

These measurements shall be made using a standard (étalon) lamp and/or LED module(s), as present in the headlamp, at the following points:

B 50 L and 50 R for the passing-beam (B 50 R and 50 L in the case of headlamps intended for left-hand traffic);

I_{max} for the driving-beam.

2.1.2.2. Results

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

2.2. Resistance to atmospheric and chemical agents

2.2.1. Resistance to atmospheric agents

Three new samples (lenses or samples of material) shall be exposed to radiation from a source having a spectral energy distribution similar to that of a black body at a temperature between 5 500 K and 6 000 K. Appropriate filters shall be placed between the source and the samples so as to reduce as far as possible radiations with wave lengths smaller than 295 nm and greater than 2 500 nm. The samples shall be exposed to an energetic illumination of 1 200 W/m^2 ± 200 W/m^2 for a period such that the luminous energy that they receive is equal to 4 500 MJ/m^2 ± 200 MJ/m^2. Within the enclosure, the temperature measured on the black panel placed on a level with the samples 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 min^{-1}.

The samples shall be sprayed with distilled water of conductivity lower than 1 mS/m at a temperature of 23 °C ± 5 °C, in accordance with the following cycle:

spraying: 5 minutes; drying: 25 minutes.

2.2.2. Resistance to chemical agents

After the test described in paragraph 2.2.1 above and the measurement described in paragraph 2.2.3.1 below have been carried out, the outer face of the said three samples shall be treated as described in paragraph 2.2.2.2 with the mixture defined in paragraph 2.2.2.1 below.

2.2.2.1. Test mixture

The test mixture shall be composed of 61,5 per cent n-heptane, 12,5 per cent toluene, 7,5 per cent ethyl tetrachloride, 12,5 per cent trichloroethylene and 6 per cent xylene (volume per cent).

2.2.2.2. Application of the test mixture

Soak a piece of cotton cloth (as per ISO 105) until saturation with the mixture defined in paragraph 2.2.2.1 above and, within 10 seconds, apply it for 10 minutes to the outer face of the sample at a pressure of 50 N/cm^2, corresponding to an effort of 100 N applied on a test surface of 14 × 14 mm.

During this 10-minute period, the cloth pad shall be soaked again with the mixture so that the composition of the liquid applied is continuously identical with that of the test mixture prescribed.

During the period of application, it is permissible to compensate the pressure applied to the sample in order to prevent it from causing cracks.

2.2.2.3. Cleaning

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 described in paragraph 2.3.1 (Resistance to detergents) at 23 °C ± 5 °C.

Afterwards the samples shall be carefully rinsed with distilled water containing not more than 0,2 per cent impurities at 23 °C ± 5 °C and then wiped off with a soft cloth.

2.2.3. Results

2.2.3.1. 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 in transmission $\Delta t = \frac{T_2 - T_3}{T_2}$, measured on the three samples according to the procedure described in Appendix 2 to this annex shall not exceed 0,020 ($\Delta t_m \leq 0{,}020$).

2.2.3.2. 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, whose mean variation $\Delta d = \frac{T_5 - T_4}{T_2}$, measured on the three samples according to the procedure described in Appendix 2 to this annex shall not exceed 0,020 ($\Delta d_m \leq 0{,}020$).

2.2.4. Resistance to light source radiations

The following test shall be done:

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

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

2.3. Resistance to detergents and hydrocarbons

2.3.1. Resistance to detergents

The outer face of three samples (lenses or samples of material) 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 parts distilled water containing not more than 0,02 per cent impurities and one part alkylaryl sulphonate.

At the end of the test, the samples shall be dried at 50 °C ± 5 °C. The surface of the samples shall be cleaned with a moist cloth.

2.3.2. Resistance to hydrocarbons

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 per cent n-heptane and 30 per cent toluene (volume per cent), and shall then be dried in the open air.

2.3.3. Results

After the above two tests have been performed successively, the mean value of the variation in transmission $\Delta t = \frac{T_2 - T_3}{T_2}$, measured on the three samples according to

The procedure described in Appendix 2 to this annex shall not exceed 0,010 ($\Delta t_m \leq 0{,}010$).

2.4. Resistance to mechanical deterioration

2.4.1. Mechanical deterioration method

The outer face of the three new samples (lenses) shall be subjected to the uniform mechanical deterioration test by the method described in Appendix 3 to this annex.

2.4.2. Results

After this test, the variations:

in transmission: $\Delta t = \frac{T_2 - T_3}{T_2}$,

and in diffusion: $\Delta d = \frac{T_5 - T_4}{T_2}$,

shall be measured according to the procedure described in Appendix 2 in the area specified in paragraph 2.2.4.1.1 of this Regulation. The mean value of the three samples shall be such that:

$$\Delta t_m \leq 0{,}100;$$

$$\Delta d_m \leq 0{,}050.$$

2.5. Test of adherence of coatings, if any

2.5.1. Preparation of the sample

A surface of 20 mm × 20 mm in area of the coating of a lens shall be cut with a razor blade or a needle into a grid of squares approximately

2 mm × 2 mm. The pressure on the blade or needle shall be sufficient to cut at least the coating.

2.5.2. Description of the test

Use an adhesive tape with a force adhesion of 2 N/(cm of width) ± 20 per cent measured under the standardized conditions specified in Appendix 4 to this annex. This adhesive tape, which shall be at least 25 mm wide, shall be pressed for at least five minutes to the surface prepared as prescribed in paragraph 2.5.1 above.

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.

2.5.3. Results

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 per cent of the gridded surface.

2.6. Tests of the complete headlamp incorporating a lens of plastic material

2.6.1. Resistance to mechanical deterioration of the lens surface

2.6.1.1. Tests

The lens of lamp sample No 1 shall be subjected to the test described in paragraph 2.4.1 above.

2.6.1.2. Results

After the test, the results of photometric measurements carried out on the headlamp in accordance with this Regulation shall not exceed:

(a) By more than 30 per cent the maximum values prescribed at points B 50 L and HV and by more than 10 per cent below the minimum values prescribed at point 75 R (in the case of headlamps intended for left-hand traffic, the points to be considered are B 50 R, HV and 75 L)

or

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

2.6.2. Test of adherence of coatings, if any

The lens of lamp sample No 2 shall be subjected to the test described in paragraph 2.5 above.

