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

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(Acts whose publication is obligatory)

Regulation No 20 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 halogen filament lamps (H4 lamps)⁽¹⁾

A. ADMINISTRATIVE PROVISIONS

SCOPE⁽²⁾

This Regulation applies to motor vehicle headlamps which may incorporate lenses of glass or plastic material.

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'

are 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. However, the fitting or elimination of filters intended solely to change the colour of the beam but not its light distribution does not entail a change of type;

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 materials constituting the lenses and coating, if any.

⁽¹⁾ Regulation of the United States Nations Economic Commission for Europe published pursuant to the provisions of Article 4(5) of Council Decision 97/836/EC (OJ L 346, 17.12.1997, p. 78).

⁽²⁾ 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. APPLICATION FOR APPROVAL OF A HEADLAMP⁽¹⁾
 - 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.
 - 2.2. 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 reserved for the approval mark;
 - 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 plan of the vehicle, if the headlamp is for use in that (those) position(s) only;
 - 2.2.2. a brief technical description;
 - 2.2.3. two samples of the type of headlamp;
 - 2.2.3.1. for the testing of a coloured filter or coloured screen (or of a coloured lens): two samples.
 - 2.2.4. For the test of plastic material of which the lenses are made:
 - 2.2.4.1. thirteen lenses;
 - 2.2.4.1.1. six of these lenses may be replaced by six 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.
 - 2.3. 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.
 - 2.4. The competent authority shall verify the existence of satisfactory arrangements for ensuring effective control on conformity of production before type approval is granted.

⁽¹⁾ Application for approval of a filament lamp: see Regulation No 37.

3. MARKINGS⁽¹⁾

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⁽²⁾, 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 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 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.

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 (at present 02) 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, except if the approval is extended to a device which only differs from the already approved device by 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 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 shown 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 approval 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 4.2.4.3 shall be affixed in the spaces referred to in paragraph 3.2 above to every headlamp conforming to a type approved under this Regulation.

⁽¹⁾ In the case of headlamps designed to meet the requirements of traffic moving on one side of the road only (either right or left), it is further recommended that the area which can be occulted to prevent discomfort to 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 should be outlined indelibly on the front lens. This marking is not necessary, however, where the area is clearly apparent from the design.

⁽²⁾ If the lens cannot be detached from the main body of the headlamp, a space on the lens shall be sufficient.

4.2. *Composition of the approval mark*

The approval mark shall consist of:

4.2.1. An international approval marking, 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, a horizontal arrow with a head on each end, the heads pointing respectively to the left and to the right;

4.2.2.3. on headlamps meeting the requirements of this Regulation in respect of the passing beam only, the letters 'HC';

4.2.2.4. on headlamps meeting the requirements of this Regulation in respect of the driving beam only, the letters 'HR';

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 'HCR';

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 6.3.2.1.2, placed near the circle surrounding the letter 'E';

In the case of reciprocally incorporated 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 6 and the permitted voltage(s) according to paragraph 1.1.1.2 of annex 6 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 of the passing beam shall not be lit simultaneously with that of any other lighting function with which it may be reciprocally incorporated: an oblique stroke (/) shall be placed behind the passing lamp symbol in the approval mark.

⁽¹⁾ 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech Republic, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24 and 25 (vacant), 26 for Slovenia and 27 for Slovakia, 28 for Belarus, 29 for Estonia, 30 (vacant), 31 for Bosnia and Herzegovina, 32-36 (vacant) and 37 for Turkey. Subsequent numbers will be assigned to other countries in the chronological order in which they ratify or accede to the Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, and the numbers thus assigned shall be communicated to the Contracting Parties to the Agreement by the Secretary-General of the United Nations.

- 4.2.3.2. On headlamps 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.
- 4.2.4. The two digits of the approval number (at present 02) 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 and 4.2.2 above shall be clearly legible and be indelible even when the headlamp is fitted in the vehicle.
- 4.3. *Arrangement of the approval mark*
- 4.3.1. *I n d e p e n d e n t l a m p s*
- Annex 3, figures 1 to 9, to this Regulation gives examples of arrangements of the approval mark with the above-mentioned additional symbols.
- 4.3.2. *G r o u p e d , c o m b i n e d o r r e c i p r o c a l l y i n c o r p o r a t e d l a m p s*
- 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 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 (see four possible examples in annex 3).
- 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 10, 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. Annex 3, figure 11, 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.

- 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 passing beam and a headlamp providing a driving beam, each equipped with its own filament lamp, are assembled to form a composite unit the adjusting device shall enable each optical system individually to be duly adjusted.

- 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 shall apply.

- 5.3. The components by which the filament lamp is fixed to the reflector shall be so made that, even in darkness, the filament lamp can be fixed in no position but the correct one ⁽²⁾.

The filament lamp holder shall conform to the characteristics given on data sheet 7005-39-1 of IEC Publication 61-2, third edition, 1969.

- 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 at a given angle 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, the components for attaching the filament lamp to the reflector must be so designed and made that, in each of its two settings, the filament lamp 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.

⁽¹⁾ Technical requirements for filament lamps: see Regulation No 37.

⁽²⁾ A headlamp is regarded as satisfying the requirements of this paragraph if the filament lamp can be easily fitted into the headlamp and the feather keys can be correctly fitted into their slots even in darkness.

5.5. Complementary tests shall be done according to the requirements of annex 5 to ensure that in use there is no excessive change in photometric performance.

5.6. If the lens of the headlamp is of plastic material, tests shall be done according to the requirements of annex 6.

6. ILLUMINATION

6.1. General provisions

6.1.1. Headlamps shall be so made that with suitable H4 filament lamps they give adequate illumination without dazzle when emitting the passing beam, and good illumination when emitting the driving beam.

6.1.2. The illumination produced by the headlamp shall be determined by means of a vertical screen set up 25 m forward of the headlamp and at right angles to its axes as shown in annex 4 to this Regulation.

6.1.3. The headlamps shall be checked by means of an uncoloured standard (reference) filament lamp designed for a rated voltage of 12 V. In the case of headlamps which may be fitted with selective-yellow filters⁽¹⁾ such filters shall be replaced by geometrically identical uncoloured filters with a transmission factor of at least 80 %. During the checking of the headlamp, the voltage at the terminals of the filament lamp must be regulated so as to obtain the following characteristics:

	Consumption in watts	Light flux in lumens
passing filament	About 55	750
driving filament	About 60	1 250

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

6.1.4. The dimensions determining the position of the filaments inside the standard filament lamp are shown in the relevant data sheets of Regulation No 37.

6.1.5. The bulb of the standard filament lamp must be of such shape and optical quality that it does not cause any reflection or refraction adversely affecting the light distribution. Compliance with this requirement shall be checked by measuring the light distribution obtained when a standard (reference) headlamp is fitted with the standard (reference) filament lamp (see paragraph 9 below).

6.2. Provisions concerning passing beams

6.2.1. The passing beam must produce a sufficiently sharp 'cut-off' to permit a satisfactory adjustment with its aid. The 'cut-off' must be a horizontal straight line on the side opposite to the direction of the traffic for which the headlamp is intended; on the other side, it must not extend beyond either the broken line HV H1 H4 formed by a straight line HV H1 making a 45° angle with the horizontal and the straight line H1 H4, 25 cm above the straight line hh, or the straight line HV H3, inclined at an angle of 15° above the horizontal (see annex 4). A 'cut-off' extending beyond both line HV H2 and line H2H4 and resulting from a combination of the two above possibilities shall in no circumstances be permitted.

⁽¹⁾ These filters shall consist of all components, including the lens, intended to colour the light (except those forming part of the filament lamp itself).

- 6.2.2. The headlamp shall be so aimed that
- 6.2.2.1. in the case of headlamps designed to meet the requirements of right-hand traffic, the 'cut-off' on the left-half of the screen⁽¹⁾ is horizontal and, in the case of headlamps designed to meet the requirements of left-hand traffic, the 'cut-off' on the right-half of the screen is horizontal;
- 6.2.2.2. this horizontal part of the 'cut-off' is situated on the screen 25 cm below the level hh (see annex 4);
- 6.2.2.3. the 'elbow' of the 'cut-off' is on line vv⁽²⁾.
- 6.2.3. When so aimed, the headlamp need, if its approval is sought solely for provision of a passing beam⁽³⁾, comply only with the requirements set out in paragraphs 6.2.5 to 6.2.7 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 6.5.5 to 6.2.7 and 6.3.
- 6.2.4. Where a headlamp so aimed does not meet the requirements set out in paragraphs 6.2.5 to 6.2.7 and 6.3, its alignment may be changed, provided that the axis of the beam is not displaced laterally by more than 1° (= 44 cm) to the right or left⁽⁴⁾. To facilitate alignment by means of the 'cut-off', the headlamp may be partially occulted in order to sharpen the 'cut-off'.
- 6.2.5. The illumination produced on the screen by the passing beam shall meet the following requirements:

Point on measuring screen				Required illumination in lux
Headlamps for right-hand traffic		Headlamps for left-hand traffic		
Point B	50 L	Point B	50 R	≤ 0,4
Point 75	50 R	Point 75	50 L	≥ 12
Point 75	50 L	Point 75	50 R	≤ 12
Point 50	50 L	Point 50	50 R	≤ 15
Point 50	50 R	Point 50	50 L	≥ 12
Point 50	50 V	Point 50	50 V	≥ 6
Point 25	50 L	Point 25	50 R	≥ 2
Point 25	50 R	Point 25	50 L	≥ 2
Any point in zone III				≤ 0,7
Any point in zone IV				≥ 3
Any point in zone I ≤ 2 x (E 50 R or E 50 L) (*)				
(*) E 50 R and E 50 L are the illuminations actually measured.				

⁽¹⁾ The test screen must be sufficiently wide to allow examination of the 'cut-off' over a range of at least 5° on either side of the line vv.

⁽²⁾ If the beam does not have a cut-off with a clear 'elbow', the lateral adjustment shall be effected in the manner which best satisfies the requirements for illumination at points 75 R and 50 R for right-hand traffic and for points 75 L and 50 L for left-hand traffic.

⁽³⁾ Such a special 'passing beam' headlamp may incorporate a driving beam not subject to requirements.

⁽⁴⁾ The limit of realignment of 1° towards the right or left is not incompatible with the upward or downward vertical realignment. The latter is limited only by the requirements of paragraph 6.3. However, the horizontal part of the 'cut-off' should not extend beyond the line hh (the provisions of paragraph 6.3 are not applicable to headlamps intended to meet the requirements of this Regulation only for provision of a passing beam).

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

6.2.7. The illumination values in zones 'A' and 'B' as shown in figure C in annex 4 shall be checked by the measurement of the photometric values of points 1 to 8 on this figure; these values shall lie within the following limits:

$$1 + 2 + 3 \geq 0,3 \text{ lux, and}$$

$$4 + 5 + 6 \geq 0,6 \text{ lux, and}$$

$$0,7 \text{ lux} \geq 7 \geq 0,1 \text{ lux and}$$

$$0,7 \text{ lux} \geq 8 \geq 0,2 \text{ lux}^{(1)}$$

These new values shall not be required for headlamps which have been approved before the application date of Supplement 3 to the 02 series of amendments to this Regulation (2 December 1992) nor to the extensions of such approvals.

6.2.8. 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 of the filament lamp, meet the requirements set forth above for the corresponding direction of traffic.

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 illumination produced on the screen by the driving beam shall be taken with the same headlamp alignment as for measurements under paragraphs 6.2.5 to 6.2.7 above; in the case of a headlamp providing a driving beam only, it shall be so adjusted that the area of maximum illumination is centred on the point of intersection of lines hh and vv; 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 illumination (EM).

6.3.2. The illumination produced on the screen by the driving beam shall meet the following requirements.

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

6.3.2.1.1. The maximum intensity (IM) of the driving beam expressed in thousands of candelas shall be calculated by the formula:

$$I_M = 0,625 E_M$$

6.3.2.1.2. The reference mark (I'M) of this maximum intensity, referred to in paragraph 4.2.2.7 above, shall be obtained by the ratio:

$$I'_M = I_M / 3 = 0,208 E_M$$

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.

⁽¹⁾ Illumination values in any point of zones A and B, which also lies within zone III, shall not exceed 0,7 lux.

6.3.2.2. Starting from point HV, horizontally to the right and left, the illumination shall be not less than 24 lux up to a distance of 1,125 m and not less than 6 lux up to a distance of 2,25 m.

6.4. In the case of headlamps with an 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 realised on the test goniometer with respect to a line joining the centre of the light source and point HV on the 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 degrees 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 75R (75L respectively);

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

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 the 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 tests of paragraph 6.4.3 shall be made with the reflector moved into its extreme positions (instead of $\pm 2^\circ$) by means of the headlamps adjusting device.

6.5. The screen illumination values mentioned in paragraphs 6.2.5 to 6.2.7 and 6.3 shall be measured by means of a photo-receptor, the effective area of which shall be contained within a square of 65 mm side.

7. PROVISIONS CONCERNING COLOURED LENSES AND FILTERS

7.1. Approval may be obtained for headlamps emitting either white or selective-yellow lights with an uncoloured filament lamp.

Expressed in CIE trichromatic coordinates, the corresponding colorimetric characteristics for yellow lenses or filters are as follows:

Selective-yellow filter (screen or lens)

Limit towards red $y \geq 0,138 + 0,58 x$

Limit towards green $y \geq 1,29 x - 0,1$

Limit towards white $y \leq -x + 0,966$

Limit towards spectral value $y \leq -x + 0,992$

which can also be expressed as follows:

dominant wave-length 575-585 nm

purity factor 0,90-0,98

The transmission factor must be $\geq 0,78$. The transmission factor shall be determined by using a light source with a colour temperature of 2,856 K⁽¹⁾.

- 7.2. The filter must be part of the headlamp, and must be attached to it in such a way that the user cannot remove it either inadvertently or, with ordinary tools, intentionally.

8. GAUGING OF DISCOMFORT

The discomfort caused by the passing beam of headlamps shall be gauged⁽²⁾.

9. STANDARD (REFERENCE) HEADLAMP⁽³⁾

A headlamp shall be deemed to be a standard (reference) headlamp if it

- 9.1. satisfies the above-mentioned requirements for approval;
- 9.2. has an effective diameter of not less than 160 mm;
- 9.3. provides, with a standard (reference) filament lamp, at the various points and in the various zones referred to in paragraph 6.2.5, illumination equal to:
- 9.3.1. not more than 90 % of the maximum limits, and
- 9.3.2. not less than 120 % of the minimum limits, prescribed in the table in paragraph 6.2.5.

10. OBSERVATION CONCERNING COLOUR

Since any approval under this Regulation is granted, pursuant to paragraph 7.1 above, for a type of headlamp emitting either white light or selective-yellow light, article 3 of the Agreement to which the Regulation is annexed shall not prevent the Contracting Parties from prohibiting headlamps emitting a beam of white or selective-yellow light on vehicles registered by them.

C. FURTHER ADMINISTRATIVE PROVISIONS

11. MODIFICATION OF THE HEADLAMP TYPE AND EXTENSION OF APPROVAL

- 11.1. Every modification of the headlamp type shall be notified to the administrative department which approved the headlamp type. The said department may then either:
- 11.1.1. 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
- 11.1.2. Require a further test report from the technical service responsible for conducting the tests.

⁽¹⁾ Corresponding to illuminant A of the international commission on illumination (CIE).

⁽²⁾ This requirement will be the subject of a recommendation to administrations.

⁽³⁾ Different values may be accepted provisionally. In the absence of definitive specifications, the use of an approved headlamp is recommended.

- 11.2. 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.
- 11.3. 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.
12. CONFORMITY OF PRODUCTION
- 12.1. 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.
- 12.2. In order to verify that the requirements of paragraph 12.1 are met, suitable controls of the production shall be carried out.
- 12.3. The holder of the approval shall in particular:
- 12.3.1. ensure the existence of procedures for the effective control of the quality of products;
- 12.3.2. have access to the control equipment necessary for checking the conformity to each approved type;
- 12.3.3. 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;
- 12.3.4. 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;
- 12.3.5. ensure that for each type of product at least the tests prescribed in Annex 5 to this Regulation are carried out;
- 12.3.6. 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-established the conformity of the corresponding production.
- 12.4. The competent authority which has granted type approval may at any time verify the conformity control methods applicable to each production unit.
- 12.4.1. In every inspection, the test books and production survey records shall be presented to the visiting inspector.
- 12.4.2. 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.
- 12.4.3. When the quality level appears unsatisfactory or when it seems necessary to verify the validity of the test carried out in the application of paragraph 12.4.2 above, the inspector shall select samples, to be sent to the technical service which has conducted the type approval tests, using the criteria of Annex 7.

- 12.4.4. The competent authority may carry out any test prescribed in this Regulation. These tests will be on the samples selected at random without causing distortion of the manufacturer's delivery commitments and in accordance with the criteria of Annex 7.
- 12.4.5. 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.
- 12.5. Headlamps with apparent defects are disregarded.
- 12.6. The references mark is disregarded.
13. PENALTIES FOR NON-CONFORMITY OF PRODUCTION
- 13.1. 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.
- 13.2. 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.
14. PRODUCTION DEFINITELY 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.
15. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS
- 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 administrative departments 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.
-

ANNEX I

Communication

[maximum format: A4 (210 × 297 mm)]



issued by: Name of administration

.....

.....

.....

concerning ⁽²⁾: APPROVAL GRANTED

APPROVAL EXTENDED

APPROVAL REFUSED

APPROVAL WITHDRAWN

PRODUCTION DEFINITELY DISCONTINUED

of a type of headlamp pursuant to Regulation No 20

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 test report:

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

(²) Strike out what does not apply.

- 8. Number of test report:
- 9. Brief description:
Category as described by the relevant marking ⁽¹⁾
Colour of light emitted: white/selective yellow ⁽²⁾
- 10. Position of the approval mark:
- 11. Reason(s) for extension (if applicable):
- 12. Approval granted/refused/extended/withdrawn ⁽²⁾
- 13. Place:
- 14. Date:
- 15. Signature:
- 16. 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⁾ Indicate the appropriate marking selected from the list below.

CR,	CR,	CR,	C/R,	C/R,	C/R,	C,	C,	C,	C/,	C/,	C/,	R CR PL,
CR PL,	CR PL,	CR PL,	C/R PL,	C/R PL,	C/R PL,	C PL,	C PL,	C PL,	C PL,	C PL,	C PL,	
C PL,	C PL,	C PL,	C/PL,	C/PL,	C/PL,	RPL						

⁽²⁾ Strike out what does not apply.

ANNEX 2

Examples of arrangements of approval marks

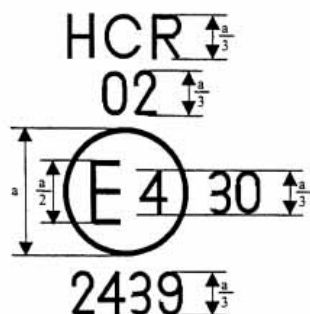


Figure 1

$a = 12 \text{ mm min}$

The headlamp bearing the approval marking shown above is a headlamp approved in the Netherlands (E4), under approval number 2439, meeting the requirements of this Regulation, as amended by the 02 series of amendments (02), in respect of both the driving beam and the passing beam (HCR) and which is designed for right-hand traffic only.

The figure 30 indicates that the maximum intensity of the driving beam is between 86 250 and 101 250 candelas.

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.