3. Verification of the conformity of production

3.1. With regard to the materials used for the manufacture of lenses, the lamps of a series shall be recognized as complying with this Regulation if:

3.1.1. After the test for resistance to chemical agents and the test for resistance to detergents and hydrocarbons, the outer face of the samples exhibits no cracks, chipping or deformation visible to the naked eye (see paras. 2.2.2, 2.3.1 and 2.3.2 above);

3.1.2. After the test described in paragraph 2.6.1.1 above, the photometric values at the points of measurement considered in paragraph 2.6.1.2 above are within the limits prescribed for conformity of production by this Regulation.

3.2. If the test results fail to satisfy the requirements, the tests shall be repeated on another sample of headlamps selected at random.

Appendix 1

CHRONOLOGICAL ORDER OF APPROVAL TESTS

A. Tests on plastic materials (lenses or samples of material supplied pursuant to paragraph 2.2.4 of this Regulation).

Samples	Lenses or samples of material										Lenses			
Tests	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.1. Limited photometry (A.6, para. 2.1.2)											X	X	X	
1.1.1. Temperature change (A.6, para. 2.1.1)											X	X	X	
1.2. Limited photometry (A.6, para. 2.1.2)											X	X	X	
1.2.1. Transmission measurement	X	X	X	X	X	X	X	X	X					
1.2.2. Diffusion measurement	X	X	X				X	X	X					
1.3. Atmospheric agents (A.6, para. 2.2.1)	X	X	X											
1.3.1. Transmission measurement	X	X	X											
1.4. Chemical agents (A.6, para.2.2.2)	X	X	X											
1.4.1. Diffusion measurements	X	X	X											
1.5. Detergents (A.6, para. 2.3.1)				X	X	X								
1.6. Hydrocarbons (A.6, para. 2.3.2)				X	X	X								
1.6.1. Transmission measurement				X	X	X								
1.7. Deterioration (A.6, para. 2.4.1)							X	X	X					
1.7.1. Transmission measurement							X	X	X					
1.7.2. Diffusion measurement							X	X	X					
1.8. Adherence (A.6, para. 2,5)														X
1.9. Resistance to light source radiations (A.6, para. 2.2.4)										X				

B. Tests on complete headlamps (supplied pursuant to paragraph 2.2.3 of this Regulation).

Tests	Complete headlamp	
	Sample No	
	1	2
2.1. Deterioration (para. 2.6.1.1)	x	
2.2. Photometry (para. 2.6.1.2)	x	
2.3. Adherence (para. 2.6.2)		x

Appendix 2

METHOD OF MEASUREMENT OF THE DIFFUSION AND TRANSMISSION OF LIGHT

1. Equipment (see figure)

The beam of a collimator K with a half divergence $\beta/2 = 17{,}4 \times 10^{-4}$ rd is limited by a diaphragm D_τ with an opening of 6 mm against which the sample stand is placed.

A convergent achromatic lens L_2, corrected for spherical aberrations links the diaphragm D_τ with the receiver R; the diameter of the lens L_2 shall be such that it does not diaphragm the light diffused by the sample in a cone with a half top angle of $\beta/2 = 14°$.

An annular diaphragm D_D, with angles $\alpha_o/2 = 1°$ and $\alpha_{max}/2 = 12°$ is placed in an image focal plane of the lens L_2.

The non-transparent central part of the diaphragm is necessary in order to eliminate the light arriving directly from the light source. It shall be possible to remove the central part of the diaphragm from the light beam in such a manner that it returns exactly to its original position.

The distance L_2 D_τ and the focal length F_2 [1] of the lens L_2 shall be so chosen that the image of D_τ completely covers the receiver R.

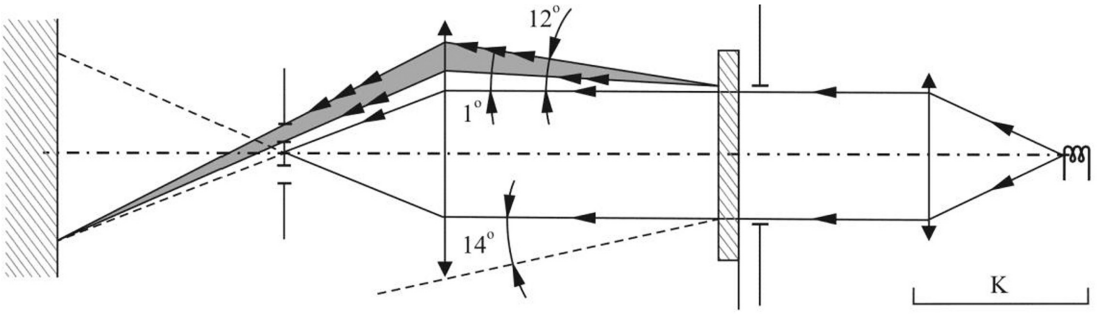
When the initial incident flux is referred to 1 000 units, the absolute precision of each reading shall be better than 1 unit.

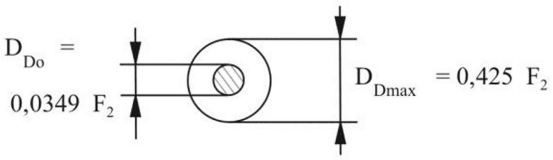
2. Measurements

The following readings shall be taken:

Reading	With sample	With central part of D_D	Quantity represented
T_1	No	No	Incident flux in initial reading
T_2	Yes (before test)	No	Flux transmitted by the new material in a field of 24°
T_3	Yes (after test)	No	Flux transmitted by the tested material in a field of 24°
T_4	Yes (before test)	Yes	Flux diffused by the new material
T_5	Yes (after test)	Yes	Flux diffused by the tested material

[1] For L_2 it is recommended to use a focal distance of about 80 mm.


12°
1°
14°
K


D Do =
0,0349 F2
D Dmax = 0,425 F2


R
F2
L2
L1
D D
D T

Appendix 3

SPRAY TESTING METHOD

1. Test equipment

1.1. Spray gun

The spray gun used 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.

Under these operation conditions the fan pattern obtained shall be 170 mm ± 50 mm in diameter on the surface exposed to deterioration, at a distance of 380 mm ± 10 mm from the nozzle.

1.2. Test mixture

The test mixture shall be composed of:

(a) Silica sand of hardness 7 on the Mohr scale, with a grain size between 0 and 0,2 mm and an almost normal distribution, with an angular factor of 1,8 to 2;

(b) Water of hardness not exceeding 205 g/m^3 for a mixture comprising 25 g of sand per litre of water.

2. Test

The outer surface of the lamp lenses shall be subjected once or more than once to the action of the sand jet produced as described above. 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 described in Appendix 2, is such that:

$$\Delta d = \frac{T_5 - T_4}{T_2} = 0{,}0250 \pm 0{,}0025$$

Several reference samples may be used to check that the whole surface to be tested has deteriorated homogeneously.

Appendix 4

ADHESIVE TAPE ADHERENCE TEST

1. Purpose

This method allows to determine under standard conditions the linear force of adhesion of an adhesive tape to a glass plate.

2. Principle

Measurement of the force necessary to unstick an adhesive tape from a glass plate at an angle of 90°.

3. Specified atmospheric conditions

The ambient conditions shall be at 23 °C ± 5 °C and 65 ± 15 per cent RH.

4. Test pieces

Before the test, the sample roll of adhesive tape shall be conditioned for 24 hours in the specified atmosphere (see para. 3 above).

Five test pieces each 400 mm long shall be tested from each roll. These test pieces shall be taken from the roll after the first three turns were discarded.

5. Procedure

The test shall be under the ambient conditions specified in paragraph 3.

Take the five test pieces while unrolling the tape radially at a speed of approximately 300 mm/s, then apply them within 15 seconds in the following manner:

Apply the tape to the glass plate progressively with a slight length-wise rubbing movement of the finger, without excessive pressure, in such a manner as to leave no air bubble between the tape and the glass plate.

Leave the assembly in the specified atmospheric conditions for 10 minutes.

Unstick about 25 mm of the test piece from the plate in a plane perpendicular to the axis of the test piece.

Fix the plate and fold back the free end of the tape at 90°. Apply force in such a manner that the separation line between the tape and the plate is perpendicular to this force and perpendicular to the plate.

Pull to unstick at a speed of 300 mm/s ± 30 mm/s and record the force required.

6. Results

The five values obtained shall be arranged in order and the median value taken as a result of the measurement. This value shall be expressed in Newtons per centimetre of width of the tape.

ANNEX 7

MINIMUM REQUIREMENTS FOR SAMPLING BY AN INSPECTOR

1. General

1.1. The conformity requirements shall be considered satisfied from a mechanical and a geometrical standpoint in accordance with the requirements of this Regulation, if any, if the differences do not exceed inevitable manufacturing deviations. This condition also applies to colour.

1.2. With respect to photometric performances, the conformity of mass-produced headlamps shall not be contested if, when testing photometric performances of any headlamp chosen at random and equipped with a standard filament lamp and/or LED module(s) present in the headlamp:

1.2.1. No measured value deviates unfavourably by more than 20 per cent from the value prescribed in this Regulation. For values B 50 L (or R) ([1]) and zone III, the maximum unfavourable deviation may be respectively:

B 50 L (or R):	170 cd equivalent 20 per cent
	255 cd equivalent 30 per cent
Zone III	255 cd equivalent 20 per cent
	380 cd equivalent 30 per cent

1.2.2. Or if

1.2.2.1. For the passing-beam, the values prescribed in this Regulation are met at HV (with a tolerance of + 170 cd) and related to that aiming at least one point of each area delimited on the measuring screen (at 25 m) by a circle 15 cm in radius around points B 50 L (or R) ([1]) (with a tolerance of 85 cd), 75 R (or L), 50 V, 25 R, 25 L, and in the entire area of zone IV which is not more than 22,5 cm above line 25 R and 25 L;

1.2.2.2. And if, for the driving-beam, HV being situated within the isolux 0,75 I_{max}, a tolerance of + 20 per cent for maximum values and – 20 per cent for minimum values is observed for the photometric values at any measuring point specified in paragraph 6.3.2 of this Regulation. The reference mark is disregarded.

1.2.3. If the results of the test described above do not meet the requirements, the alignment of the headlamp may be changed, provided that the axis of the beam is not displaced laterally by more than 1° to the right or left.

1.2.4. If the results of the tests described above do not meet the requirements, tests shall be repeated using another standard filament lamp and/or LED module(s) present in the headlamp.

1.2.5. Headlamps with apparent defects are disregarded.

1.2.6. The reference mark is disregarded.

1.3. If, however, vertical adjustment cannot be performed repeatedly to the required position within the tolerances described in paragraph 6.2.2.3 of this Regulation, one sample shall be tested according to the procedure described in paragraphs 2 and 3 of Annex 9.

2. First sampling

In the first sampling four headlamps are selected at random. The first sample of two is marked A, the second sample of two is marked B.

([1]) Letters in brackets refer to headlamps intended for right-hand traffic.

2.1. The conformity is not contested

2.1.1. Following the sampling procedure shown in Figure 1 of this annex the conformity of mass-produced headlamps shall not be contested if the deviations of the measured values of the headlamps in the unfavourable directions are:

2.1.1.1. Sample A

A1:	one headlamp		0 per cent
	one headlamp	not more than	20 per cent
A2:	both headlamps	more than	0 per cent
	but	not more than	20 per cent
	go to sample B		

2.1.1.2. Sample B

B1:	both headlamps		0 per cent

2.1.2. Or if the conditions of paragraph 1.2.2 for sample A are fulfilled.

2.2. The conformity is contested

2.2.1. Following the sampling procedure shown in Figure 1 of this annex the conformity of mass-produced headlamps shall be contested and the manufacturer requested to make his production meet the requirements (alignment) if the deviations of the measured values of the headlamps are:

2.2.1.1. Sample A

A3:	one headlamp	not more than	20 per cent
	one headlamp	more than	20 per cent
	but	not more than	30 per cent