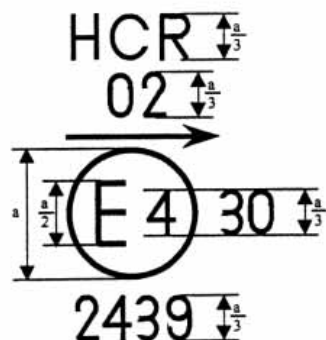


Figure 2

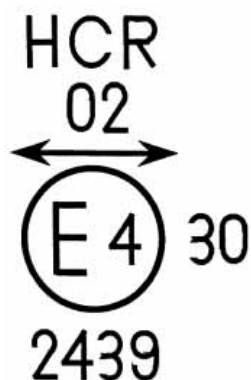


Figure 3 a

$a = 12 \text{ mm min}$



Figure 3 b

The headlamp bearing the approval marking shown above is a headlamp meeting the requirements of this Regulation with respect to both the passing beam and the driving beam and designed:

- For left-hand traffic only,
- For both traffic systems, by means of an adjustment as desired of the setting of the optical unit or the filament lamp.

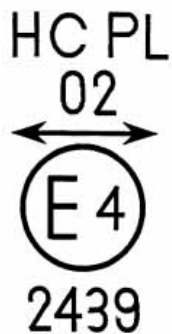


Figure 4

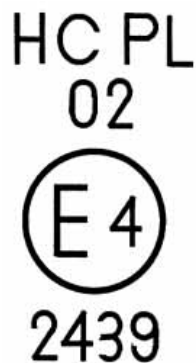


Figure 5

The headlamp bearing the approval mark shown above is a headlamp incorporating the lens of plastic material meeting the requirements of this Regulation with respect to the passing beam only, and designed:

- For both traffic systems.
- For right-hand traffic only.

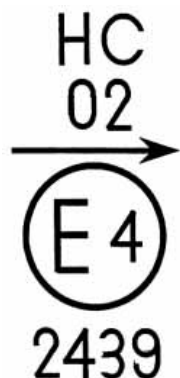


Figure 6

The headlamp bearing the approval mark shown above is a headlamp meeting the requirements of this Regulation:

- With respect to the passing beam only, and designed for left-hand beam traffic only.
- With respect to the driving beam only.



Figure 7

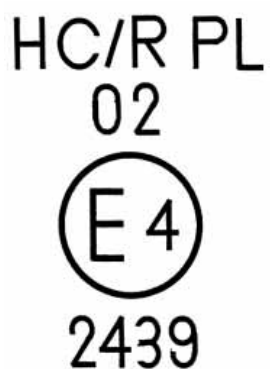


Figure 8

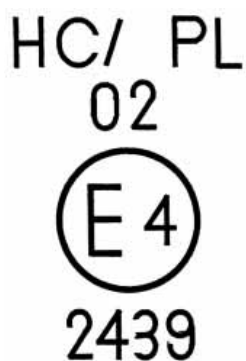


Figure 9

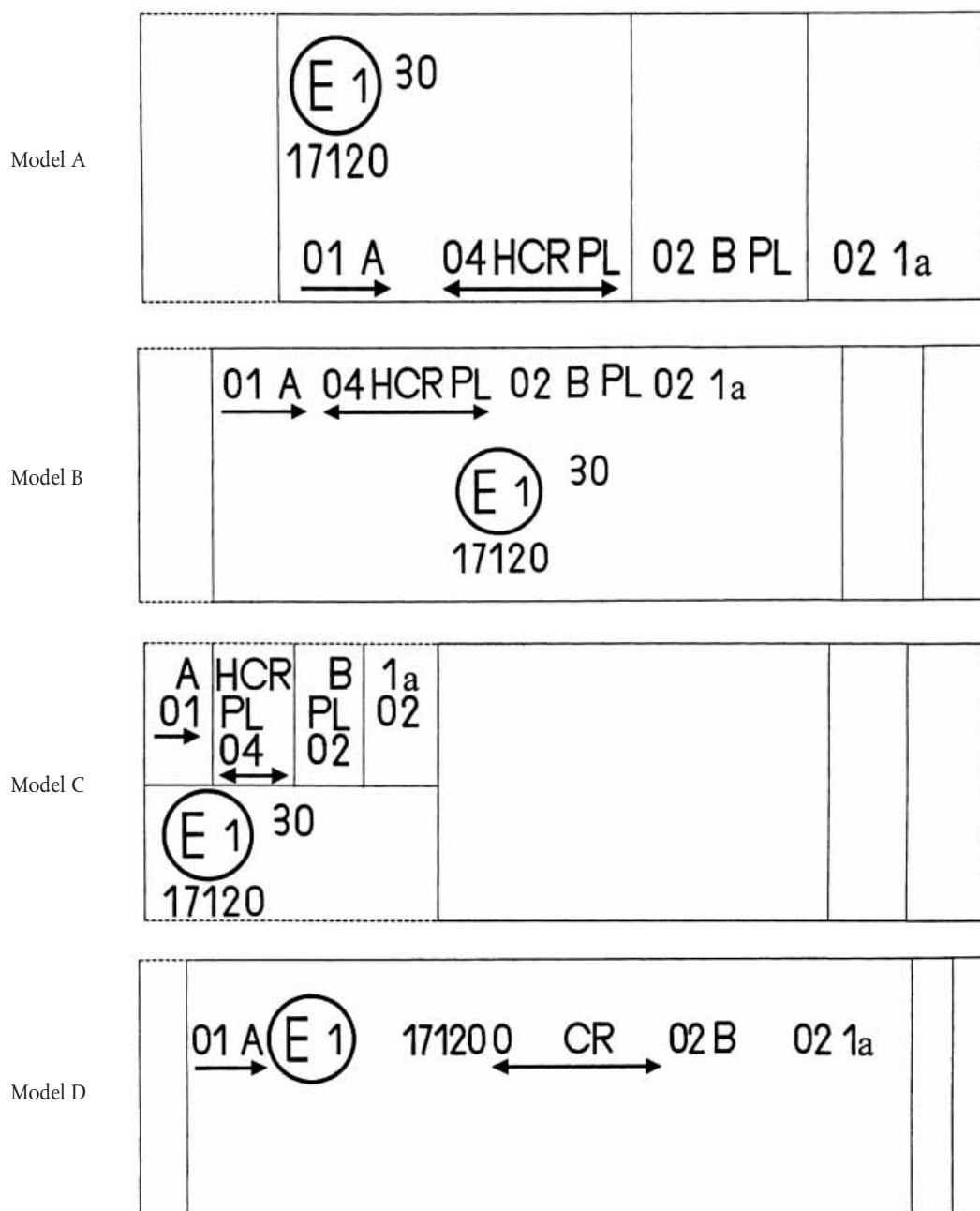
Identification of a headlamp incorporating the lens of plastic material meeting the requirements of Regulation No 20:

- For both the passing beam and the driving beam and designed for right-hand traffic only,
- For the passing beam only and designed for left-hand traffic only.

The passing lamp filament shall not be lit simultaneously with the driving lamp filament and/or any other headlamp with which it is reciprocally incorporated. Simplified marking for grouped, combined or reciprocally incorporated lamps

Figure 10

(The vertical and horizontal lines schematise the shape of the light-signalling device. They are not part of the approval mark).



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

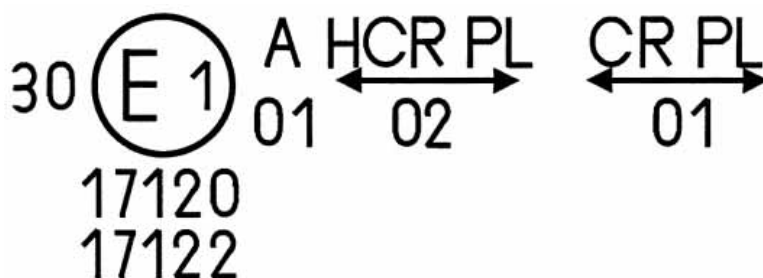
- A front position lamp approved in accordance with the 01 series of amendments to Regulation No 7;
- A headlamp with a passing beam designed for right-hand and left-hand traffic and a driving beam with a maximum intensity comprised between 86 250 and 101 250 candelas (as indicated by the number 30), approved in accordance with the 02 series of amendments to Regulation No 20 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 02 series of amendments to Regulation No 6.

Lamp reciprocally incorporated with a headlamp

Figure 11

Example 1



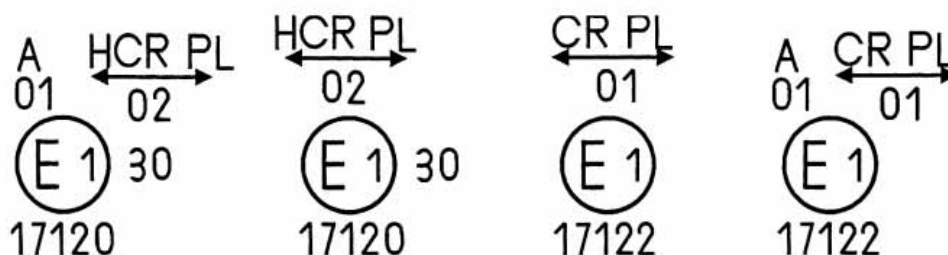
The above example corresponds to the marking of a lens of plastic material intended to be used in different types of headlamps, namely:

either: a headlamp 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 Germany (E1) in accordance with the requirements of Regulation No 20 as amended by the 02 series of amendments, which is reciprocally incorporated with a front position lamp approved in accordance with the 01 series of amendments to Regulation No 7;

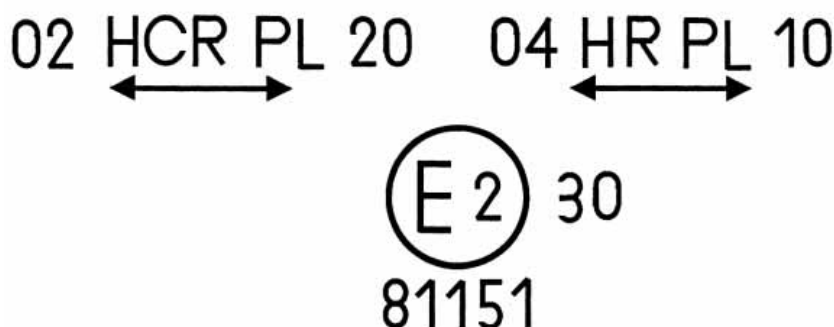
or: a headlamp with a passing beam designed for right-hand and left-hand traffic and a driving beam, approved in Germany (E1) in accordance with the requirements of Regulation No 1 as amended by the 01 series of amendments, which is reciprocally incorporated with the same front position lamp as above;

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



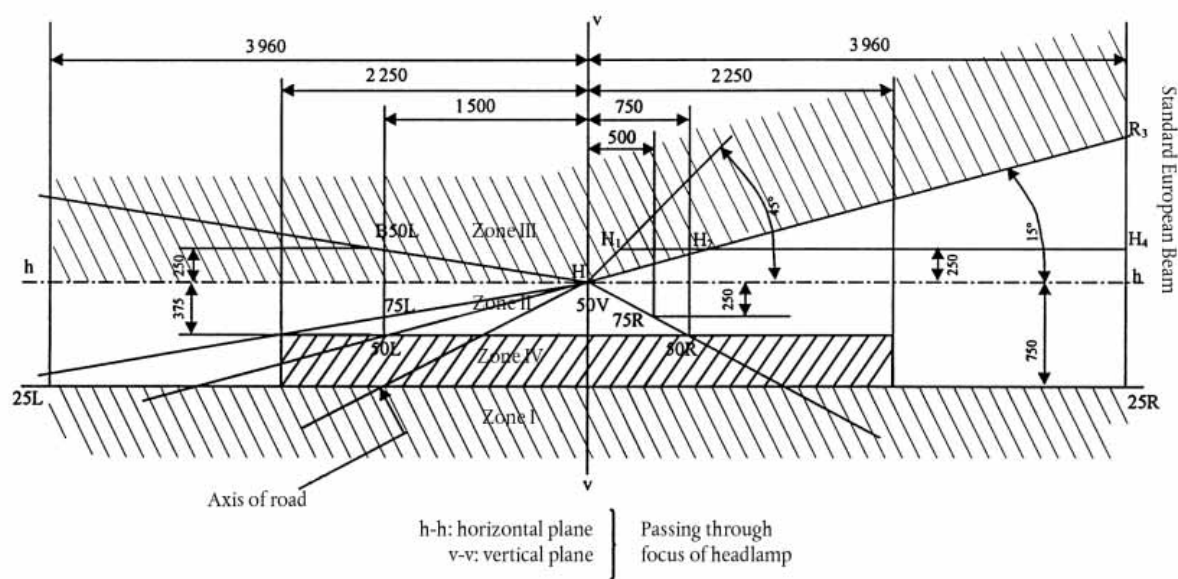
The above example corresponds to the marking of a lens of plastic material used in an assembly of two headlamps approved in France (E2), consisting of a headlamp emitting a passing beam designed for both traffic systems and of a driving beam with a maximum intensity comprised between x and y candelas, meeting the requirements of Regulation No 20, and of a headlamp emitting a driving beam with a maximum intensity comprised between w and z candelas, meeting the requirements of Regulation No 8 or Regulation No 20, the maximum intensity of all the driving beams being comprised between 86 250 and 101 250 candelas.

ANNEX 3

Measuring screen

A. Headlamp for right-hand traffic (Dimensions in mm)

Standard European Beam



B. Headlamp for left-hand traffic (Dimensions in mm)

Standard European Beam

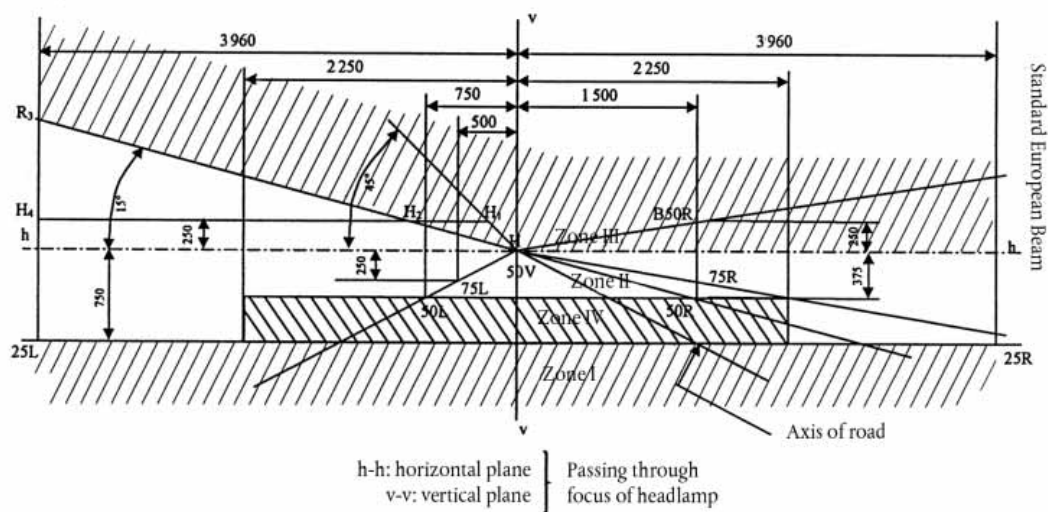
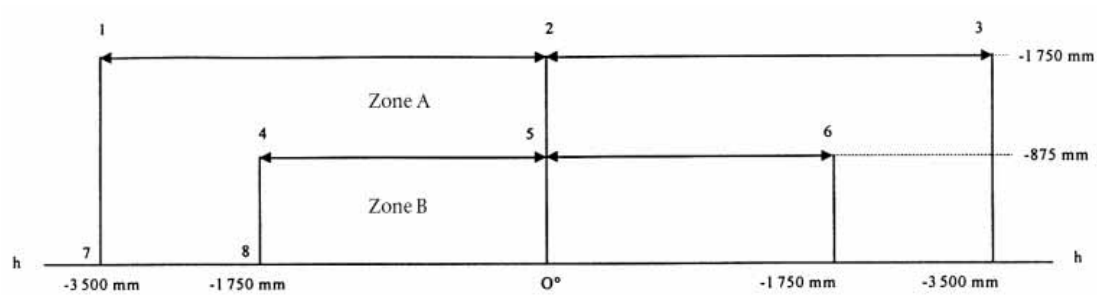


Figure C



Note: Figure C shows the measuring points for right-hand traffic. Points 7 and 8 move to their corresponding location at the right-hand side of the picture for left-hand traffic.

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 Emax 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.

1. TEST FOR STABILITY OF PHOTOMETRIC PERFORMANCE

The tests shall be carried out in a dry and still atmosphere at an ambient temperature of $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$, the complete headlamp being mounted on a base representing the correct installation on the vehicle.

1.1. *Clean headlamp*

The headlamp shall be operated for 12 hours as described in subparagraph 1.1.1. checked as prescribed in subparagraph 1.1.2.

1.1.1. Test procedure

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) is to be approved, the corresponding filament is lit for the prescribed time⁽¹⁾,
- (b) In the case of a reciprocally incorporated passing lamp and driving lamp (dual filament lamp or two filament lamps):
- If the applicant declares that the headlamp is to be used with a single filament lit⁽²⁾ at a time, the test shall be carried out in accordance with this condition, activating⁽¹⁾ each specified function successively for half the time specified in paragraph 1.1. In all other cases⁽²⁾ ⁽¹⁾, the headlamp shall be subjected to the following cycle until the time specified is reached:
 - 15 minutes, passing-beam filament lit
 - 5 minutes, all filaments lit;
- (c) In the case of grouped lighting functions all the individual functions shall be lit simultaneously for the time specified for individual lighting functions (a), also taking into account the use of reciprocally incorporated lighting functions (b), according to the manufacturer's specifications.

1.1.1.2. **Test voltage**

The voltage shall be adjusted so as to supply 90 per cent of the maximum wattage specified in the Regulation for filament lamps (Regulation No 37). The applied wattage shall in all cases comply with the corresponding value of a filament lamp of 12 V rated voltage, except if the applicant for approval specifies that the headlamp may be used at a different voltage. In the latter case, the test shall be carried out with the filament lamp whose wattage is the highest that can be used.

⁽¹⁾ When the tested headlamp is grouped and/or reciprocally incorporated with 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 operation mode with an on/ off time ratio of approximately one to one

⁽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.

1.1.2. Test results

1.1.2.1. **Visual inspection**

Once the headlamp has been stabilised 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 - HV for headlamps designed for right-hand traffic,

50 L - B 50 R - HV for headlamps designed for left-hand traffic.

Driving beam: point of Emax

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).

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 headlamp*

After being tested as specified in subparagraph 1.1 above, the headlamp shall be operated for one hour as described in subparagraph 1.1.1, after being prepared as prescribed in subparagraph 1.2.1, and checked as prescribed in subparagraph 1.1.2.

1.2.1. Preparation 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⁽¹⁾, 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⁾ 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% solution at 20° C.

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 ⁽¹⁾,

13 parts by weight of distilled water with a conductivity of ≤ 1 ms/m, and

2 ± 1 parts by weight of surface-actant ⁽²⁾

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 % of the values measured for each following point under the conditions described in this annex:

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

50 R and 50 V ⁽³⁾ for a passing lamp only, designed for right-hand traffic,

50 L and 50 V ⁽³⁾ for a passing lamp only, designed for left-hand traffic.

1.2.1.3. **Measuring equipment**

The measuring equipment shall be equivalent to that used during headlamp approval tests. A standard (reference) filament lamp shall be used for the photometric verification.

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 passing lamp.

The headlamp tested in accordance with paragraph 1, shall be subjected to the test described in 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 $23^\circ\text{C} \pm 5^\circ\text{C}$.

Using a mass production filament lamp which has been aged for at least one hour the headlamp shall be operated on passing beam without being dismantled from or readjusted in relation to its test fixture. (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 vv 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 (r3) and 60 minutes (r60) respectively after operation.

⁽¹⁾ 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% solution at 20° C.

⁽²⁾ The tolerance on quantity is due to the necessity of obtaining a dirt that correctly spreads out on all the plastic lens.

⁽³⁾ Point 50 V is situated 375 mm below HV on the vertical line V-V on the screen at 25 m distance.

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 in milliradians (mrad) shall be considered as acceptable for a passing lamp, only when the absolute value $\Delta r_I = |r_3 - r_{60}|$ recorded on the headlamp is not more than 1,0 mrad ($\Delta r_I \leq 1,0$ mrad).

2.2.2. However, if this value is more than 1,0 mrad but not more than 1,5 mrad ($1,0 \text{ mrad} < \Delta r_I \leq 1,5 \text{ mrad}$) a second 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 stabilise 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),

Period of rest for one hour.

The headlamp type shall be considered as 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 1,0 mrad.

$$[(\Delta r_I + \Delta r_{II}) / 2] \leq 1,0 \text{ mrad}$$

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 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 headlamps shall not be contested if, when testing photometric performances of any headlamp chosen at random and equipped with a standard filament lamp:
 - 1.2.1. no measure value deviates unfavourably by more than 20 % from the values prescribed in this Regulation.

For values B 50 L (or R) and zone III, the maximum unfavourable deviation may be respectively:

B 50 L (or R): 0,2 lx equivalent 20 %

0,3lx equivalent 30 %

Zone III: 0,3 lx equivalent 20 %

0,45 lx equivalent 30 %
 - 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 + 0,2 lx) 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 + 0.1 lx), 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 Emax, a tolerance of + 20 % for maximum values and -20 % 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 tests 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⁽²⁾.
 - 1.2.4. If the results of the tests described above do not meet the requirements, tests of the headlamp shall be repeated using another standard 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.

⁽¹⁾ Letters in brackets refer to headlamps intended for left hand traffic.

⁽²⁾ See the corresponding footnote in the text of the Regulation.

If this value exceeds 1,5 mrad but is not more than 2,0 mrad, a second headlamp shall be subjected to the test after which the mean of absolute values recorded on both samples shall not exceed 1,5 mrad.

- 1.4. The chromaticity coordinates shall be complied with when the headlamp is equipped with a filament lamp set to Standard A colour temperature.

The photometric performance of a headlamp emitting selective yellow light when equipped with a colourless filament lamp 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 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 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 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 headlamp shall be subjected to photometric measurements at the points provided for in the Regulation, the reading being limited to points Emax, HV⁽¹⁾ HL, HR⁽²⁾ in the case of the 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 the acceptability of his products in order to meet the specifications laid down for verification of conformity of products in paragraph 12.1 of this Regulation.

The criteria governing the acceptability shall be such that, with a confidence level of 95 %, the minimum probability of passing a spot check in accordance with Annex 7 (first sampling) would be 0,95.

⁽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 on 'hh' located at 1,125 m 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 2.1-2.5 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 $40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and 85-95 % RH;
- 1 hour at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and 60-75 % RH;
- 15 hours at $-30\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$;
- 1 hour at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and 60-75 % RH;
- 3 hours at $80\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$;
- 1 hour at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and 60-75 % RH.

Before this test, the samples shall be kept at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and 60-75 % RH for at least four hours.

Note: The periods of one hour at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ 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 lamp, at the following points:

- B 50 L and 50 R for the passing beam of a passing lamp or a passing/driving lamp (B 50 R and 50 L in the case of headlamps intended for left-hand traffic);

— $E_{\max}$ route for the driving beam of a driving lamp or a passing/driving lamp.

2.1.2.2. Results

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

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 $1\,200\text{ W/m}^2 \pm 200\text{ W/m}^2$ for a period such that the luminous energy that they receive is equal to $4\,500\text{ MJ/m}^2 \pm 200\text{ MJ/m}^2$. Within the enclosure, the temperature measured on the black panel placed on a level with the samples shall be $50\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$. In order to ensure a regular exposure, the samples shall revolve around the source of radiation at a speed between 1 and 5 1/min.

The samples shall be sprayed with distilled water of conductivity lower than 1 mS/m at a temperature of $23\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$, 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.

2.2.2.1. Test mixture

The test mixture shall be composed of 61,5 % n-heptane, 12,5 % toluene, 7,5 % ethyl tetrachloride, 12,5 % trichloroethylene and 6 % xylene (volume 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/cm², 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 (Resistance to detergents) $23\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$.

Afterwards the samples shall be carefully rinsed with distilled water containing not more than 0,2 % impurities at $23\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$ 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 $d = (T_5 - T_4) / T_2$, 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 $50\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$ and then immersed for five minutes in a mixture maintained at $23\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$ and composed of 99 parts distilled water containing not more than 0,02 % impurities and one part alkylaryl sulphonate.

At the end of the test, the samples shall be dried at $50\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$. 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 % n-heptane and 30 % 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 2.2.4.1.1 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 % measured under the standardised 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 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 % 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 by more than 130 % the maximum values prescribed at points B 50 L and HV and not be more than 90 % 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).

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 recognised 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 para. 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 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)

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 (paragraph 2.1.2)										X	X	X	
1.1.1.	Temperature change (paragraph 2.1.1)										X	X	X	
1.1.2.	Limited photometry (paragraph 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 agent (2.2.1)	X	X	X										
1.3.1.	Transmission measurement	X	X	X										
1.4.	Chemicals agents (paragraph 2.2.2)	X	X	X										
1.4.1.	Diffusion measurement	X	X	X										
1.5.	Detergents (paragraph 2.3.1)				X	X	X							
1.6.	Hydrocarbons (paragraph 2.3.2)				X	X	X							
1.6.1.	Transmission measurement				X	X	X							
1.7.	Deterioration (paragraph 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 (paragraph 2.5)													X

B. Tests on complete lamps (supplied pursuant to paragraph 2.2.3 of this Regulation)

Tests		Complete headlamp	
		Sample No	
		1	2
2.1.	Deterioration (paragraph 2.6.1.1)	X	
2.2.	Photometry (paragraph 2.6.1.2)	X	
2.3.	Adherence (paragraph 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 $\beta/2 = 14^\circ$.

An annular diaphragm D_D with angles $\alpha_0/2 = 1^\circ$ and $\alpha_{\max}/2 = 12^\circ$ 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.

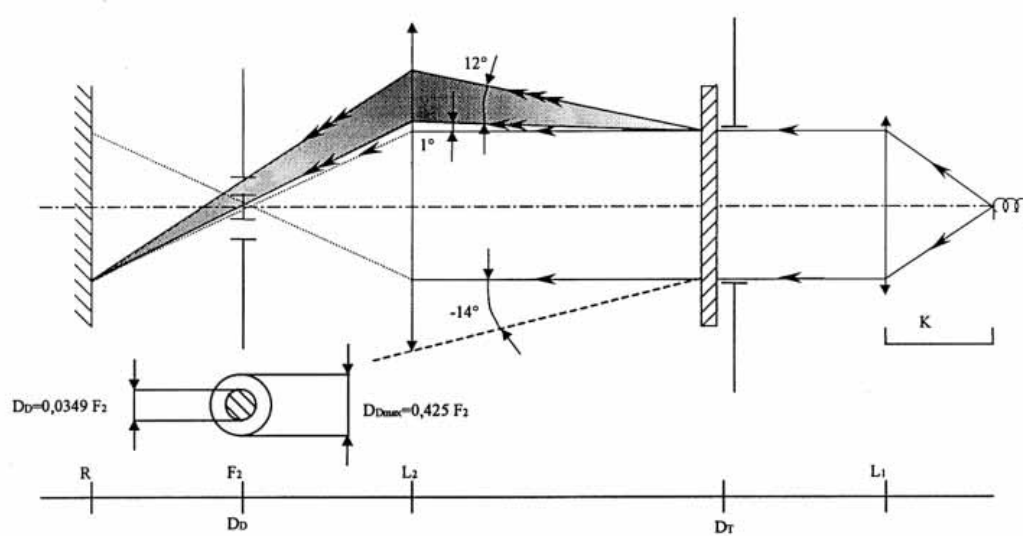
When the initial incident flux is referred to 1 000 units, the absolute precision of each reading shall be better than 1 unit.

2. MEASUREMENTS

The following readings shall be taken:

Reading	With sample	With central of D_D	Quantity represented
T1	No	No	Incident flux in initial reading
T2	Yes (before test)	No	Flux transmitted by the new material in a field of 24 °C
T3	Yes (after test)	No	Flux transmitted by the tested material in a field of 24 °C
T4	Yes (before test)	Yes	Flux diffused by the new material
T5	Yes (after test)	Yes	Flux diffused by the tested material

⁽¹⁾ For L_2 it is recommended to use a focal distance of about 80 mm.



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 $0,24 \pm 0,02$ 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 $\pm$ 50 mm in diameter on the surface exposed to deterioration, at a distance of 380 mm $\pm$ 10 mm from the nozzle.

1.2. **Test mixture**

The test mixture shall be composed of:

- 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;
- Water of hardness not exceeding 205g/m³ 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 4, is such that:

$$(\Delta d = T5 - T4)/T2 = 0,0250 \pm 0,0025.$$

Several reference samples may be used to check 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 $23\text{ °C} \pm 5\text{ °C}$ and $65 \pm 15\%$ 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 para. 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 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 $300\text{ mm/s} \pm 30\text{ mm/s}$ 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 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 geometric standpoint, in accordance with the requirements of this Regulation, if any, if the differences do not exceed inevitable manufacturing deviations.
 - 1.2. With respect to photometric performance, 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;
 - 1.2.1. no measured value deviates unfavourably by more than 20 % from the values prescribed in this Regulation. For values B 50 L (or R) and Zone III the maximum deviation may be respectively:

B 50 L (or R): 0.2 lx equivalent 20 %

0,3 lx equivalent 30 %

Zone III: 0,3 lx equivalent 20 %

0,45 lx equivalent 30 %
 - 1.2.2. or if
 - 1.2.2.1. for the passing beam, the prescribed values in this Regulation are met at HV (with a tolerance of 0,2 lx) 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) (with a tolerance of 0,1 lx), 75 R (or L), 50 V, 25 R, 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 E_{max} , a tolerance of + 20 % for maximum values and - 20% 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 tests 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⁾.
 - 1.2.4. If the results of the tests described above do not meet the requirements, tests on the headlamp shall be repeated using another standard filament lamp.
 - 1.2.5. Headlamps with apparent defects are disregarded.
 - 1.2.6. The reference mark is disregarded.
 - 1.3. The chromaticity coordinates shall be complied with when the headlamp is equipped with a filament lamp set to Standard A colour temperature. The photometric performance of a headlamp emitting selective yellow light when equipped with a colourless filament lamp shall be multiplied by 0,84.

⁽¹⁾ See the corresponding footnote in the text of the Regulation

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.

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 deviation of the measured values of the headlamps in the unfavourable directions are:

2.1.1.1. sample A

A1: one headlamp 0 %

one headlamp not more than 20 %

A2: both headlamps more than 0 %

but not more than 20 %

go to sample B

2.1.1.2. sample B

B1: Both headlamps 0 %

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 %

one headlamp more than 20 %

but not more than 30 %

2.2.1.2. sample B

B2: in the case of A2 one headlamp more than 0 %

but no more than 20 %

one headlamp not more than 20 %

B3: in the case of A2 one headlamp 0 %

one headlamp more than 20 %

but not more than 30 %

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 13 applied if, following the sampling procedure 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 %

one headlamp more than 30 %

A5: both headlamps more than 20 %

2.3.2. sample B

B4: in the case of A2 one headlamp more than 0 %

but not more than 20 %

one headlamp more than 20 %

B5: in the case of A2 both headlamps more than 20 %

B6: in the case of A2 one headlamp 0 %

one headlamp more than 30 %

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 cases of A3, B2, B3 a repeated sampling, third sample C of two headlamps and fourth sample D 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 %

one headlamp not more than 20 %

C2: both headlamps more than 0 %

but not more than 20 %

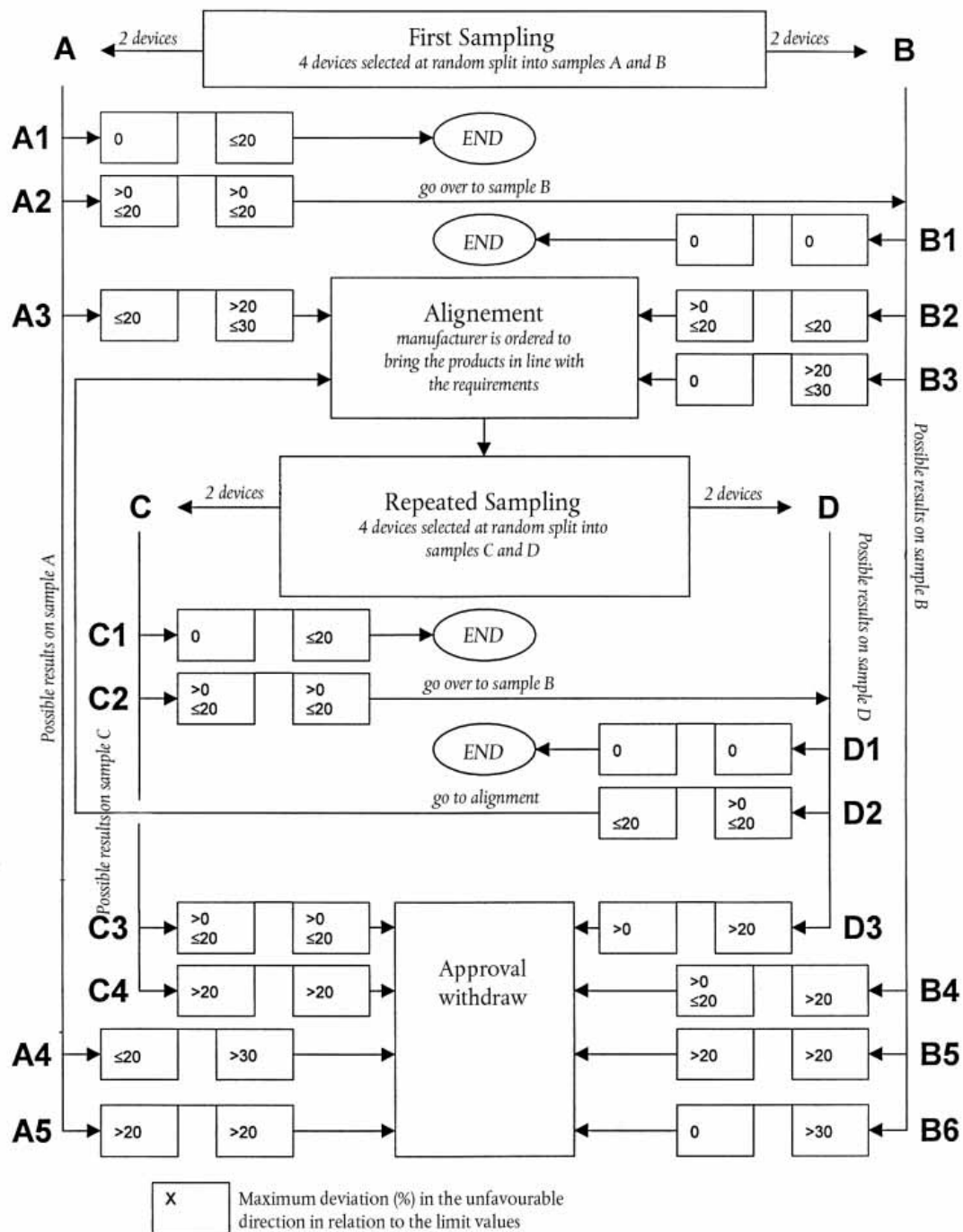
go to sample D

3.1.1.2. sample D

D1: in the case of C2 both headlamps 0 %

- 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 %
but not more than 20 %
one headlamp not more than 20 %
- 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 14 applied if, following the sampling procedure in Figure 1 of this Annex, the deviation of the measured values of the headlamps are:
- 3.3.1. sample C
- C3: one headlamp not more than 20 %
one headlamp more than 20 %
C4: both headlamps more than 20 %
- 3.3.2. sample D
- D3: in the case of C2
one headlamp 0 or more than 0 %
one headlamp more than 20 %
- 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 positions 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 in 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



Regulation No 31 of the United Nations Economic Commission for Europe (UN/ECE) concerning the uniform provisions concerning the approval of halogen sealed-beam unit (HSB unit) motor vehicle headlamps emitting an asymmetrical passing beam or a driving beam or both⁽¹⁾

1. SCOPE⁽²⁾

This Regulation applies to motor vehicle headlamps which may incorporate lenses of glass or plastic material.

2. DEFINITIONS

For the purpose of this Regulation,

2.1. 'Halogen sealed-beam headlamp unit'

(hereinafter termed 'HSB unit') means a headlamp whose components, including a reflector of glass, metal or other material, an optical system and one or more halogen light sources, form an integral whole which is indivisibly joined and cannot be dismantled without rendering the unit completely unusable. Such units are:

2.1.1. of 'category 1',

when they emit only a driving beam;

2.1.2. of 'category 21',

when they emit only a passing beam;

2.1.3. of 'category 22',

when they emit, at the user's choice, either a driving beam or a passing beam;

2.2. 'lens,'

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

2.3. 'coating,'

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

2.4. 'HSB units of different types',

means 'units which differ' in such essential respects as:

2.4.1. the trade name or mark;

⁽¹⁾ Regulation of the United Nations Economic Commission for Europe published pursuant to the provisions of Article 4 (5) of Council Decision 97/836/EC (OJ L 346, 17.12.1997, p. 78).

⁽²⁾ Nothing in this Regulation shall prevent a Party to the Agreement applying this Regulation from prohibiting the combination of an HSB unit incorporating a lens of plastic material approved under this Regulation with a mechanical headlamp-cleaning device (with wipers).

- 2.4.2. the characteristics of the optical system;
- 2.4.3. the inclusion or elimination of components capable of altering the optical effects by reflection, refraction, absorption and/or deformation during operation; the fitting or elimination of filters intended solely to change the colour of the beam but not its light distribution does not constitute a change of type;
- 2.4.4. the rated voltage;
- 2.4.5. the shape of the filament or filaments;
- 2.4.6. the kind of beam produced (passing beam, driving beam or both);
- 2.4.7. the materials constituting the lens and coating, if any.