2.2.1.2. Sample B

B2:	in the case of A2		
	one headlamp	more than	0 per cent
	but	not more than	20 per cent
	one headlamp	not more than	20 per cent
B3:	in the case of A2		
	one headlamp		0 per cent
	one headlamp	more than	20 per cent
	but	not more than	30 per cent

2.2.2. Or if the conditions of paragraph 1.2.2 for sample A are not fulfilled.

2.3. Approval withdrawn

Conformity shall be contested and paragraph 11. applied if, following the sampling procedure shown in Figure 1 of this annex, the deviations of the measured values of the headlamps are:

2.3.1. Sample A

A4:	one headlamp	not more than	20 per cent
	one headlamp	more than	30 per cent
A5:	both headlamps	more than	20 per cent

2.3.2. Sample B

B4:	in the case of A2		
	one headlamp	more than	0 per cent
	but	not more than	20 per cent
	one headlamp	more than	20 per cent
B5:	in the case of A2		
	both headlamps	more than	20 per cent
B6:	in the case of A2		
	one headlamp		0 per cent
	one headlamp	more than	30 per cent

2.3.3. Or if the conditions of paragraph 1.2.2 for samples A and B are not fulfilled.

3. Repeated sampling

In the case of A3, B2, B3 a repeated sampling, third sample C of two headlamps, selected from stock manufactured after alignment, is necessary within two months' time after the notification.

3.1. The conformity is not contested

3.1.1. Following the sampling procedure shown in Figure 1 of this annex the conformity of mass-produced headlamps shall not be contested if the deviations of the measured values of the headlamps are:

3.1.1.1. Sample C

C1:	one headlamp		0 per cent
	one headlamp	not more than	20 per cent
C2:	both headlamps	more than	0 per cent
	but	not more than	20 per cent
	go to sample D		

3.1.1.2. Sample D

D1:	in the case of C2	
	both headlamps	0 per cent

3.1.2. Or if the conditions of paragraph 1.2.2 for sample C are fulfilled.

3.2. The conformity is contested

3.2.1. Following the sampling procedure shown in Figure 1 of this annex the conformity of mass-produced headlamps shall be contested and the manufacturer requested to make his production meet the requirements (alignment) if the deviations of the measured values of the headlamps are:

3.2.1.1. Sample D

D2:	in the case of C2		
	one headlamp	more than	0 per cent
	but	not more than	20 per cent
	one headlamp	not more than	20 per cent

3.2.1.2. Or if the conditions of paragraph 1.2.2 for sample C are not fulfilled.

3.3. Approval withdrawn

Conformity shall be contested and paragraph 11. applied if, following the sampling procedure shown in Figure 1 of this annex, the deviations of the measured values of the headlamps are:

3.3.1. Sample C

C3:	one headlamp	not more than	20 per cent
	one headlamp	more than	20 per cent
C4:	both headlamps	more than	20 per cent

3.3.2. Sample D

D3:	in the case of C2		
	one headlamp	0 or more than	0 per cent
	one headlamp	more than	20 per cent

3.3.3. Or if the conditions of paragraph 1.2.2 for samples C and D are not fulfilled.

4. Change of the vertical position of the cut-off line

With respect to the verification of the change in vertical position of the cut-off line under the influence of heat, the following procedure shall be applied:

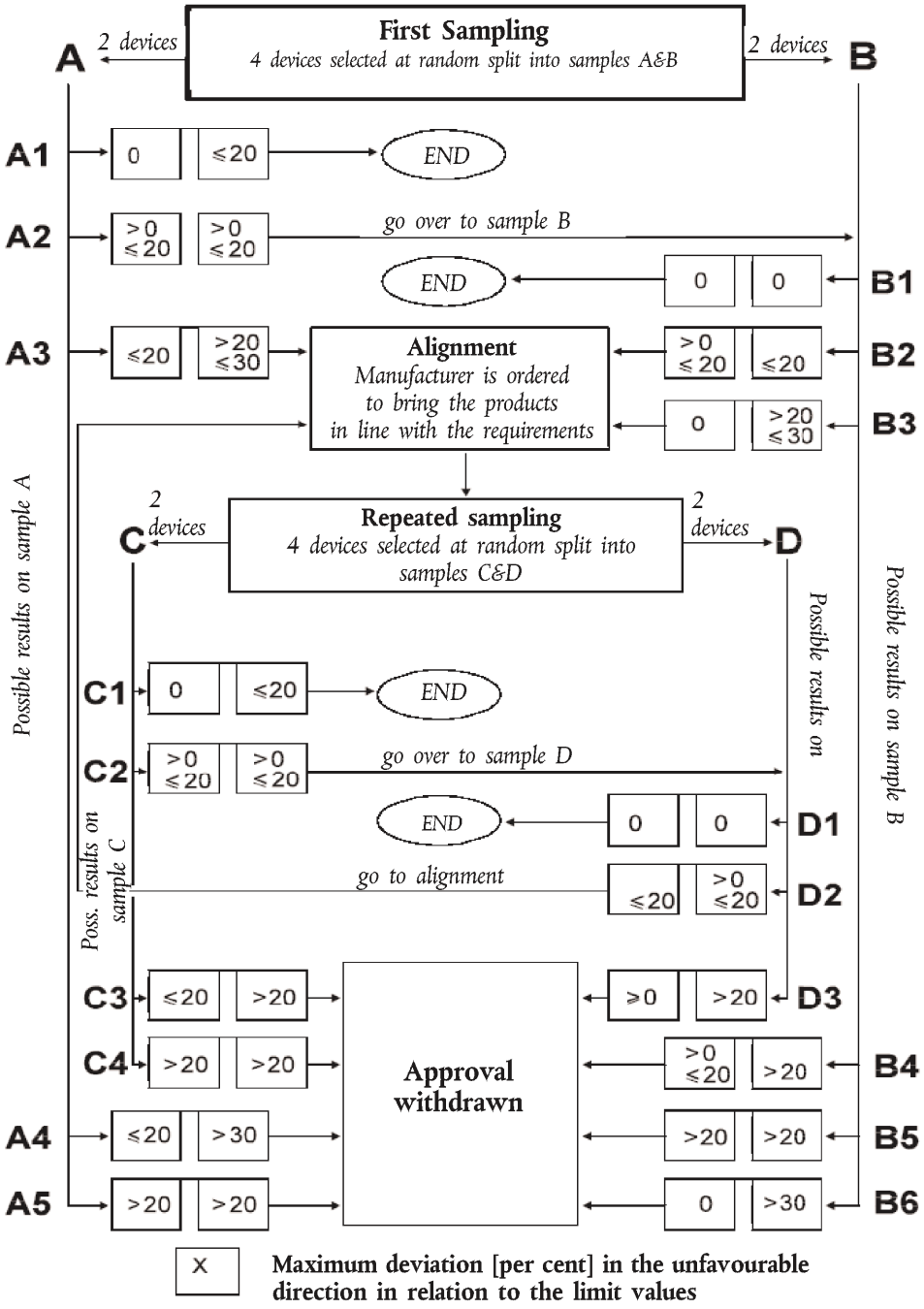
One of the headlamps of sample A after sampling procedure in Figure 1 of this annex shall be tested according to the procedure described in paragraph 2.1 of Annex 4 after being subjected three consecutive times to the cycle described in paragraph 2.2.2 of Annex 4.

The headlamp shall be considered as acceptable if Δr does not exceed 1,5 mrad.

If this value exceeds 1,5 mrad but is not more than 2,0 mrad, the second headlamp of sample A shall be subjected to the test after which the mean of the absolute values recorded on both samples shall not exceed 1,5 mrad.

However, if this value of 1,5 mrad on sample A is not complied with, the two headlamps of sample B shall be subjected to the same procedure and the value of Δr for each of them shall not exceed 1,5 mrad.

Figure 1


First Sampling
4 devices selected at random split into samples A&B
2 devices
2 devices
A
B
A1
A2
A3
A4
A5
B1
B2
B3
B4
B5
B6
0
≤20
END
>0 ≤20
go over to sample B
Alignment
Manufacturer is ordered to bring the products in line with the requirements
>20 ≤30
Repeated sampling
4 devices selected at random split into samples C&D
C
D
C1
C2
C3
C4
D1
D2
D3
go over to sample D
go to alignment
≥0
>20
Approval withdrawn
Possible results on sample A
Possible results on sample B
Poss. results on sample C
Possible results on
X
Maximum deviation [per cent] in the unfavourable direction in relation to the limit values

ANNEX 8

OVERVIEW OF OPERATIONAL PERIODS CONCERNING TESTS FOR STABILITY OF PHOTOMETRIC PERFORMANCE

Abbreviations:

P: passing-beam lamp

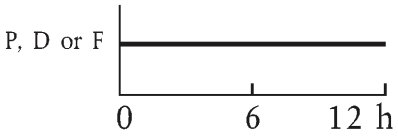
D: driving-beam lamp (D1 + D2 means two driving-beams)

F: front fog lamp

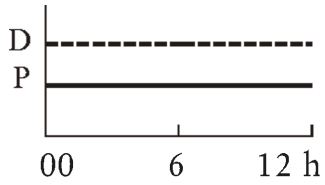
— — — — — —: means a cycle of 15 minutes off and 5 minutes lit.

All following grouped headlamps and front fog lamps together with the added class B marking symbols are given as examples and are not exhaustive.

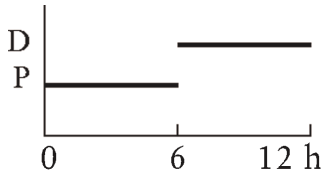
1. P or D or F (HC or HR or B)



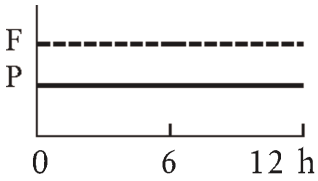
2. P+D (HCR) or P+D1+D2 (HCR HR)



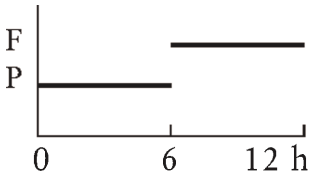
3. P+D (HC/R) or P+D1+D2 (HC/R HR)



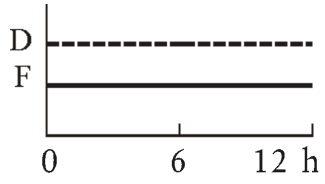
4. P+F (HC B)



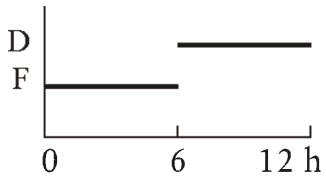
5. P+F (HC B/) or HC/B



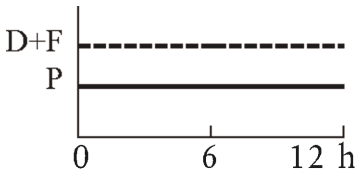
6. D+F (HR B) or D1+D2+F (HR HR B)



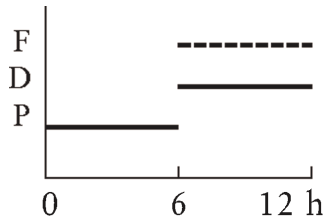
7. D+F (HR B/) or D1+D2+F (HR HR B/)



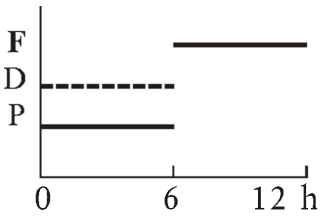
8. P+D+F (HCR B) or P+D1+D2+F (HCR HR B)



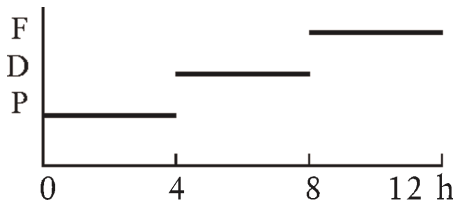
9. P+D+F (HC/R B) or P+D1+D2+F (HC/R HR B)



10. P+D+F (HCR B/) or P+D1+D2+F (HCR HR B/)



11. P+D+F (HC/R B/) or P+D1+D2+F (HC/R HR B/)



ANNEX 9

INSTRUMENTAL VERIFICATION OF THE 'CUT-OFF' FOR PASSING-BEAM HEADLAMPS

1. General

In the case where paragraph 6.2.2.4 of this Regulation applies, the quality of the 'cut-off' shall be tested according to the requirements set out in paragraph 2. below and the instrumental vertical and horizontal adjustment of the beam shall be performed according to the requirements set out in paragraph 3. below.