3. APPLICATION FOR APPROVAL

- 3.1. 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:
 - 3.1.1. whether the HSB unit is intended to provide both a passing beam and a driving beam or only one of these beams;
 - 3.1.2. where the HSB unit is intended to provide a passing beam, whether it is designed for both right-hand and left-hand traffic or for right-hand or left-hand traffic only.
- 3.2. Every application for approval shall be accompanied by:
 - 3.2.1. drawings in triplicate, sufficiently detailed to permit identification of the type and giving a front view of the HSB unit (with, if applicable, details of the lens moulding) and a cross-section; also the filament(s) and shield(s) shall be shown on the drawings at a scale of 2:1 both in front view and in side view; the drawing must show the position intended for the approval number and the additional symbols in relation to the circle of the approval mark;
 - 3.2.2. a brief technical description;
 - 3.2.3. samples as follows:
 - 3.2.3.1. for approval of an HSB unit emitting uncoloured light: five samples;
 - 3.2.3.2. for approval of an HSB unit emitting coloured light: two coloured-light samples and five uncoloured-light samples of the same type, differing from the type submitted, only in that the lens or filter is not coloured;
 - 3.2.3.3. in the case of HSB units which emit coloured light, which differ from uncoloured-light units only in the colour of light emitted and which have already satisfied the requirements of paragraphs 6, 7 and 8 below, it will be sufficient to submit only one sample of a coloured-light unit to undergo the tests described in paragraph 9 below;

- 3.2.4. for the test of plastic material of which the lenses are made:
 - 3.2.4.1. thirteen lenses.
 - 3.2.4.1.1. six of these lenses may be replaced by six samples of material at least 60 x 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 x 15 mm;
 - 3.2.4.1.2. every such lens or sample of material shall be produced by the method to be used in mass production;
 - 3.2.4.2. a reflector to which the lenses can be fitted in accordance with the manufacturer's instructions.
- 3.3. The characteristics of the materials making up the lenses and coatings, if any, should be accompanied by the test report on these materials and coatings if they have already been tested.
- 3.4. The competent authority shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted.
- 4. MARKINGS⁽¹⁾
 - 4.1. HSB units submitted for approval shall bear the trade name or mark of the applicant.
 - 4.2. They shall comprise, on the lens, a space of sufficient size to accommodate the approval mark and the additional symbols provided for in paragraph 5 below; the space shall be shown in the drawings referred to in paragraph 3.2.1 above.
 - 4.3. They shall bear, either on the lens or on the body, the rated voltage and rated wattage of the driving-beam filament, followed by the rated wattage of the passing-beam filament, where applicable.
- 5. APPROVAL
 - 5.1. *General*
 - 5.1.1. If all the HSB unit type samples submitted in pursuance of paragraph 3 above meet the requirements of this Regulation, approval shall be granted.
 - 5.1.2. 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.

⁽¹⁾ In the case of units designed to meet the requirements of traffic moving on one side of the road only (either right or left), it is further recommended that the area which can be occulted to prevent discomfort to users in a country where traffic moves on the side of the road opposite to that for which the unit was designed should be outlined indelibly on the lens. This marking is not necessary, however, where the area is clearly apparent from the design.

- 5.1.3. An approval number shall be assigned to each type approved. Its first two digits (at present 02) 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 HSB unit 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.
- 5.1.4. Notice of approval or of extension or refusal or withdrawal of approval or production definitely discontinued of a type of optical unit 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.
- 5.1.5. In addition to the mark prescribed in paragraph 4.1, an approval mark as described in paragraphs 5.2 and 5.3 below shall be affixed in the spaces referred to in paragraph 4.2 above to every headlamp conforming to a type of HSB unit approved under this Regulation.
- 5.2. *Composition of the approval mark*
- The approval mark shall consist of:
- 5.2.1. an international approval marking, comprising:
- 5.2.1.1. a circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted approval⁽¹⁾;
- 5.2.1.2. the approval number prescribed in paragraph 5.1.3 above;
- 5.2.2. the following additional symbol (or symbols):
- 5.2.2.1. on HSB optical units meeting left-hand traffic requirements only, a horizontal arrow, pointing to the right of an observer, facing the HSB optical unit, i.e., to the side of the road on which the traffic moves;
- 5.2.2.2. on HSB optical units meeting the requirements of this Regulation in respect of the passing beam only, the letters 'HSC';
- 5.2.2.3. on HSB optical units meeting the requirements of this Regulation in respect of the driving beam only, the letters 'HSR';
- 5.2.2.4. on HSB optical units meeting the requirements of this Regulation in respect of both the passing beam and the driving beam, the letters 'HSCR';
- 5.2.2.5. on HSB optical units 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 8.3.2.1.2 below, placed near the circle surrounding the letter 'E':

⁽¹⁾ 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech Republic, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal and 22 for the Russian Federation, 23 for Greece, 24 (vacant), 25 for Croatia, 26 for Slovenia, 27 for Slovakia, 28 for Belarus, 29 for Estonia, 30 (vacant), 31 for Bosnia and Herzegovina, 32-36 (vacant), 37 for Turkey, 38-39 (vacant), and 40 for the former Yugoslav Republic of Macedonia. Subsequent numbers will be assigned to other countries in the chronological order in which they ratify or accede to the Agreement concerning the Adoption of Uniform Technical Conditions for Wheeled Equipments and parts which can be fitted and/or be used on wheeled vehicle and the conditions for Reciprocal Recognition of Approvals Granted on the basis of these prescriptions, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

- 5.2.2.6. on HSB units incorporating a lens of plastic material, the group of letters 'PL' near the symbols prescribed in paragraphs 5.2.2.3 to 5.2.2.5 above.
- 5.2.2.7. the two digits of the approval number (at present 02) 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.
- 5.2.2.8. In every case the relevant operating mode used during the test procedure according to paragraph 1.1.1.1 of annex 6 and the allowed voltage(s) according to paragraph 1.1.1.2 of annex 6 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: on units meeting the requirements of this Regulation which are so designed that the filament of the passing beam shall not be lit simultaneously with that of any other lighting function with which it may be reciprocally incorporated: an oblique stroke (/) shall be placed behind the passing lamp symbol in the approval mark.
- 5.2.2.9. The marks and symbols referred to in paragraphs 5.2.1 and 5.2.2 above shall be clearly legible and be indelible even when the optical unit is fitted in the vehicle.
- 5.3. *Arrangement of the approval mark*
- 5.3.1. *Independent lamps*
- Annex 2, figures 1 to 7, to this Regulation gives examples of arrangements of the approval mark with the above-mentioned additional symbols.
- 5.3.2. *Grouped, combined or reciprocally incorporated lamps*
- 5.3.2.1. 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:
- 5.3.2.1.1. it is visible after their installation;
- 5.3.2.1.2. 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.
- 5.3.2.2. 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:
- 5.3.2.2.1. either on the appropriate light-emitting surface,
- 5.3.2.2.2. 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).
- 5.3.2.3. 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.

5.3.2.4. 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.

5.3.2.5. Annex 2, figure 8, to this Regulation gives examples of arrangements of approval marks for grouped, combined or reciprocally incorporated lamps with all the above-mentioned additional symbols.

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

The provisions laid down in paragraph 5.3.2 above are applicable.

5.3.3.1. 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 HSB unit, even if it cannot be separated from the lens, also comprises the space described in paragraph 4.2 above and bears the approval mark of the actual functions.

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

5.3.3.2. Annex 2, figure 9, to this Regulation gives examples of arrangements of approval marks relating to the above case.

6. GENERAL SPECIFICATIONS

6.1. Every sample shall conform to the specifications set forth in this paragraph and in paragraphs 7 and 8 below and, if necessary, to those set forth in paragraph 9.

6.2. HSB units shall be so designed and made 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.

6.2.1. HSB optical units shall be fitted with a device enabling them to be so adjusted on the vehicle as to comply with the rules applicable to them. Such a device need not be fitted on HSB optical unit insert if the use of such inserts is confined to vehicles on which the headlamp setting can be adjusted by other means.

Where an HSB optical unit providing a driving beam and an HSB optical unit providing a passing beam are assembled as exchangeable subunits to form a composite unit, the adjusting device shall enable each HSB unit individually to be duly adjusted.

6.2.2. However, this will not apply to headlamp assemblies whose reflectors are indivisible. For this type of assembly the requirements of paragraph 8.3 of this Regulation shall apply. In the case where more than one light source is used to provide the main beam, the combined main-beam functions will be used to determine the maximum value of the illumination (EM).

6.3. The terminals shall be in electrical contact with the appropriate filament or filaments only and shall be robust and firmly fixed to the HSB unit.

6.4. HSB units shall comprise electrical connections in conformity with those shown in one of the patterns reproduced in annex 3 to this Regulation and shall be of the dimensions specified in that annex.

6.5. Complementary tests shall be done according to the requirements of annex 6 to ensure that in use there is no excessive change in photometric performance.

6.6. If the lens of the HSB unit is of plastic material, tests shall be done according to the requirements of annex 7.

7. RATED AND TEST VALUES

7.1. The rated voltage is 12 volts⁽¹⁾.

7.2. The wattage shall not exceed 75 watts on the driving beam filament and 68 watts on the passing beam filament measured at a test voltage of 13.2 volts.

8. ILLUMINATION⁽²⁾

8.1. *General specifications*

8.1.1. HSB units shall be made so as to give adequate illumination without dazzle when emitting the passing beam and good illumination when emitting the driving beam.

8.1.2. The illumination produced by the HSB unit shall be determined by means of a vertical screen set up 25 m forward of the unit as shown in annex 4 to this Regulation⁽³⁾.

8.1.3. On this screen, the illumination referred to in paragraphs 8.2.5, 8.2.6 and 8.3 below shall be measured by means of a photoreceptor, the effective area of which shall be contained within a square of 65 mm side.

8.2. *Requirements concerning the passing beam*

8.2.1. The passing beam shall produce a 'cut-off' sharp enough to serve as a satisfactory means of adjustment. The 'cut-off' shall be a horizontal straight line on the side opposite to the direction of the traffic for which the unit is intended. On the other side it shall not extend beyond either the broken line HV H1 H4 formed by a straight line HV H1 making a 45° angle with the horizontal and a straight line H1 H4, 25 cm above the straight line hh, or the straight line HV H3, inclined at an angle of 15° above the horizontal (see annex 4 to this Regulation). A 'cut-off' extending beyond both line HV H2 and line H2 H4 and resulting from a combination of the above two possibilities shall in no circumstances be permitted.

⁽¹⁾ Requirements for HSB units with a rated voltage of 24 volts are under consideration.

⁽²⁾ All photometric measurements shall be made at the rated voltage specified in paragraph 7.1.

⁽³⁾ If, in the case of an HSB unit designed to meet the requirements of this Regulation in respect of the passing beam only, the focal axis diverges appreciably from the general direction of the beam, lateral adjustment shall be effected in the manner which best satisfies the requirements for illumination at points 75 R and 50 R for right-hand traffic and 75 L and 50 L for left-hand traffic.

- 8.2.2. The HSB unit shall be so aimed that on the passing beam:
- 8.2.2.1. in the case of HSB units designed to meet the requirements of right-hand traffic, the 'cut-off' on the left half of the screen⁽¹⁾ is horizontal and, in the case of HSB units designed to meet the requirements of left-hand traffic, the 'cut-off' on the right half of the screen is horizontal;
- 8.2.2.2. this horizontal part of the 'cut-off' is situated on the screen 25 cm below the level hh (see annex 4 to this Regulation);
- 8.2.2.3. the 'elbow' of the 'cut-off' is on line vv⁽²⁾.
- 8.2.3. When so adjusted, the HSB unit need meet only the requirements laid down in paragraphs 8.2.5 and 8.2.6 below if approval thereof is sought solely for provision of a passing beam⁽³⁾; if it is intended to provide both a passing beam and a driving beam it shall meet the requirements laid down in paragraphs 8.2.5, 8.2.6 and 8.3.
- 8.2.4. Where an HSB unit so adjusted does not meet the requirements laid down in paragraphs 8.2.5, 8.2.6 and 8.3, its alignment may be changed provided that the axis of the beam is not displaced laterally by more than 1° (= 44 cm) to the right or left⁽⁴⁾. To facilitate alignment by means of the 'cut-off', the unit may be partially occulted in order to sharpen the 'cut-off'.
- 8.2.5. The illumination produced on the screen by the passing beam shall meet the following requirements:

Point on measuring screen		HSB Headlamps for left-hand traffic
Required illumination	HSB Headlamps for right-hand traffic	
B 50 L	B 50 L	≤ 0,4
B 75 R	B 75 L	≥ 12
B 75 L	B 75 R	≤ 12
B 50 L	B 50 R	≤ 15
B 50 R	B 50 L	≥ 12
B 50 V	B 50 V	≥ 6
B 25 L	B 25 R	≥ 2
B 25 R	B 25 L	≥ 2
Any point in zone III		≤ 0,7
Any point in zone IV		≥ 3
Any point in zone I		≤ 2 x (E 50 R or) (*) / (E 50 L)

(*) E 50 R and E 50 L are the illuminations actually measured.

- (1) The test screen shall be wide enough to allow examination of the 'cut-off' over a range of at least 5° on either side of the line vv.
- (2) If the beam does not have a 'cut-off' with a clear 'elbow', lateral adjustment shall be affected in the manner which best satisfies the requirements for illumination at points 75 R and 50 R for right-hand traffic and 75 L and 50 L for left-hand traffic.
- (3) An HSB unit designed to emit a passing beam may incorporate a driving beam not subject to this specification.
- (4) The limit of realignment of 1° to the right or left is not incompatible with vertical realignment upward or downward. The latter is limited only by the requirements of paragraph 8.3. However, the horizontal part of the 'cut-off' should not extend beyond the line hh (the provisions of paragraph 8.3 are not applicable to HSB units intended to meet the requirements of this Regulation only for provision of a passing beam).

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

8.3. *Requirements concerning the driving beam*

- 8.3.1. In the case of an HSB unit designed to provide a driving beam and a passing beam, measurements of the illumination produced on the screen by the driving beam shall be taken with the same HSB unit alignment as for measurements under paragraphs 8.2.5 and 8.2.6; if the HSB unit provides a driving beam only, it shall be so adjusted that the area of maximum illumination is centred on the point of intersection HV of lines hh and vv; such an HSB unit need meet only the requirements laid down in paragraph 8.3.

- 8.3.2. The illumination produced on the screen by the driving beam shall meet the following requirements:

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

- 8.3.2.1.1. The maximum intensity (I_M) of the driving beam expressed in thousands of candelas shall be calculated by the formula:

$$I_M = 0,625 E_M$$

- 8.3.2.1.2. The reference mark (I'_M) of this maximum intensity, referred to in paragraph 5.2.2.5, shall be obtained by the ratio:

$$I'_M = I_M / 3 = 0,208 E_M$$

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

- 8.3.2.2. Starting from point HV, horizontally to the right and left, the illumination shall be not less than 24 lux up to a distance of 1,125 m and not less than 6 lux up to a distance of 2,25 m.

9. COLOUR

- 9.1. Approval may be obtained for HSB units emitting either white or selective yellow light⁽¹⁾. Expressed in CIE trichromatic co-ordinates, the corresponding colorimetric characteristics for selective yellow light are as follows at the test voltage:

Limit towards red $y \geq 0,138 + 0,580 x$

Limit towards green $y \leq 1,290x - 0,100$

Limit towards white $y \geq -x + 0,966$

Limit towards spectral value $y \leq -x + 0,992$

⁽¹⁾ Notwithstanding the provisions of article 3 of the 1958 Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of approval for Motor Vehicle Equipment and Parts, the approval of an HSB unit under this Regulation shall not prevent the Contracting Parties to the Agreement applying this Regulation from prohibiting, on vehicles registered in their territory, the use of HSB units emitting a beam of either white or selective yellow light.

which can be expressed as follows:

dominant wave length: 575 to 585 nm

purity factor: 0,90 to 0,98

- 9.2. The illumination produced on the screen by a selective yellow passing beam shall meet the requirements of paragraphs 8.2.5 and 8.2.6 with the minimum illuminations multiplied by a factor of 0,85; the maximum illumination values remain the same.

10. GAUGING OF DISCOMFORT

The discomfort caused by the passing beam of HSB units shall be gauged⁽¹⁾.

11. CONFORMITY OF PRODUCTION

- 11.1. Headlamps approved under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set forth in paragraphs 8 and 9.

- 11.2. In order to verify that the requirements of paragraph 11.1 are met, suitable controls of the production shall be carried out.

- 11.3. The holder of the approval shall in particular:

- 11.3.1. ensure the existence of procedures for the effective control of the quality of products;
- 11.3.2. have access to the control equipment necessary for checking the conformity to each approved type;
- 11.3.3. 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;
- 11.3.4. analyze 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;
- 11.3.5. ensure that for each type of product at least the tests prescribed in annex 5 to this Regulation are carried out;
- 11.3.6. 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.

- 11.4. The competent authority which has granted type approval may at anytime verify the conformity control methods applicable to each production unit.

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

⁽¹⁾ This requirement will be subject to a recommendation to administrations.

- 11.4.2. 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.
- 11.4.3. 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 11.4.2 above, the inspector shall select samples, to be sent to the technical service which has conducted the type approval tests, using the criteria of annex 8.
- 11.4.4. 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 8.
- 11.4.5. 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.
- 11.5. Headlamps with apparent defects are disregarded.
- 11.6. The reference mark is disregarded.
- 12. PENALTIES FOR NON-CONFORMITY OF PRODUCTION
- 12.1. The approval granted in respect of a type of HSB unit pursuant to this Regulation may be withdrawn if the requirements set forth above are not met, or if an HSB unit bearing the approval mark does not conform to the type approved.
- 12.2. 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.
- 13. MODIFICATION AND EXTENSION OF APPROVAL OF A TYPE OF HALOGEN 'SEALED-BEAM' HEADLAMP UNIT (HSB UNIT)
- 13.1. Every modification of the type of HSB unit shall be notified to the administrative department which approved the type of HSB unit. The department may then either:
 - 13.1.1. consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the HSB unit still complies with the requirements; or
 - 13.1.1. require a further test report from the technical service responsible for conducting the tests.
- 13.2. Confirmation or refusal of approval, specifying the alterations shall be communicated by the procedure specified in paragraph 5.1.4 above to the Parties to the Agreement applying this Regulation.

- 13.3. 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.
14. PRODUCTION DEFINITELY DISCONTINUED
- If the holder of an approval completely ceases to manufacture a type of HSB unit 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.
15. TRANSITIONAL PROVISIONS
- 15.1. As from the date of entry into force of the 02 series of amendments to this Regulation no Contracting Party applying it shall refuse to grant approvals under this Regulation as amended by the 02 series of amendments.
- 15.2. As from 24 months after the date of entry into force mentioned in paragraph 15.1 above, Contracting Parties applying this Regulation shall grant approvals only if the type of HSB unit corresponds to the requirements of this Regulation as amended by the 02 series of amendments.
- 15.3. Existing approvals granted under this Regulation before the date mentioned in paragraph 15.2 above shall remain valid. However, Contracting Parties applying this Regulation may prohibit the fitting of HSB units which do not meet the requirements of this Regulation as amended by the 02 series of amendments:
- 15.3.1. on vehicles for which type approval or individual approval is granted more than 24 months after the date of entry into force mentioned in paragraph 15.1 above,
- 15.3.2. on vehicles first registered more than five years after the date of entry into force mentioned in paragraph 15.1 above.
16. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS AND OF ADMINISTRATIVE DEPARTMENTS
- 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 administrative departments 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.
-

ANNEX 1

Communication concerning the approval or extension or communication

[maximum format: A4 (210 x 297 mm)]



issued by: Name of administration

.....

.....

.....

concerning ⁽²⁾: APPROVAL GRANTED

APPROVAL EXTENDED

APPROVAL REFUSED

APPROVAL WITHDRAWN

PRODUCTION DEFINITELY DISCONTINUED

of a type of: Halogen 'Sealed-Beam' Headlamp Unit (HSB unit) pursuant to Regulation No 31

Approval No. Extension No.

1. HSB unit submitted for approval as type ⁽³⁾

Colour of light emitted: white/selective yellow ⁽²⁾

Rated voltage Rated wattage

2. The passing lamp filament may/may not ⁽²⁾ be lit simultaneously with the driving lamp filament and/or another reciprocally incorporated lamp.

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

(²) Strike out what does not apply.

(³) Indicate the appropriate marking selected from the list below:

HSCR	HSCR	HSCR	HSC	HSC	HSC	HSR	HSR
↔	↔	↔	↔	↔	↔	↔	↔
HSC/R	HSC/R	HSC/R	HSC/	HSC/	HSCR PL	HSCR PL	
↔	↔	↔	↔	↔	↔	↔	
HSCR PL	HSC PL	HSC PL	HSC PL	HSC PL	HSR PL	HSC/R PL	
↔	↔	↔	↔	↔	↔	↔	
HSC/R PL	HSC/R PL	HSC/PL	HSC/PL	HSC/PL	HSC/PL	HSC/PL	
↔	↔	↔	↔	↔	↔	↔	

- 3. Trade name or mark:
- 4. Manufacturer's name and address:
- 5. If applicable, name and address of 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. Approval granted/extended/refused/withdrawn⁽¹⁾
- 11. Reason(s) of extension (if applicable)
- 12. Maximum illumination (in lux) of the driving beam at 25 m from the HSB unit (average for 5 units)
- 13. Place:
- 14. Date:
- 15. Signature:
- 16. The attached drawing No. shows the unit.

⁽¹⁾ Strike out what does not apply.

ANNEX 2

Examples of arrangements of approval marks

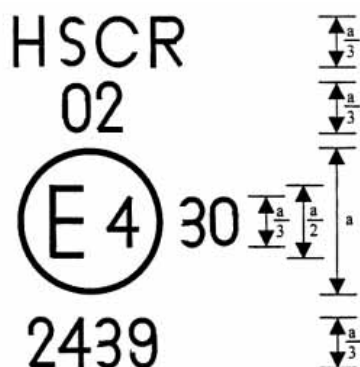


Figure 1

$a = 12 \text{ mm min.}$

The above approval mark affixed to an HSB optical unit indicates that the unit concerned was approved in the Netherlands (E4) under number 2439, that it meets the requirements of this Regulation, as amended by the 02 series of amendments, in respect of both the driving beam and the passing beam, and that it is designed for right-hand traffic only.

The figure 30 indicates that the maximum intensity of the driving beam is between 86 250 and 101 250 candelas.

Note: The approval number and the additional symbol(s) 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.

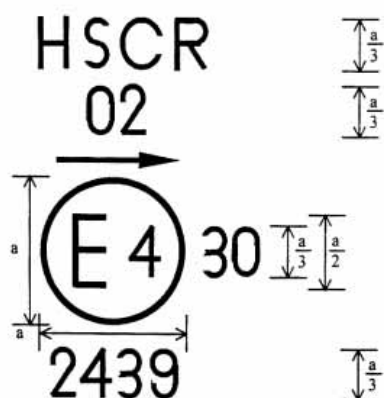


Figure 2

$a = 12 \text{ mm min.}$

The above approval mark affixed to an HSB optical unit indicates that the unit concerned meets the requirements of this Regulation as amended by the 02 series of amendments, with respect to both the passing beam and the driving beam and that it is designed for left-hand traffic only.



Figure 3 a

The above approval mark affixed to an HSB optical unit indicates that the unit concerned meets the requirements of this Regulation as amended by the 02 series of amendments, in respect of the passing beam only, and that it is designed for right-hand traffic only.



Figure 3 b

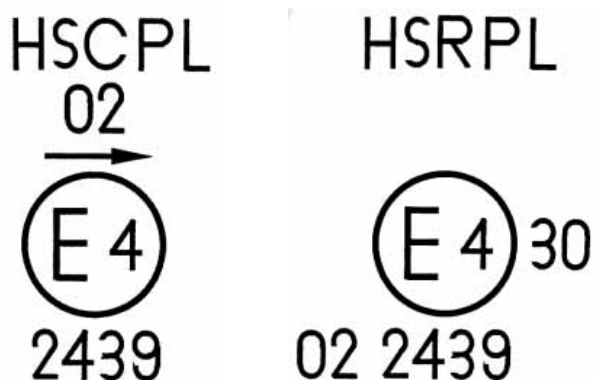


Figure 4

Figure 5

The above approval marks affixed to HSB optical units incorporating the lens of plastic material indicate that the units concerned meet the requirements of this Regulation, as amended by the 02 series of amendments: With respect to the passing beam only, and that they are driving beam only designed for left-hand traffic only. The number 30 indicates that the maximum intensity of the driving beam is between 82 500 and 101 250 candelas.

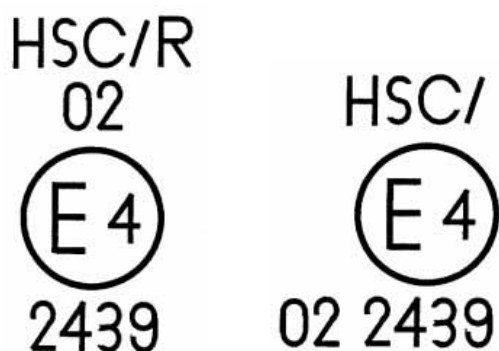


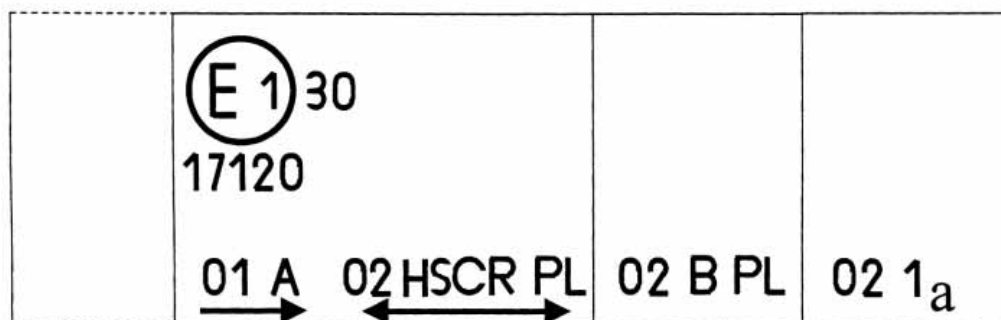
Figure 6

Figure 7

Identification of an HSB unit meeting the requirements of Regulation No 31 with respect to both the passing with respect to the passing beam and the driving beam and beam only and designed for designed for right-hand traffic only.

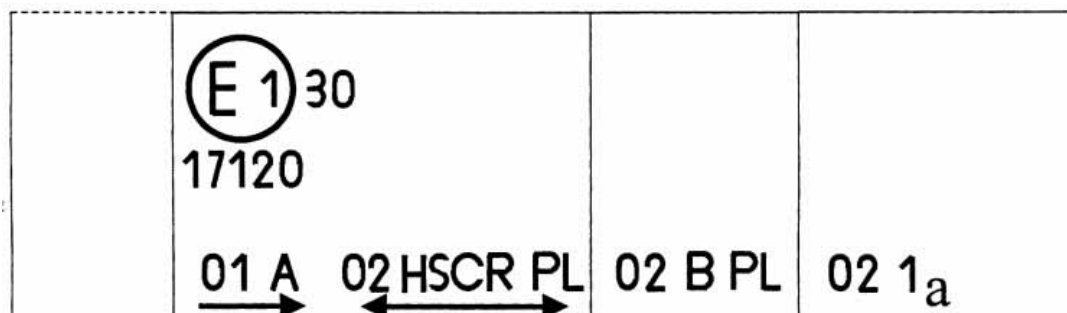
The passing lamp filament shall not be lit simultaneously with the driving lamp filament and/or another reciprocally incorporated lamp.

Figure 8

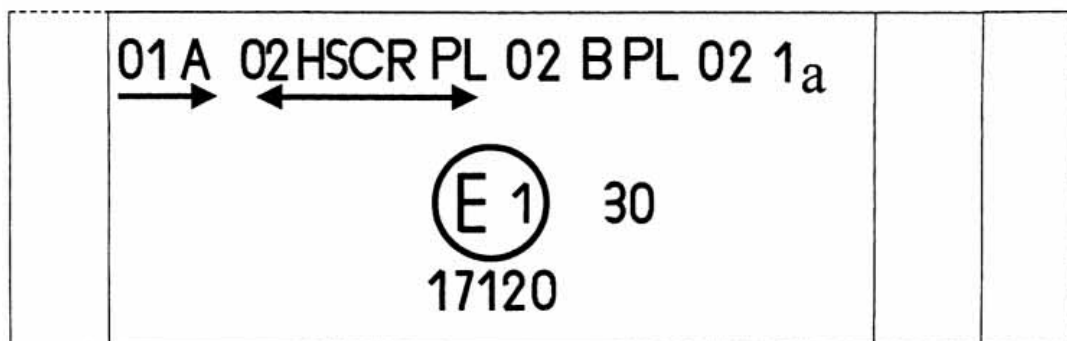


Simplified marking for grouped, combined or reciprocally incorporated lamps (The vertical and horizontal lines schematise the shape of the light-signalling device. They are not part of the approval mark.)

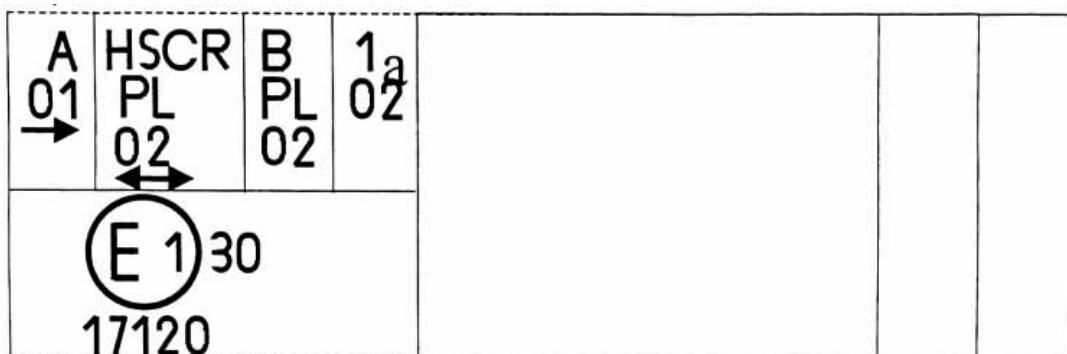
Model A

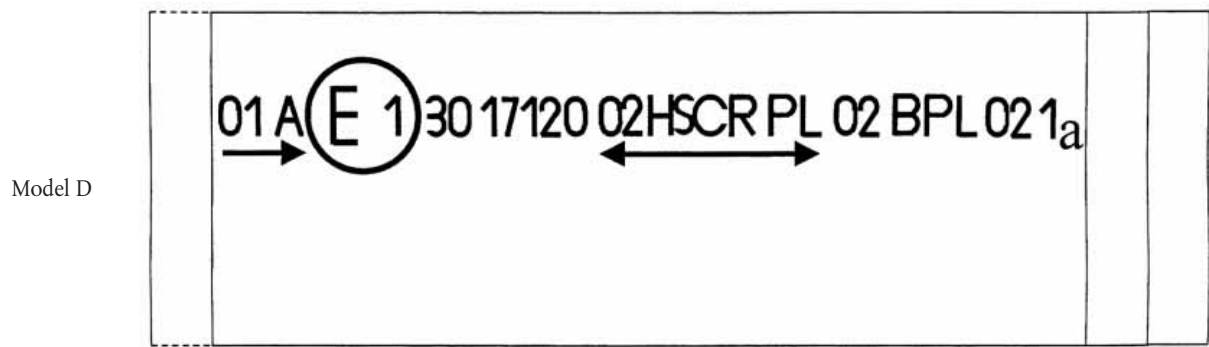


Model B



Model C





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

a front position lamp approved in accordance with the 01 series of amendments to Regulation No 7;

an HSB optical unit 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 02 series of amendments to Regulation No 31 and incorporating a lens of plastic material;

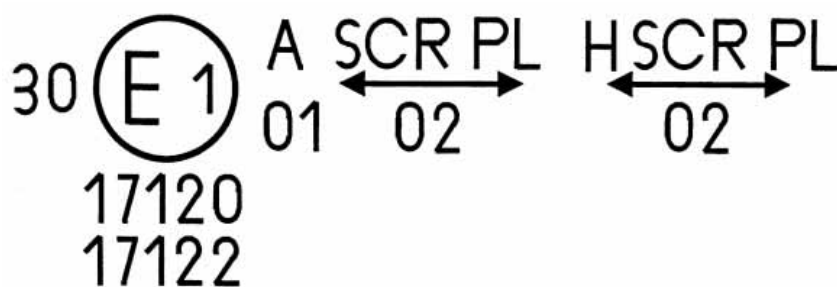
a front fog lamp approved in accordance with the 02 series of amendments to Regulation No 19 and incorporating a lens of plastic material;

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

Figure 9

Lamp reciprocally incorporated with an HSB unit

Example 1



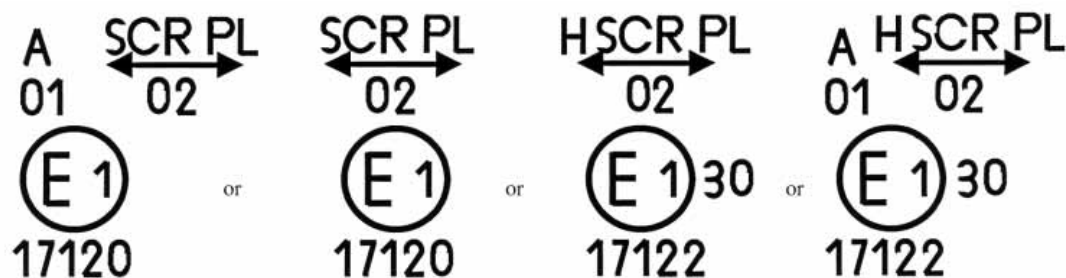
The above example corresponds to the marking of a lens of plastic material intended to be used in different types of HSB units, namely:

either: an HSB unit with a passing beam designed for right-hand and left-hand traffic and a driving beam approved in Germany (E1) in accordance with the requirements of Regulation No 5 as amended by the 02 series of amendments, which is reciprocally incorporated with a front position lamp approved in accordance with the 01 series of amendments to Regulation No 7;

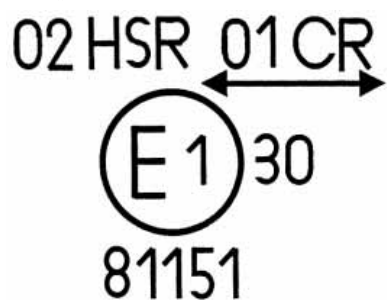
or: an HSB unit with a passing beam designed for right-hand and left-hand traffic and a driving beam with a maximum intensity comprised between 86 250 and 101 250 candelas, approved in Germany (E1) in accordance with the requirements of Germany (E1) in accordance with the requirements of Regulation No 31 as amended by the 02 series of amendments which is reciprocally incorporated with the same front position lamp as above;

or even: either of the above-mentioned HSB units approved as a single lamp.

The main body of the optical unit shall bear the only valid approval number, for instance:



Exemple 2



The above example corresponds to the marking of a lens used in an assembly of two HSB optical units approved in the Netherlands (E4), consisting of a headlamp emitting a passing beam designed for both traffic systems and of a driving beam meeting the requirements of Regulation No 1, and of a headlamp emitting a driving beam meeting the requirements of Regulation No 31.

ANNEX 3

Electrical connections of HSB units

Category 1 (Driving only)

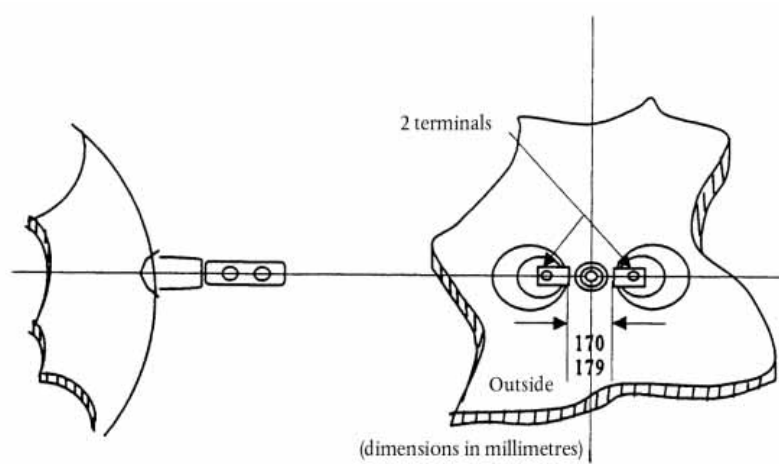


Fig. 1

Category 21 (Passing only)

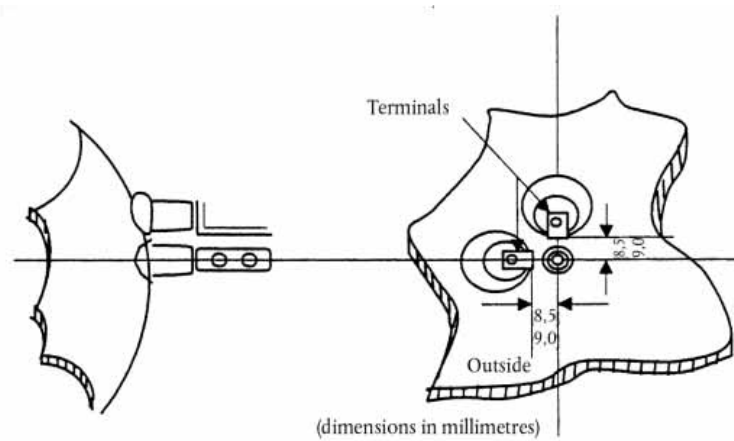


Fig. 2

Category 22 (Passing and driving)

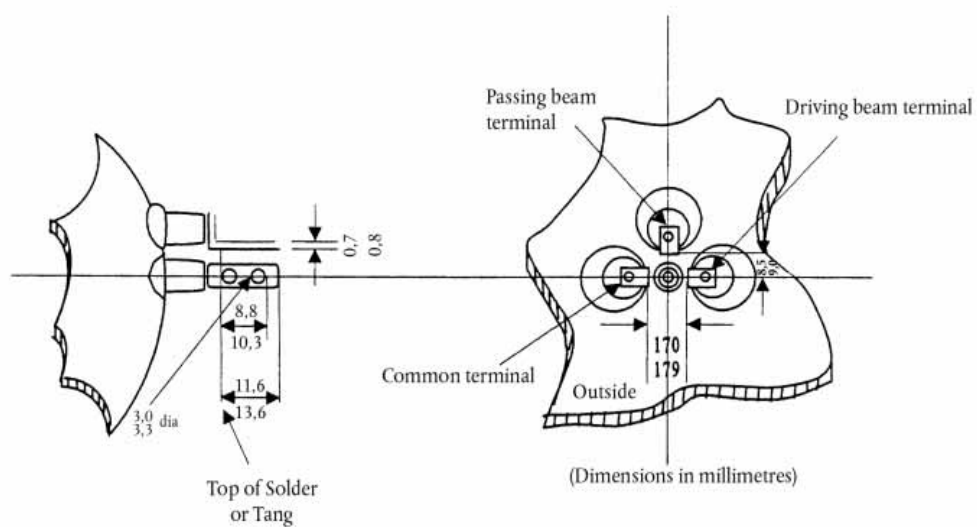
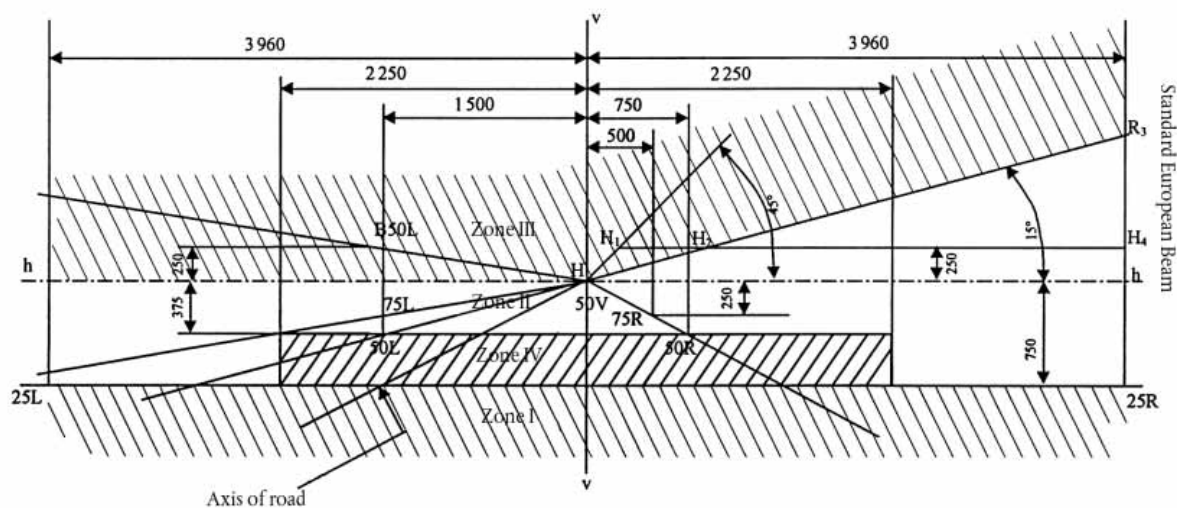