Before carrying out the measurement of the quality of 'cut-off' and the instrumental aiming procedure, a visual pre-aim in accordance with paragraphs 6.2.2.1 and 6.2.2.2 of this Regulation is required.

2. Measurement of the quality of the 'cut-off'

To determine the minimum sharpness, measurements shall be performed by vertically scanning through the horizontal part of the 'cut-off' in angular steps of 0,05° at either a measurement distance of:

(a) 10 m with a detector having a diameter of approximately 10 mm or

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

The measuring distance at which the test was carried out shall be recorded in item 9. of the communication form (see Annex 1 of this Regulation).

To determine the maximum sharpness, measurements shall be performed by vertically scanning through the horizontal part of the 'cut-off' in angular steps of 0,05° exclusively at a measurement distance of 25 m and with a detector having a diameter of approximately 30 mm.

The 'cut-off' quality shall be considered acceptable if the requirements of paragraphs 2.1 to 2.3 below comply with at least one set of measurements.

2.1. Not more than one 'cut-off' shall be visible ([1]).

2.2. Sharpness of 'cut-off'

The sharpness factor G is determined by scanning vertically through the horizontal part of the 'cut-off' at 2,5° from the V-V where:

$G = (\log E_{\beta} - \log E_{(\beta + 0{,}1°)})$ where β = the vertical position in degrees.

The value of G shall not be less than 0,13 (minimum sharpness) and not greater than 0,40 (maximum sharpness).

2.3. Linearity

The part of the horizontal 'cut-off' that serves for vertical adjustment shall be horizontal between 1,5° and 3,5° from the V-V line (see Figure 1).

([1]) This paragraph should be amended when an objective test method is available.

The inflection points of the 'cut-off' gradient at the vertical lines at 1,5°, 2,5° and 3,5° shall be determined by the equation:

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

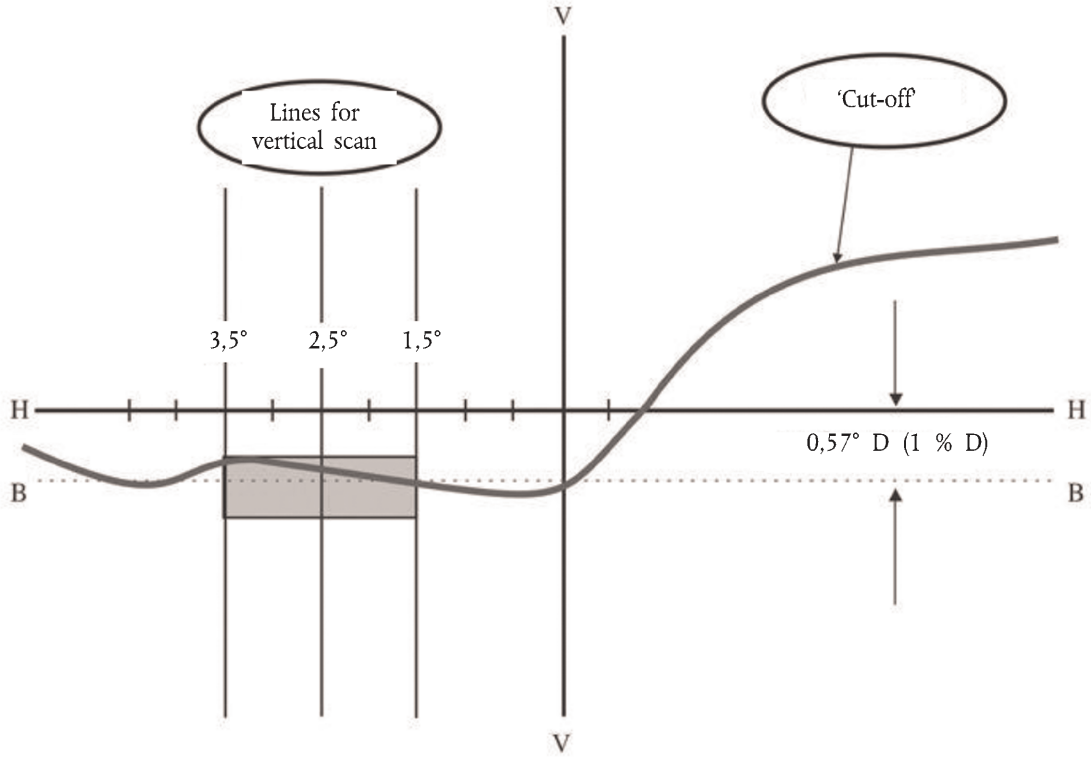
The maximum vertical distance between the inflection points determined shall not exceed 0,2°.

3. Vertical and horizontal adjustment

If the 'cut-off' complies with the quality requirements of paragraph 2 of this annex, the beam adjustment may be performed instrumentally.

Figure 1

Measurement of 'cut-off' quality



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

3.1. Vertical adjustment

Moving upward from below the line B (see Figure 2 below), a vertical scan is carried out through the horizontal part of the 'cut-off' at 2,5° from V-V. The inflection point (where d^2 (log E)/dv^2 = 0) is determined and positioned on the line B situated one per cent below H-H.