Fig. 3

ANNEX 4

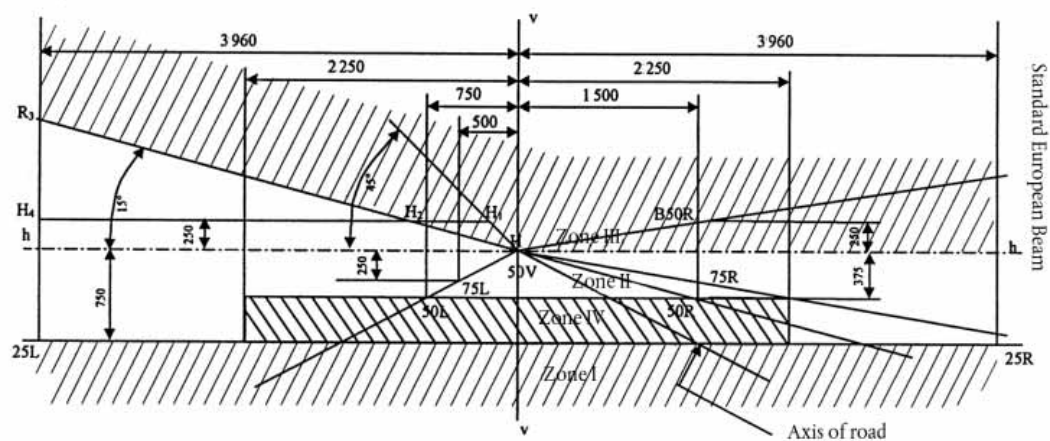
Measuring screen

A. HSB unit for right-hand traffic



Dimensions in mm

B. HSB unit for left-hand traffic



Dimensions en mm

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 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 headlamps shall not be contested if, when testing photometric performances of any headlamp chosen at random:
 - 1.2.1. no measured value deviates unfavourably by more than 20 per cent from the values prescribed in this Regulation. For values B 50 (or R) and zone III, the maximum unfavourable deviation may be respectively:

B 50 L (or R) 0,2 lx equivalent 20 per cent

0,3 lx equivalent 30 per cent

Zone III 0,3 lx equivalent 20 per cent

0,45 lx 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 + 0,2 lx) 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 + 0,1 lx), 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 E_{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 8.3 of this Regulation.
 - 1.2.3. If the results of the tests 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⁽²⁾.
- 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 6 after being subjected three consecutive times to the cycle described in paragraph 2.2.2 of annex 6.

The headlamp shall be considered as acceptable if Δr does not exceed 1,5 mrad.

⁽¹⁾ Letters in brackets refer to headlamps intended for left-hand traffic.

⁽²⁾ See the corresponding footnote (note 4, p. 53) in the text of the Regulation.

If this value exceeds 1,5 mrad but is not more than 2,0 mrad, a second headlamp 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. The chromaticity coordinates shall be complied with.

The photometric performance of a headlamp emitting selective yellow light 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 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 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 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 headlamp shall be subjected to photometric measurements at the points provided for in the Regulation, the reading being limited to points $E_{\max}$, HV⁽¹⁾, HL, HR⁽²⁾ in the case of the 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 4).

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 11.1 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.

⁽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 on 'hh' located at 1,125 m to the left and to the right of point HV respectively.

ANNEX 6

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 points for $E_{\max}$ for driving beam and 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.

1. TEST OF STABILITY OF PHOTOMETRIC PERFORMANCE

The tests shall be carried out in a dry and still atmosphere at an ambient temperature of $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$, the complete headlamp being mounted on a base representing the correct installation on the vehicle.

1.1. Clean headlamp

The headlamp shall be operated for 12 hours as described in subparagraph 1.1.1 and checked as prescribed in subparagraph 1.1.2.

1.1.1. Test procedure

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) is to be approved, the corresponding filament is lit for the prescribed time⁽¹⁾;
- b) in the case of a reciprocally incorporated passing lamp and driving lamp (dual filament HSB headlamp);

If the applicant declares that the headlamp is to be used with a single filament lit⁽²⁾ at a time, the test shall be carried out in accordance with this condition, activating⁽¹⁾ each specified function successively for half the time specified in paragraph 1.1;

In all other cases⁽¹⁾⁽²⁾ the headlamp, shall be subjected to the following cycle until the time specified is reached:

15 minutes, passing-beam filament lit

5 minutes, all filaments lit.

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

1.1.1.2. Test voltage

The voltage shall be adjusted so as to supply 90 % of the maximum wattage specified in this Regulation for the type(s) of HSB headlamp(s) concerned is (are) obtained.

⁽¹⁾ Should two filaments be simultaneously lit when headlamp flashing is used, this shall not be considered as being normal use of both filaments simultaneously.

⁽²⁾ When the tested headlamp is grouped and/ or reciprocally incorporated with 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 operation mode with an on/ off time ratio of approximately one to one.

1.1.2. Test results**1.1.2.1. Visual inspection**

Once the headlamp has been stabilised 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 — HV for headlamps designed for right-hand traffic,

50 L — B 50 R — HV for headlamps designed for left-hand traffic.

Driving beam

Point of $E_{\max}$

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 para 2 of this annex);

A 10 % 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 headlamp

After being tested as specified in subparagraph 1.1 above, the headlamp shall be operated for one hour as described in subparagraph 1.1.1, after being prepared as prescribed in subparagraph 1.2.1, and checked as prescribed in subparagraph 1.1.2.

1.2.1. Preparation 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 part by weight of NaCMC⁽¹⁾, and
- an appropriate quantity of distilled water, with a conductivity of $\leq 1 \text{ mS/m}$.

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⁾ 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 % solution at 20°.

- 1 part by weight of vegetal carbon dust (beechwood) with a particle size of 0-100 μm ,
- 0,2 part by weight of NaCMC⁽¹⁾,
- 13 parts by weight of distilled water with a conductivity of $\leq 1 \text{ mS/m}$, and
- 2 ± 1 parts by weight of surface-actant⁽²⁾.

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 % of the values measured for each following point under the conditions described in paragraph 1 above:

Point of E_{max} in driving beam, photometric distribution for a driving/passing lamp,

Point of E_{max} in driving beam, photometric distribution for a driving lamp only,

50 R and 50 V⁽³⁾ for a passing lamp only, designed for right-hand traffic,

50 L and 50 V⁽³⁾ for a passing lamp only, designed for left-hand traffic.

1.2.1.3. Measuring equipment

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

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 passing lamp.

The headlamp tested in accordance with paragraph 1.1, shall be subjected to the test described in 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 $23^\circ\text{C} \pm 5^\circ\text{C}$.

Using a mass production HSB headlamp which has been aged for at least one hour the headlamp shall be operated on 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 para. 1.1.1.2). The position of the cut-off line in its horizontal part (between vv 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 (t_3) and 60 minutes (t_{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.

⁽¹⁾ 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 % solution at 20° .

⁽²⁾ The tolerance on quantity is due to the necessity of obtaining a dirt that correctly spreads out on all the plastic lens.

⁽³⁾ 50 V is situated 375 mm below HV on the vertical line v-v on the screen at 25 m distance.

2.2. *Test results*

2.2.1. The result expressed in milliradians (mrad) shall be considered as acceptable when the absolute value $\Delta r_I = (r_3 - r_{60})$ recorded on the headlamp is not more than 1,0 mrad ($\Delta r_I \leq 1,0$ mrad).

2.2.2. However, if this value is more than 1,0 mrad but not more than 1,5 mrad ($1,0 \text{ mrad} < \Delta r_I \leq 1,5 \text{ mrad}$) a second headlamp shall be tested as described in 2.1 after being subjected three consecutive times to the cycle as described below, in order to stabilise the position of mechanical parts of the headlamp on a base representative of the correct installation on the vehicle:

operation of the passing lamp for one hour, (the voltage shall be adjusted as specified in paragraph 1.1.1.2),

period of rest for one hour.

The headlamp type shall be considered as 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 1,0 mrad

$[(\Delta r_I + \Delta r_{II}) / 2] \leq 1,0 \text{ mrad}$.

ANNEX 7

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 3.2.4 of this Regulation shall satisfy the specifications indicated in paragraphs 2.1 to 2.5 below.
- 1.2. Two out of the five samples of complete lamps supplied pursuant to paragraph 3.2.3 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 2.1-2.5 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 $40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and 85-95 % RH;
- 1 hour at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and 60-75 % RH;
- 15 hours at $-30\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$;
- 1 hour at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and 60-75 % RH;
- 3 hours at $80\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$;
- 1 hour at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and 60-75 % RH;

Before this test, the samples shall be kept at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and 60-75 % RH for at least four hours.

Note: The periods of one hour at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ 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 lamp, at the following points:

- B 50 L and 50 R for the passing beam of a passing lamp or a passing/driving lamp (B 50 R and 50 L in the case of headlamps intended for left-hand traffic);

— Emax route for the driving beam of a driving lamp or a passing/driving lamp;

2.1.2.2. **Results**

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

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 $1\,200\text{ W/m}^2 \pm 200\text{ W/m}^2$ for a period such that the luminous energy that they receive is equal to $4\,500\text{ MJ/m}^2 \pm 200\text{ MJ/m}^2$. Within the enclosure, the temperature measured on the black panel placed on a level with the samples shall be $50\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$. In order to ensure a regular exposure, the samples shall revolve around the source of radiation at a speed between 1 and 5 1/min.

The samples shall be sprayed with distilled water of conductivity lower than 1 mS/m at a temperature of $23\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$, 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 % n-heptane, 12,5 % toluene, 7,5 % ethyl tetrachloride, 12,5 % trichloroethylene and 6 % 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/cm², 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 (Resistance to detergents) at $23\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$.

Afterwards the samples shall be carefully rinsed with distilled water containing not more than 0,2 % impurities at $23\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$ 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 4 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 $50\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$ and then immersed for five minutes in a mixture maintained at $23\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$ and composed of 99 parts distilled water containing not more than 0,02 % impurities and one part alkylaryl sulphonate.

At the end of the test, the samples shall be dried at $50\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$. 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 % n-heptane and 30 % 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 3.2.4.1.1 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 % measured under the standardised 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 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 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 above.

2.6.1.2. Results

After the test, the results of photometric measurements carried out on the lamp in accordance with this Regulation shall not exceed by more than 30 % the maximum values prescribed at points B 50 L and HV and not be more than 10 % below the minimum values prescribed at point 75 R (in the case of headlamps intended for left-hand traffic, the points to be considered are B 50 R, HV and 75 L).

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 recognised 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).

-
- 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 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 3.2.4 of this Regulation)

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

B. Tests on complete lamps (supplied pursuant to paragraph 3.2.3 of this Regulation)

Tests		Complete headlamp	
		Sample No	
		1	2
2.1.	Deterioration (paragraph 2.6.1.1)	X	
2.2.	Photometry (paragraph 2.6.1.2)	X	
2.3.	Adherence (paragraph 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 $\beta/2 = 14^\circ$.

An annular diaphragm D_D with angles $\alpha_a/2 = 1^\circ$ and $\alpha_{\max}/2 = 12^\circ$ 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.

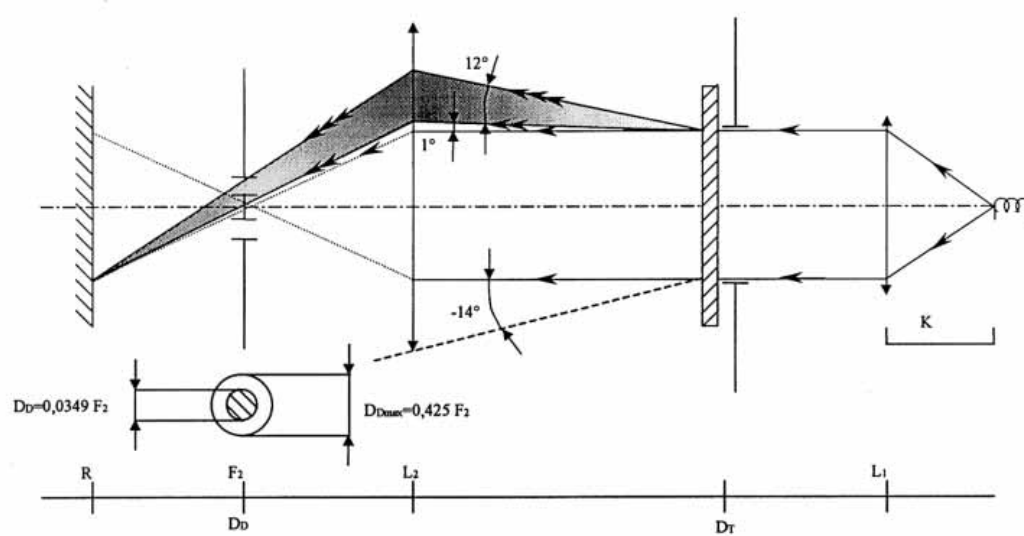
When the initial incident flux is referred to 1 000 units, the absolute precision of each reading shall be better than 1 unit.

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 °C
T_3	Yes (after test)	No	Flux transmitted by the tested material in a field of 24 °C
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.



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 $0,24 \pm 0,02$ 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 $\pm$ 50 mm in diameter on the surface exposed to deterioration, at a distance of 380 mm $\pm$ 10 mm from the nozzle.

1.2. **Test mixture**

The test mixture shall be composed of:

- 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;
- Water of hardness not exceeding 205 g/m³ 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 4, in such that:

$$\Delta d = (T5 - T4)/T_2 = 0,0250 \pm 0,0025.$$

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 $23\text{ °C} \pm 5\text{ °C}$ and $65 \pm 15\%$ 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 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 $300\text{ mm/s} \pm 30\text{ mm/s}$ 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 Newtons per centimetre of width of the tape.

ANNEX 8

Minimum requirements for sampling by an inspector

1. GENERAL
 - 1.1. The conformity requirements shall be considered satisfied from a mechanical and a geometric standpoint, in accordance with the requirements of this Regulation, if any, if the differences do not exceed inevitable manufacturing deviations.
 - 1.2. With respect to photometric performance, the conformity of mass produced headlamps shall not be contested if, when testing photometric performances of any headlamp chosen at random;
 - 1.2.1. no measured value deviates unfavourably by more than 20 per cent from the values prescribed in this Regulation. For values B 50 L (or R) and Zone III the maximum deviation may be respectively:

B 50 L (or R) 0,2 lx equivalent 20 per cent

0,3 lx equivalent 30 per cent

Zone III 0,3 lx equivalent 20 per cent

0,45 lx 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 0,2 lx) 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 0,1 lx), 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 E_{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 8.3 of this Regulation. The reference mark is disregarded.
 - 1.2.3. If the results of the tests 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⁽²⁾.
 - 1.2.4. Headlamps with apparent defects are disregarded.
 - 1.2.5. The reference mark is disregarded.
 - 1.3. The chromaticity coordinates shall be complied with.

The photometric performance of a headlamp emitting selective yellow light shall be the values contained in this Regulation multiplied by 0,84.

⁽¹⁾ Letters in brackets refer to headlamps intended for left-hand traffic.

⁽²⁾ See the corresponding footnote (note 4, p. 53) in the text of the Regulation.

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.

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 deviation 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 12 applied if, following the sampling procedure in Figure 1 of this annex 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 not 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 cases of A3, B2, B3 a repeated sampling, third sample C of two headlamps and fourth sample D 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 12 applied if, following the sampling procedure 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 positions of the cut-off line under the influence of heat, the following procedure shall be applied:

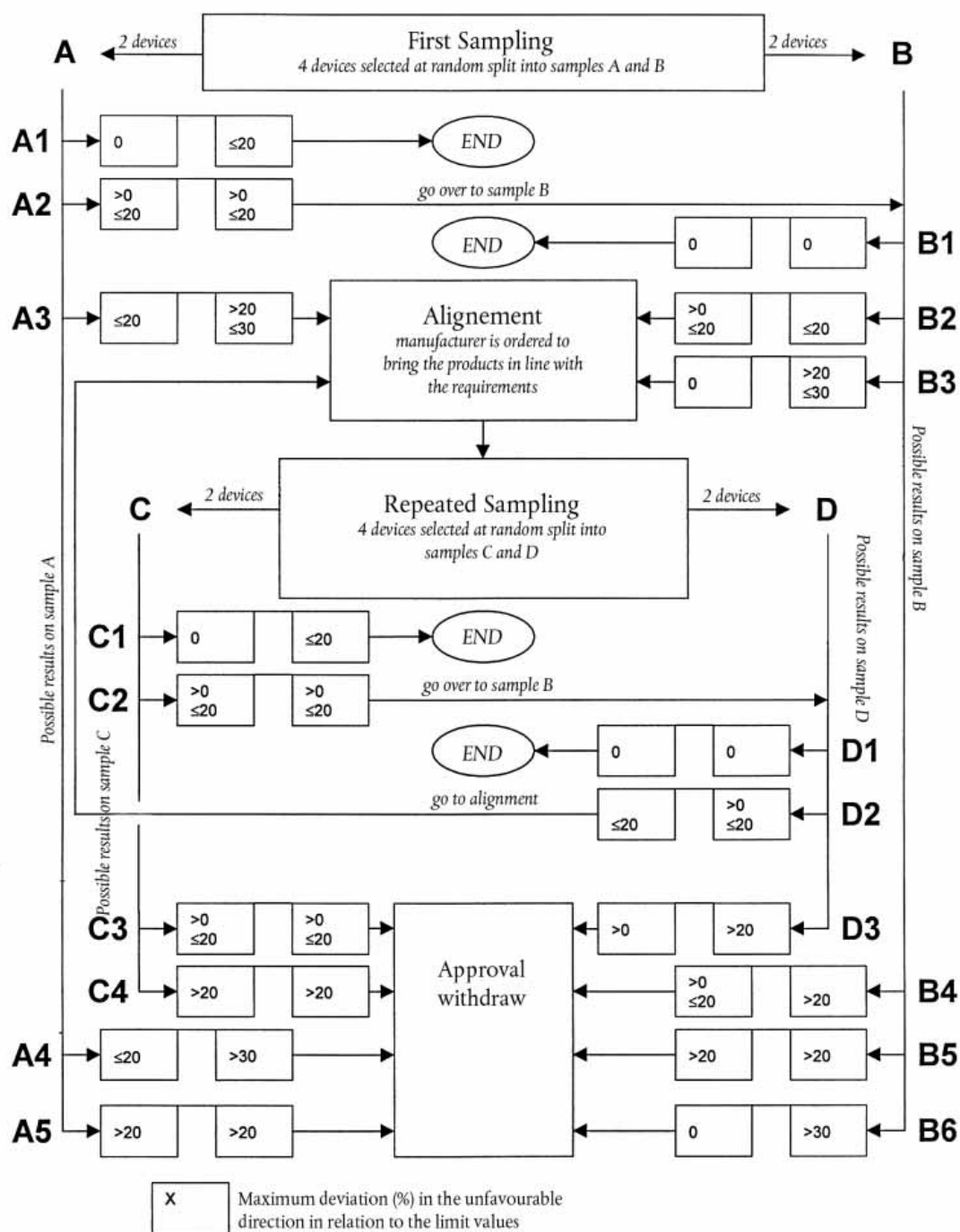
One of the headlamps of sample A after sampling procedure in Figure 1 of this annex shall be tested according to the procedure described in paragraph 2.1 of annex 6 after being subjected three consecutive times to the cycle described in paragraph 2.2.2 of annex 6.