3.2. Horizontal adjustment

The applicant shall specify one of the following horizontal aim methods:

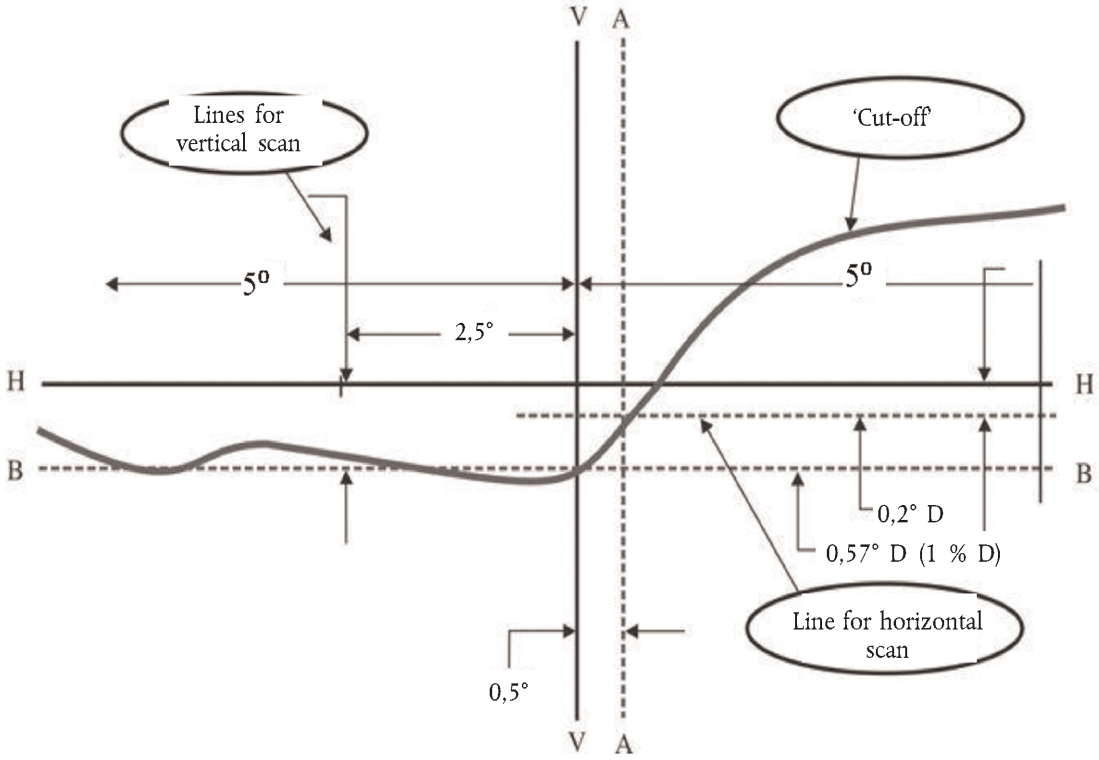
(a) The '0,2 D line' method (see Figure 2 below).

A single horizontal line at 0,2° D shall be scanned from 5° left to 5° right after the lamp has been aimed vertically. The maximum gradient 'G' determined using the formula $G = (\log E_{\beta} - \log E_{(\beta + 0{,}1°)})$ where β is the horizontal position in degrees, shall not be less than 0,08.

The inflection point found on the 0,2 D line shall be positioned on the line A.

Figure 2

Instrumental vertical and horizontal adjustment — horizontal line scan method



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

(b) The '3 line' method (see Figure 3)

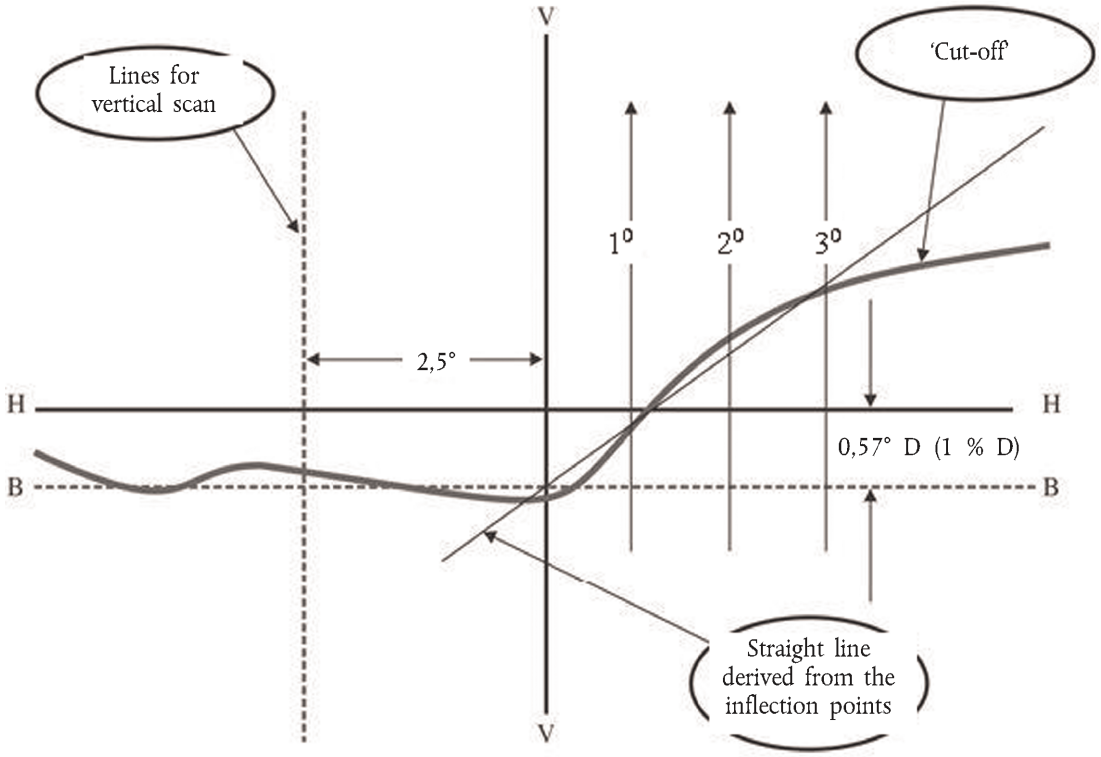
Three vertical lines shall be scanned from 2° D to 2° U at 1°R, 2°R, and 3°R after the lamp has been aimed vertically. The respective maximum gradients 'G' determined using the formula:

$$G = (\log E_{\beta} - \log E_{(\beta + 0{,}1°)})$$

where β is the vertical position in degrees, shall not be less than 0,08. The inflection points found on the three lines shall be used to derive a straight line. The intersection of this line and the line B found while performing vertical aim shall be placed on the V line.

Figure 3

Instrumental vertical and horizontal adjustment — Three line scan method



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

ANNEX 10

REQUIREMENTS FOR LED MODULES AND HEADLAMPS INCLUDING LED MODULES

1. General specifications

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

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

1.3. LED module(s) shall be tamperproof.

1.4. The design of removable LED module(s) shall be such that:

1.4.1. When the LED module is removed and replaced by another module provided by the applicant and bearing the same light source module identification code, the photometric specifications of the headlamp shall be met;

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

2. Manufacture

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

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

3. Test conditions

3.1. Application

3.1.1. All samples shall be tested as specified in paragraph 4. below.

3.1.2. The kind of light sources on a LED module shall be light-emitting diodes (LED) as defined in Regulation No 48 paragraph 2.7.1 in particular with regard to the element of visible radiation. Other kinds of light sources are not permitted.

3.2. Operating conditions

3.2.1. LED module operating conditions

All samples shall be tested under the conditions as specified in paragraphs 6.1.4 and 6.1.5 of this Regulation. If not specified differently in this annex LED modules shall be tested inside the headlamp as submitted by the manufacturer.

3.2.2. Ambient temperature

For the measurement of electrical and photometric characteristics, the headlamp shall be operated in a dry and still atmosphere at an ambient temperature of 23 °C ± 5 °C.

3.3. Ageing

Upon the request of the applicant the LED module shall be operated for 15 h and cooled down to ambient temperature before starting the tests as specified in this Regulation.

4. Specific requirements and tests

4.1. Colour rendering

4.1.1. Red content

In addition to measurements as described in paragraph 7. of this Regulation:

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

$$k_{red} = \frac{\int_{\lambda=610\ nm}^{780\ nm} E_e(\lambda)\ V(\lambda)\ d\lambda}{\int_{\lambda=380\ nm}^{780\ nm} E_e(\lambda)\ V(\lambda)\ d\lambda} \rightleftharpoons 0{,}05$$

where:

$E_e(\lambda)$ (unit: W) is the spectral distribution of the irradiance;

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

(λ) (unit: nm) is the wavelength.

This value shall be calculated using intervals of one nanometre.

4.2. UV-radiation

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

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

where:

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

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

(For definitions of the other symbols see paragraph 4.1.1 above).

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

Table UV

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

λ	S(λ)	λ	S(λ)	λ	S(λ)
250	0,430	305	0,060	355	0,00016
255	0,520	310	0,015	360	0,00013
260	0,650	315	0,003	365	0,00011
265	0,810	320	0,001	370	0,00009
270	1,000	325	0,00050	375	0,000077
275	0,960	330	0,00041	380	0,000064
280	0,880	335	0,00034	385	0,000053
285	0,770	340	0,00028	390	0,000044
290	0,640	345	0,00024	395	0,000036
295	0,540	350	0,00020	400	0,000030
300	0,300				

4.3. Temperature stability

4.3.1. Illuminance

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

Test points to be measured:

Passing-beam 25 R

Driving-beam HV

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

4.3.1.3. Calculate the ratio between the photometric test point value determined in paragraph 4.3.1.1 above and the point value determined in paragraph 4.3.1.2 above.

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

4.3.1.5. The luminous intensity values, measured after one minute and after photometric stability has occurred, shall comply with the minimum and maximum requirements.

4.3.2. Colour

The colour of the light emitted measured after one minute and measured after photometric stability has been obtained, as described in paragraph 4.3.1.2 of this annex, shall both be within the required colour boundaries.

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

5.1. The LED module(s) shall be in the configuration as described in the technical specification as defined in paragraph 2.2.2 of this Regulation. Optical elements (secondary optics) shall be removed by the Technical Service at the request of the applicant by the use of tools. This procedure and the conditions during the measurements as described below shall be described in the test report.

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

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

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

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

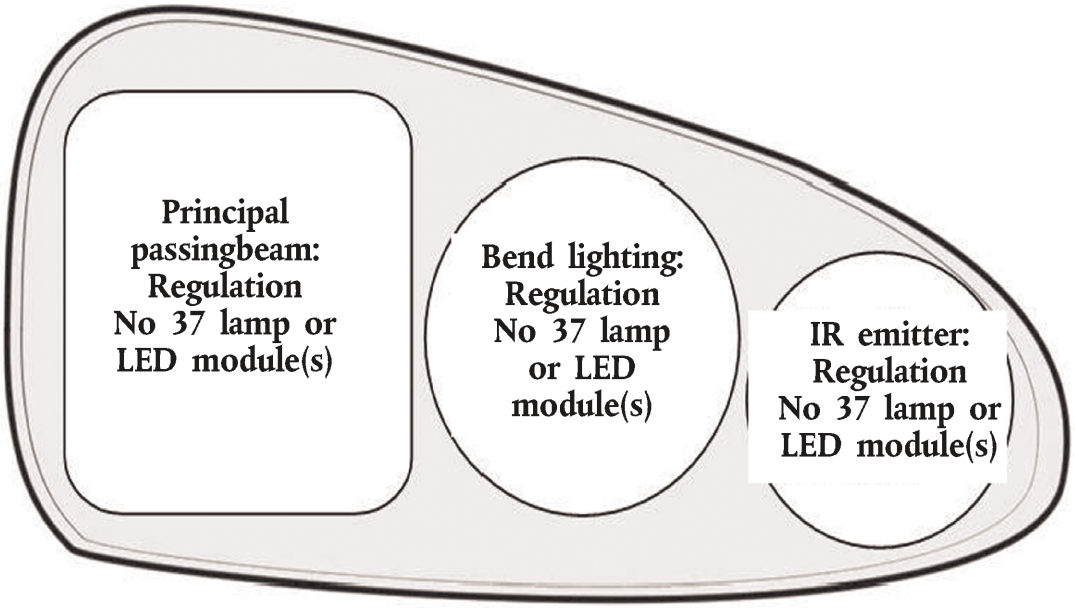
The LED module shall be burned in for approximately one hour in the closed sphere or goniophotometer.

The flux shall be measured after stability has occurred, as explained in paragraph 4.3.1.2 of this annex to this Regulation.

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

ANNEX 11

A GENERAL ILLUSTRATION FOR PRINCIPAL PASSING-BEAM AND BEAM CONTRIBUTORS AND CORRELATED LIGHT SOURCE OPTIONS



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