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 in 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



Regulation No 38 of the Economic Commission for Europe of the United Nations (UN/ECE) uniform provisions concerning the approval of rear fog lamps for power-driven vehicles and their trailers⁽¹⁾

1. DEFINITIONS

For the purposes of this Regulation,

- 1.1. 'rear fog light' means a light used to make the vehicle more easily visible from the rear by giving a red signal of greater intensity than the rear position (side) lights;
- 1.2. 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.
- 1.3. rear fog lights of different 'types' are rear fog lights 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 category of lamp.

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. For each type of rear fog light, the application shall be accompanied by:
 - 2.2.1. drawings (three copies) in sufficient detail to permit identification of the type of the rear fog light and showing geometrically the position in which the rear fog light is to be fitted to the vehicle; the axis of observation to be taken as the axis of reference in the tests (horizontal angle $H = 0^\circ$; vertical angle $V = 0^\circ$); and the point to be taken as the centre of reference in the said tests;
 - 2.2.2. a brief technical description stating, in particular, with the exception of lamps with non-replaceable light sources, the category or categories of filament lamps prescribed; this filament lamp category shall be one of those contained in Regulation No 37;
 - 2.2.3. two samples; if the rear fog light cannot be mounted indiscriminately on either side of the vehicle, the two samples submitted may be identical and may be suitable for mounting only on the right or only on the left side of the vehicle.

3. MARKINGS

The samples of a type of rear fog light submitted for approval shall:

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

⁽¹⁾ Regulation of the United Nations Economic Commission for Europe published pursuant to the provisions of Article 4(5) of Council Decision 97/836/EC (OJ L 346, 17.12.1997, p. 78).

- 3.2. bear a clearly legible and indelible marking showing in the category of the filament lamp or lamps prescribed; this is not valid for rear fog lamps with non-replaceable light sources;
- 3.3. provide adequate space for the approval mark and for the additional symbols prescribed in paragraph 4.4 below; the said space shall be shown in the drawings referred to in paragraph 2.2.1 above;
- 3.4. In the case of rear fog lamps with non-replaceable light sources bear the marking of rated voltage and rated wattage.
- 4. APPROVAL
 - 4.1. If the two samples of a type of rear fog light meet the requirements of this Regulation, approval shall be granted.
 - 4.2. An approval number shall be assigned to each type approved; the number so assigned may not subsequently be assigned by the same Contracting Party to another type of rear fog light covered by this Regulation.

The first two digits of the approval number shall be the highest number of the series of amendments incorporated in the Regulation at the time of issue of the approval. Notice of approval or of refusal of approval of a type of rear fog light shall be communicated to the Parties to the Agreement which apply this Regulation by means of a form conforming to the model in annex 1 to this Regulation and of an attached drawing, supplied by the applicant for approval, in a format not exceeding A4 (210 × 297 mm) and, if possible, on a scale of 1:1.
 - 4.3. Every rear fog light conforming to a type approved under this Regulation shall bear in the space referred to in paragraph 3.3 above, in addition to the mark and the particulars prescribed in paragraphs 3.1 and 3.2 above:
 - 4.3.1. an international approval mark consisting of:
 - 4.3.1.1. a circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted the approval⁽¹⁾;
 - 4.3.1.2. an approval number;
 - 4.3.2. the additional symbol 'F'.
 - 4.3.3. The two first digits of the approval number which indicate the most recent series of amendments to this Regulation may be marked close to the additional 'F' symbol.
 - 4.4. The mark and the symbol referred to in paragraphs 4.3.1 and 4.3.2 shall be indelible and shall be clearly legible even when the rear fog light is fitted to the vehicle.

⁽¹⁾ 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for Czech Republic, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark and 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24 (vacant), 25 for Croatia, 26 for Slovenia, 27 for Slovakia, 28 for Belarus, 29 for Estonia, 30 (vacant), 31 for Bosnia and Herzegovina, 32-36 (vacant) and 37 for Turkey. Subsequent numbers shall be assigned for other countries in the chronological order in which they ratify the Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, or in which they accede to that Agreement, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

- 4.5. When two or more lamps are part of the same unit of grouped, combined or reciprocally incorporated lamps, approval is granted only if each of these lamps satisfies the requirements of this Regulation or of another Regulation. Lamps not satisfying any one of those Regulations shall not be part of such a unit of grouped, combined, or reciprocally incorporated lamps.
- 4.5.1. Where grouped, combined or reciprocally incorporated lamps comply with the requirements of several Regulations, a single international approval mark may be applied, consisting of a circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted the approval, and approval number and, if necessary, the required arrow. This approval mark may be placed anywhere on the grouped, combined or reciprocally incorporated lamps provided that:
- 4.5.1.1. It is visible after their installation;
- 4.5.1.2. 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.
- 4.5.2. 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, shall be marked.
- 4.5.2.1. Either on the appropriate light-emitting surface;
- 4.5.2.2. Or in a group, in such a way that each lamp of the grouped, combined or reciprocally incorporated lamps may be clearly identified (see three possible examples in annex 2).
- 4.5.3. 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 a Regulation under which approval has been granted.
- 4.5.4. 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.
- 4.6. Annex 2 gives examples of arrangements of approval marks for a single lamp (figure 1) and for grouped, combined or reciprocally incorporated lamps (figure 2) with all the additional symbols referred to above.
5. GENERAL SPECIFICATIONS
- 5.1. Each sample shall conform to the specifications set forth in the paragraphs below.
- 5.2. Rear fog lamps shall be so designed and constructed that in normal use, despite the vibration to which they may then be subjected, they continue to function satisfactorily and retain the characteristics prescribed by this Regulation.

6. INTENSITY OF LIGHT EMITTED

- 6.1. The intensity of the light emitted by each of the two samples shall be not less than the minima and not greater than the maxima specified below and shall be measured in relation to the axis of reference in the directions shown below (expressed in degrees of angle with the axis of reference).
- 6.2. The intensity along the H and V axes, between 10° to the left and 10° to the right and between 5° up and 5° down, shall not be less than 150 cd.
- 6.3. The intensity of the light emitted in all directions in which the light(s) can be observed shall not exceed 300 cd per light.
- 6.4. In the case of a single lamp containing more than one light source, the lamp shall comply with the minimum intensity required when any one light source has failed and when all light sources are illuminated the maximum intensities shall not be exceeded.
- 6.5. The apparent surface in the direction of the reference axis shall not exceed 140 cm².
- 6.6. Annex 3 gives particulars of the measurement method to be used in case of doubt.

7. TEST PROCEDURE

All measurements shall be carried out with uncoloured standard lamps of the types prescribed for the device, adjusted to produce the normal luminous flux prescribed for those types of lamps.

- 7.1. All measurements on lamps equipped with non-replaceable light sources (filament lamps and other) shall be made at 6,75 V, 13,5 V or 28,0 V respectively.

In the case of light sources supplied by a special power supply, the above test voltages shall be applied to the input terminals of that power supply.

The test laboratory may require from the manufacturer the special power supply needed to supply the light sources.

8. HEAT RESISTANCE TEST

- 8.1. The light must be subjected to a 1-hour test of continuous operation following a warm-up period of 20 minutes.

The ambient temperature shall be 23 °C ± 5 °C. The lamp used shall be a lamp of the category prescribed for the light, and shall be supplied with a current at a voltage such that it gives the specified average power at the corresponding test voltage.

- 8.2. Where only the maximum power is specified, the test shall be carried out by regulating the voltage to obtain a power equal to 90 per cent of the specified power. The specified average or maximum power referred to above shall in all cases be chosen from the voltage range of 6, 12 or 24 V at which it reaches the highest value.

- 8.3. After the lamp has been stabilised at the ambient temperature, no distortion, deformation, cracking or colour modification shall be perceptible.

9. COLOUR OF LIGHT EMITTED

The colour of the light emitted as defined in annex 3 paragraph 3, which shall be measured by using a source of light at a colour temperature of 2 856 °K⁽¹⁾, must lie within the limits of the following trichromatic co-ordinates:

limit towards yellow: $y < 0,335$

limit towards purple: $z < 0,008$

However, for lamps equipped with non-replaceable light sources (filament lamps and other), the calorimetric characteristics should be verified with the light sources present in the lamp, in accordance with paragraph 7.1 of 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. 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 9 above.

10.2. The minimum requirements for conformity of production control procedures set forth in annex 4 to this Regulation shall be complied with.

10.3. The minimum requirements for sampling by an inspector set forth in annex 5 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.

11. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

11.1. The approval granted for a type of rear fog lamp may be withdrawn if the foregoing requirements are not complied with or if a rear fog light bearing the mark referred to in paragraphs 4.4.1 and 4.4.2 does not conform to the type approved.

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

12. PRODUCTION DISCONTINUED

If the holder of the approval completely ceases to manufacture a type of rear fog lamp approved under this regulation, he shall inform thereof the authority which granted the approval. Upon receiving the relevant communication, that authority shall inform the other Parties to the Agreement which apply this Regulation thereof, by means of a communication form conforming to the model in annex 1 to this Regulation.

⁽¹⁾ Corresponding to illuminant A of the International Commission on Illumination (ICl).

13. NAMES AND ADDRESSES OF TECHNICAL SERVICES CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS

The Contracting Parties to the Agreement which apply this Regulation shall communicate to the Secretariat of the United Nations the names and addresses of the technical services conducting approval tests and of the administrative departments which grant approval and to which forms certifying approval and refusal or withdrawal of approval, issued in other countries, are to be sent.

ANNEX 1

Communication (to the Regulation)

(Maximum format: A4 (210 × 297 mm))

issued by: Name of administration

.....

.....

.....

concerning ⁽²⁾ APPROVAL GRANTED

APPROVAL EXTENDED

APPROVAL REFUSED

APPROVAL WITHDRAWN

PRODUCTION DEFINITELY DISCONTINUED

of a type of rear fog lamps for power-driven vehicles and their trailers pursuant to regulation No 38

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 reports issued by that service:

9. Concise description ⁽³⁾:

— Number and type(s) of lamp(s) (1 × P21W):

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

⁽²⁾ Strike out what does not apply.

⁽³⁾ For rear fog lamps with non-replaceable light sources indicate the number and total wattage of the sealed in light sources.

10. Position of the approval mark:
11. Reason(s) for extension (if applicable):
12. Approval granted/extended/refused/withdrawn⁽¹⁾:
13. Place:
14. Date:
15. Signature:
16. The list of documents deposited with the Administrative Service which has granted approval is annexed to this communication and may be obtained on request.

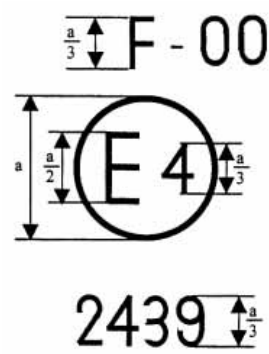
⁽¹⁾ Strike out what does not apply.

ANNEX 2

Arrangement of the approval marks

Figure 1 (Marking for single lamps)

Model A



a = 5 mm min.

The device bearing the approval mark shown above is a rear fog lamp approved in the Netherlands (E4) pursuant to Regulation No 38 under approval number 2439.

The approval number indicates that the approval was granted in accordance with the requirements of Regulation No 38 in its original version.

Figure 2 (Simplified marking for grouped, combined or reciprocally incorporated lamps)

(The vertical and horizontal lines schematise the shape of the light-signalling device. These are not part of the approval mark.)

Model B

	3333 E 4 → 1A02		
		201	A01
	F00	AR00	S201

Model C

		1A 2 A 02 01 01 F AR S2 00 00 01 3333 E 4 →	

Model D

1A 2 A 02 01 01 F AR S2 00 00 01			
3333 E 4 →			

Note: The three examples of approval marks, models, B, C and D represent three possible variants of the marking of a lighting device when two or more lamps are part of the same unit of grouped, combined or reciprocally incorporated lamps. This approval mark shows that the device was approved in the Netherlands (E4) under approval number 3333 and comprising:

A retro reflector of class 1A approved in accordance with the 02 series of amendments to Regulation No 3;

A rear direction indicator of category 2a approved in accordance with the 01 series of amendments to Regulation No 6;

A red rear position lamp (R) approved in accordance with the 01 series of amendments to Regulation No 7;

A rear fog lamp (F) approved in accordance with Regulation No 38 in its original form;

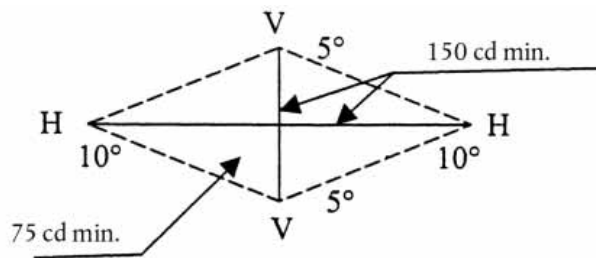
A reversing lamp (AR) approved in accordance with Regulation No 23 in its original form;

A stop lamp with two levels of illumination (S2) approved in accordance with the 01 series of amendments to Regulation No 7.

ANNEX 3

Photometric measurements

1. When photometric measurements are taken, stray reflections shall be avoided by appropriate masking.
2. In the event that the results of measurements are challenged, measurements shall be taken in such a way as to meet the following requirements:
 - 2.1. the distance of measurement shall be such that the law of the inverse of the square of the distance is applicable;
 - 2.2. the measuring equipment shall be such that the angle subtended by the receiver from the reference centre of the light is between $10'$ and 1° ;
 - 2.3. the intensity requirement for a particular direction of observation shall be satisfied if the required intensity is obtained in a direction deviating by not more than one-quarter of a degree for the direction of observation.
3. If visual examination of a light appears to reveal substantial local variations of intensity, a check shall be made to ensure that, outside the axes, no intensity measured within the rhombus defined by the extreme directions of measurement is below 75 cd (see diagram below).



4. Photometric measurement of lamps equipped with several light sources

The photometric performance shall be checked:

 - 4.1. For non-replaceable light sources (filament lamps and other):

with the light sources present in the lamp, in accordance with paragraph 7.1 of this Regulation.
 - 4.2. For replaceable filament lamps:

when equipped with mass production filament lamps at 6,75 V, 13,5 V or 28,0 V the luminous intensity values produced shall lie between the maximum limit given in this Regulation and the minimum limit of this Regulation increased according to the permissible deviation of the luminous flux permitted for the type of filament lamp chosen, as stated in Regulation No 37 for production filament lamps; alternatively a standard filament lamp may be used in turn, in each of the individual positions, operated at its reference flux, the individual measurements in each position being added together.

ANNEX 4

Minimum requirements for conformity of production control procedures

1. GENERAL

1.1. The conformity requirements shall be considered 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 lamps

shall not be contested if, when testing photometric performances of any lamp chosen at random and equipped with a standard filament lamp, or when the lamps are equipped with non-replaceable light sources (filament lamps or other), and when all measurements are made at 6,75 V, 13,5 V or 28,0 V respectively:

1.2.1. No measured value deviates unfavourably by more than 20 per cent from the values prescribed in this Regulation.

1.2.2. If, in the case of a lamp equipped with a replaceable light source and if results of the test described above do not meet the requirements, tests on lamps shall be repeated using another standard filament lamp.

1.3. The chromaticity coordinates shall be complied with when the lamp is equipped with a standard filament lamp, or for lamps equipped with non-replaceable light sources (filament lamps or other), when the colorimetric characteristics are verified with the light source present in the lamp.

2. MINIMUM REQUIREMENTS FOR VERIFICATION OF CONFORMITY BY THE MANUFACTURER

For each type of 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 and colorimetric characteristics.

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 lamps shall be selected at random from the production of a uniform batch. A uniform batch means a set of 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 lamp shall be subjected to photometric measurements for the minimum values at the points listed in annex 3 and for the chromaticity coordinates provided for in paragraph 9 of the Regulation.

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 the 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 5 (first sampling) would be 0,95.

ANNEX 5

Minimum requirements for sampling by an inspector

1. GENERAL

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

1.2. With respect to photometric performance,

the conformity of mass-produced lamps shall not be contested if, when testing photometric performances of any lamp chosen at random and equipped with a standard filament lamp, or when the lamps are equipped with non-replaceable light sources (filament lamps or other), and when all measurements are made at 6,75 V, 13,5 V or 28,0 V respectively:

1.2.1. No measured value deviates unfavourably by more than 20 per cent from the values prescribed in this Regulation.

1.2.2. If, in the case of a lamp equipped with a replaceable light source and if results of the test described above do not meet the requirements, tests on lamps shall be repeated using another standard filament lamp.

1.2.3. Lamps with apparent defects are disregarded.

1.3. The chromaticity coordinates shall be complied with when the lamp is equipped with a standard filament lamp, or for lamps equipped with non-replaceable light sources (filament lamps or other), when the colorimetric characteristics are verified with the light source present in the lamp.

2. FIRST SAMPLING

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

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 lamps shall not be contested if the deviation of the measured values of the lamps in the unfavourable directions are:

2.1.1.1. sample A

A1: one lamp 0 %

one lamp not more than 20 %

A2: both lamps more than 0 %

but not more than 20 %

go to sample B

2.1.1.2. sample B

B1: both lamps 0 %

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 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 lamps are:
- 2.2.1.1. sample A
- A3: one lamp not more than 20 %
one lamp more than 20 %
but not more than 30 %
- 2.2.1.2. sample B
- B2: in the case of A2
one lamp more than 0 %
but not more than 20 %
one lamp not more than 20 %
- B3: in the case of A2
one lamp 0 %
one lamp more than 20 %
but not more than 30 %
- 2.2.2. or, if the conditions 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 in Figure 1 of this annex, the deviations of the measured values of the lamps are:
- 2.3.1. sample A
- A4: one lamp not more than 20 %
one lamp more than 30 %
A5: both lamps more than 20 %
- 2.3.2. sample B
- B4: in the case of A2 one lamp more than 0 %
but not more than 20 %
one lamp more than 20 %
- B5: in the case of A2
both lamps more than 20 %
- B6: in the case of A2
one lamp 0 %
one lamp more than 30 %
- 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 cases of A3, B2, B3 a repeated sampling, third sample C of two lamps and fourth sample D of two lamps, 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 lamps shall not be contested if the deviations of the measured values of the lamps are:

3.1.1.1. sample C

C1: one lamp 0 %

one lamp not more than 20 %

C2: both lamps more than 0 %

but not more than 20 %

go to sample D

3.1.1.2. sample D

D1: in the case of C2

both lamps 0 %

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 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 lamps are:

3.2.1.1. sample D

D2: in the case of C2

one lamp more than 0 %

but not more than 20 %

one lamp not more than 20 %

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 in Figure 1 of this annex, the deviations of the measured values of the lamps are:

3.3.1. sample C

C3: one lamp not more than 20 %

one lamp more than 20 %

C4: both lamps more than 20 %

3.3.2. sample D

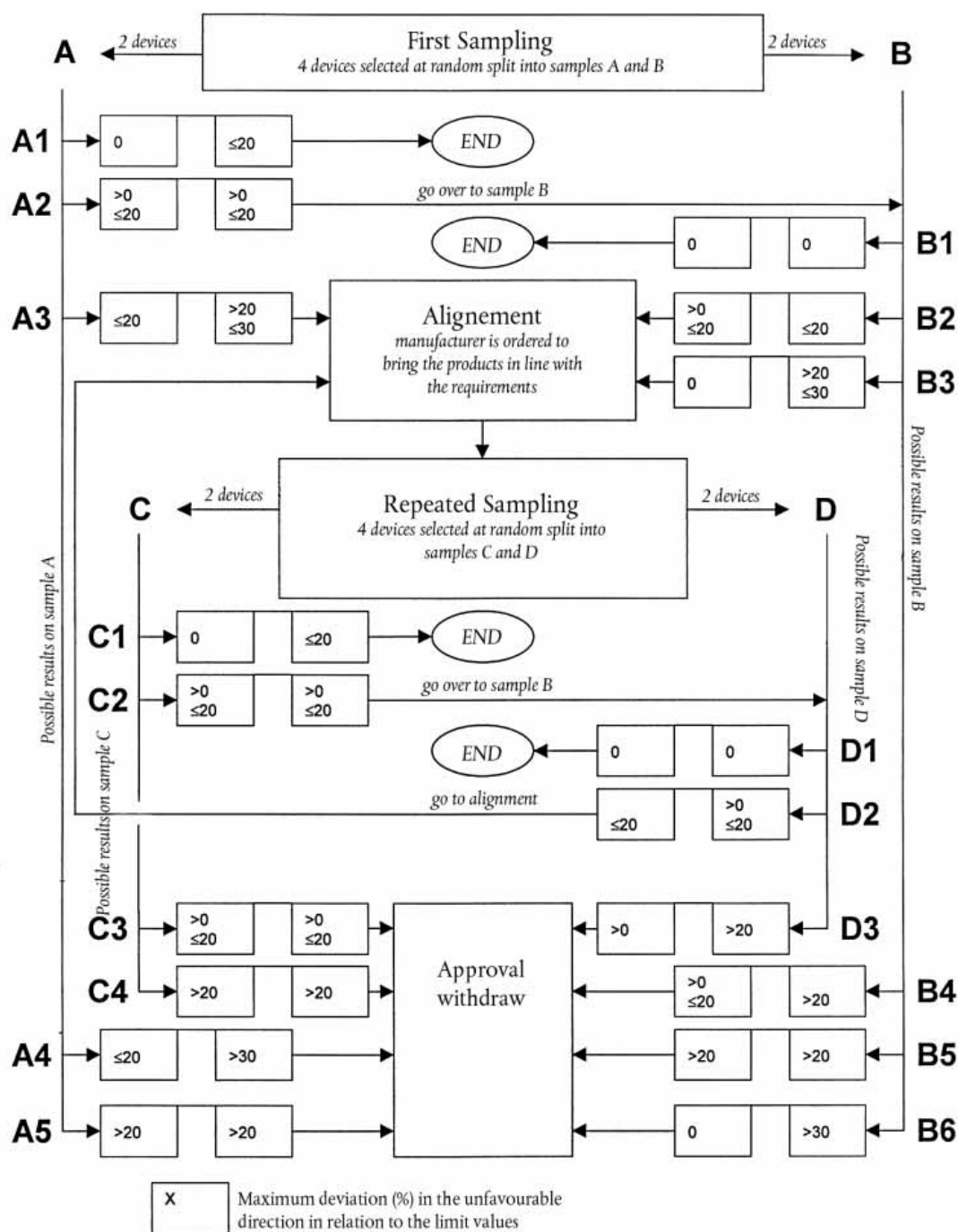
D3: in the case of C2

one lamp 0 or more than 0 %

one lamp more than 20 %

3.3.3. or, if the conditions of paragraph 1.2.2 for samples C and D are not fulfilled.

Figure 1



Regulation No 98 of the Economic Commission for Europe of the United Nations (UN/ECE) uniform provisions concerning the approval of motor vehicle headlamps equipped with gas-discharge light sources⁽¹⁾

A. ADMINISTRATIVE PROVISIONS

SCOPE⁽²⁾

This Regulation applies to motor vehicle headlamps equipped with gas discharge light source(s) which may incorporate lenses of glass or plastic material.

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. 'Ballast' means the electrical supply of the gas-discharge light source. This ballast may be partly or completely inside or outside the headlamp;
- 1.4. 'Matched pair' means the set of lamps of the same function on the left- and right-hand side of the vehicle;
- 1.5. Additional definitions are given in Regulation No 48;
- 1.6. Headlamps of different 'types' are headlamps which differ in such essential respects as:
 - 1.6.1. the trade name or mark;
 - 1.6.2. the characteristics of the optical system;
 - 1.6.3. the inclusion or elimination of components capable of altering the optical effects by reflection, refraction, absorption and/or deformation during operation. However, the fitting or elimination of filters intended solely to change the colour of the beam and not its light distribution does not entail a change of type;
 - 1.6.4. suitability for right-hand or left-hand or for both traffic systems;

⁽¹⁾ Regulation of the United Nations Economic Commission for Europe published pursuant to the provisions of Article 4 (5) of Council Decision 97/836/EC (OJ L 346, 17.12.1997, p. 78).

⁽²⁾ Nothing in this Regulation shall prevent a Contracting Party to the Agreement applying this Regulation from prohibiting the combination of a headlamp approved 'PL' (Plastic Lense) under this Regulation with a mechanical headlamp-cleaning (i.e. with wipers) on vehicles which it registers.

- 1.6.5. the kind of beam produced (passing beam or driving beam or both);
- 1.6.6. the materials constituting the lenses and coating, if any;
- 1.7. 'Light-transmitting components' means any part of the headlamp which transmits light for illumination, such as outer and inner lenses, lens or reflector coatings.
- 2. APPLICATION FOR APPROVAL OF A HEADLAMP⁽¹⁾
 - 2.1. The application for approval shall be submitted by the owner of the trade name or mark of the headlamp or by his duly accredited representative. It shall specify:
 - 2.1.1. whether the headlamp is intended to provide a passing beam, a driving beam or both;
 - 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. the maximum vertical angles above and below the nominal position(s) which the aiming device can achieve;
 - 2.1.5. which light sources are energised when the various beam combinations are used;
 - 2.1.6. the category of gas-discharge light source as listed in Regulation No 99.
 - 2.2. Every application shall be accompanied by:
 - 2.2.1. drawings in triplicate in sufficient detail to permit identification of the type (see paragraphs 3.2 and 4.2 below). The drawings must show the position intended for the approval number and the additional symbols in relation to the circle of the approval mark, and must show the headlamp in vertical (axial) section and in front elevation, with main details of the optical design including the flutings, if applicable.
 - 2.2.2. A brief technical specification including the make and types of the ballast(s), where it applies.
 - 2.2.3. Samples, as follows:
 - 2.2.3.1. for approval of a headlamp, two samples with standard gas-discharge light source and one ballast of each type to be used, where applicable;

⁽¹⁾ For gas-discharge light sources see Regulation No 99.

- 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 x 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 UV-resistance of light transmitting components made of plastic material against UV radiation of gas-discharge light sources inside the headlamp:
- 2.2.5.1. One sample 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 low-UV-type gas-discharge light sources are being applied as specified in Regulation XXX (TRANS/SC.1/WP.29/GRE/R.195) or if provisions are taken, to shield the relevant headlamp components from UV radiation, e.g. by glass filters.
- 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.
- 2.4. 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⁽¹⁾
- 3.1. Headlamps submitted for approval shall bear legibly and indelibly on the lens the trade name or mark of the applicant.
- 3.2. They shall comprise, on the lens and on the main body⁽²⁾, 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.

⁽¹⁾ In the case of headlamps designed to meet the requirements of traffic moving on one side of the road only (either right or left) it is further recommended that the area which can be occulted to prevent discomfort to 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 should be outlined indelibly on the front lens and explained in the maintenance book of the vehicles. This marking is not necessary, however, where the area is clearly apparent from the design.

⁽²⁾ If the lens cannot be separated from the main body of the headlamp, the provision of a marking area on the lens will suffice.

- 3.3. Headlamps designed to satisfy the requirements of both right-hand and left-hand traffic shall bear markings indicating the two settings of the optical unit on the vehicle or of the gas-discharge light source 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. All beams may bear on their light-emitting surface a centre of reference as shown in annex 6.
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. Headlamps conforming to this Regulation may be grouped, combined or reciprocally incorporated with any other lighting or light-signalling function(s) provided that their respective lighting functions are not impaired.
- 4.1.3. 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.
- 4.1.4. An approval number shall be assigned to each type approved. Its first two digits (at present 00) 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. However, the matched pair is considered to be one type.
- 4.1.5. 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 communication form conforming to the model in annex 1 to this Regulation.
- 4.1.6. 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 marking, 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 4.1.4 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 light source, a horizontal arrow with a head at each end, the heads pointing respectively to the left and to the right;
 - 4.2.2.3. on headlamps meeting the requirements of this Regulation in respect of the passing beam only, the letter 'DC';
 - 4.2.2.4. on headlamps meeting the requirements of this Regulation in respect of the driving beam only, the letter 'DR';
 - 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 'DCR';
 - 4.2.2.6. on headlamps incorporating a lens of plastic material, the 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 6.3.2.2 below, placed near the circle surrounding the letter 'E';

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

- 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 allowed 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 passing beam shall not be lit simultaneously with that of any other lighting function with which it may be reciprocally incorporated: an oblique stroke (/) shall be placed behind the passing lamp symbol in the approval mark.

⁽¹⁾ 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech Republic, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24 (vacant), 25 for Croatia, 26 for Slovenia, 27 for Slovakia, 28 for Belarus, 29 for Estonia, 30 (vacant), 31 for Bosnia and Herzegovina, 32-36 (vacant) and 37 for Turkey. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and parts, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

- 4.2.4. The two digits of the approval number (at present 00) 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 and 4.2.2 shall be clearly legible and be indelible even when the headlamp is fitted in the vehicle. The displacement of a moving component is deemed to fulfil this requirement.
- 4.3. *Arrangement of the approval mark*
- 4.3.1. *I n d e p e n d e n t l a m p s*
- Annex 2, figures 1 to 9, to this Regulation give examples of arrangements of the approval marks with the above-mentioned additional symbols.
- 4.3.2. *G r o u p e d , c o m b i n e d o r r e c i p r o c a l l y i n c o r p o r a t e d l a m p s*
- 4.3.2.1. Where grouped, combined or reciprocally incorporated lamps have 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 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, even if displacement of a movable component is necessary;
- 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 Regulations 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, Figure 10).
- 4.3.2.3. The size of the components of a single approval mark shall not be less than the minimum size required by the Regulation under which approval has been granted for the smallest of the individual marks.
- 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 2, Figure 10 of 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. Annex 2, Figure 11, 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 comply with the specifications set forth in paragraphs 6 to 8 below.

- 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 vehicle 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 headlamps setting can be adjusted by other means.

Where a headlamp providing a passing beam and a headlamp providing a driving beam, each equipped with its own light source(s), are assembled to form a composite unit, the adjusting device shall enable each optical system individually to be duly adjusted. The same provision applies to headlamps providing a front fog lamp beam and a driving beam, and to headlamps providing a passing beam and a front fog lamp beam, and to headlamps providing these three beams.

- 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 shall apply.

- 5.3. In the case when gas-discharge light source replacement can be carried out without tools, the lamp holder shall conform to the dimensional characteristics as given on the data sheet of IEC Publication 61-2, relevant to the category of gas-discharge light source used. The gas-discharge light source must fit easily into the headlamp.

- 5.4. Headlamps designed to satisfy the requirements of both 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.

⁽¹⁾ Technical requirements gas-discharge light sources: see Regulation No 99.

Such initial or selective setting may consist, for example, of fixing either the optical unit at a given angle on the vehicle or the light source(s) at a given angle 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 light source, the components for attaching the light source to the reflector must be so designed and made that, in each of its two settings, the light source 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. On headlamps designed to provide alternately a driving beam and a passing beam, any mechanical, electro-mechanical or other device incorporated in the headlamp for switching from one beam to the other⁽¹⁾ must be so constructed that:

5.5.1. the device is strong enough to function 50 000 times without suffering damage despite the vibrations to which it may be subjected in normal use;

5.5.2. in the case of failure it is possible to obtain the passing beam automatically;

5.5.3. either the passing beam or the driving beam can always be obtained without any possibility of the mechanism stopping in between the two positions;

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

5.6. 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.

5.7. Light transmitting components made of plastic material shall be tested according to the requirements of annex 5.

5.8. The headlamp and ballast system shall not generate radiated or power line disturbances to cause a malfunction of other electric/electronic systems of the vehicle⁽²⁾.

6. ILLUMINATION

6.1. *General Provisions*

6.1.1. Headlamps shall be so made that with suitable gas-discharge light source they give adequate illuminance without dazzle when emitting the passing beam, and good illumination when emitting the driving beam.

6.1.2. The illumination produced by the headlamp shall be determined by means of a vertical screen set up 25 m forward of the headlamp and at right angles to its axes (see paragraph 6.2.6 and annex 3 to this Regulation), or by any equivalent photometric method.

⁽¹⁾ These provisions shall not apply to the control switch.

⁽²⁾ Compliance with the requirements for electromagnetic compatibility is relevant to the individual vehicle type.

- 6.1.3. The headlamp using a removable gas-discharge light source shall be deemed satisfactory if the photometric requirements set in the present paragraph 6 are met with one standard light source, which has been aged during at least 15 cycles, in accordance with annex 4, paragraph 4 of Regulation No 99. The flux of this gas-discharge light source may differ from the objective luminous flux specified in Regulation No 99. In this case, the illuminances shall be corrected accordingly.

This correction does not apply to headlamps using non removable gas-discharge light source, or to headlamps with the ballast(s) totally or partially integrated.

- 6.1.4. The dimensions determining the position of the arc inside the standard gas-discharge light source are shown in the relevant data sheet of Regulation No 99.

- 6.1.5. Photometric compliance must be checked in accordance with paragraph 6.2.6 or 6.3 of this Regulation. This is also valid for the cut off zone between 3°R and 3°L (measurement method for the cut-off colour being under consideration).

- 6.1.6. The trichromatic coordinates of the light of the beams emitted by headlamps using gas-discharge light sources must be in the following boundaries:

limit towards blue: $x \geq 0,310$

yellow: $x \leq 0,500$

green: $y \leq 0,150 + 0,640x$

green: $y \leq 0,440$

purple: $y \geq 0,050 + 0,750x$

red: $y \geq 0,382$

- 6.1.7. Four seconds after ignition of a headlamp which has not been operated for 30 minutes or more, 60 lux at least must be reached at point HV of a driving beam and 10 lux at point 50V of a passing beam for headlamps incorporating driving beam and passing beam functions, or 10 lux at point 50V for headlamps having only a passing beam function. The power supply shall be sufficient to secure the quick rise of the high current pulse.

6.2. *Provisions concerning passing beams*

- 6.2.1. The passing beam must produce a sufficiently sharp 'cut-off' to permit a satisfactory adjustment with its aid. The 'cut-off' must be a horizontal straight line on the side opposite to the direction of traffic for which the headlamp is intended; on the other side it must not extend either above the line HV/H2 of annex 3, Screen 1, or above the line HV/H3/H4 of annex 3, Screen 2. A cut-off extending above a combination of these lines shall in no circumstances be permitted.

- 6.2.2. The headlamp shall be so aimed that:

- 6.2.2.1. in the case of headlamps designed to meet the requirements of right-hand traffic, the 'cut-off' on the left-half of the screen⁽¹⁾ is horizontal and, in the case of headlamps designed to meet the requirements of left-hand traffic, the 'cut-off' on the right-half of the screen is horizontal;

⁽¹⁾ The test screen must be sufficiently wide to allow examination of the 'cut-off' over a range of at least 5° each side of the line VV.

- 6.2.2.2. this horizontal part of the 'cut-off' is situated on the screen 25 cm below the line HH (see annex 3). The kink of the elbow of the cut-off shall be on the VV line.
- 6.2.3. When so aimed, the headlamp needs, if its approval is sought solely for a passing beam, comply only with the requirements referred to in paragraphs 6.2.5 and 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 6.2.5 to 6.3.2.3. The values specified for Segment II in paragraph 6.2.6 do not apply to annex 3, Screen 2.
- 6.2.4. Where a headlamp so aimed does not meet the requirements set out in paragraphs 6.2.6 and 6.3, its alignment may be changed, provided that the axis of the beam is not displaced laterally by more than $0,50^\circ$ (= 22 cm) to the right or left and vertically not more than $0,2^\circ$ (= 8,7 cm) up or down⁽¹⁾. To facilitate alignment by means of the 'cut-off', the headlamp may be partially occulted in order to sharpen the 'cut-off'.
- 6.2.5. Only one gas-discharge light source is permitted for each passing beam headlamp.
- 6.2.5.1. The voltage applied to the terminals of the ballast(s) is:
- either: $13,5 \text{ V} \pm 0,1$ for 12 V systems
- or: otherwise specified (See annex 7)
- 6.2.6. After more than 10 minutes after ignition the illuminances produced on Screen 1 or 2 (or mirrored about the VV line for left-hand traffic) shall meet the following requirements:

Note: In the table:

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

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

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

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

Point or segments	Designation	Illuminances (lux)	Horizontal Distances (cm)	Vertical Distances (cm)
	On and above line H/H2, or on and above line H/H3/H4	1 Max		
1	HV	1 max	0	0
2	B 50 L	0,5max	L 150	U 25
3	75 R	20 min	R 50	D 25
4	50 L	20 max	L 150	D 37,5
5	25 L1	30 max	L 150	D 75
6	50 V	12 min	0	D 37,5

⁽¹⁾ The limit of realignment of $0,5^\circ$ towards the right or left is not incompatible with upward or downward vertical realignment. The latter is limited, too, by the requirements of paragraph 6.3. However, the provisions of paragraph 6.3 are not applicable to headlamps intended to meet the requirements of this Regulation only for provision of a passing beam.

Point or segments	Designation	Illuminances (lux)	Horizontal Distances (cm)	Vertical Distances (cm)
	On and above line H/H2, or on and above line H/H3/H4	1 Max		
7	50 R	20 min	R 75	D 37,5
8	25 L2	4 min	L 396	D 75
9	25 R1	4 min	R 396	D 75
10	25 L3	2 min	L 670	D 75
11	25 R2	2 min	R 670	D 75
12	15 L	1 min	L 910	D 125
13	15 R	1 min	R 910	D 125
14		(*)	L 350	U 175
15		(*)	0	U 175
16		(*)	R 350	U 175
17		(*)	L 175	U 87,5
18		(*)	0	U 87,5
19		(*)	R 175	U 87,5
20		0,1 min	L 350	0
21		0,2 min	L 175	0
A to B	Segment I	6 min	L 255 to R 225	D 37,5
C to D	Segment II	6 max	R 140 to R 396	U 45
E to F	Segment III and under	20 max	L 417 to R 375	D 187,5
	E max R	70 max	Right of VV line	Above D 75
	E max L	50 max	Left of VV line	

(*) The illumination values at points 14 through 19 shall be such that: $14 + 15 + 16 \geq 0,3$ lux and $17 + 18 + 19 \geq 0,6$ lux.

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 illumination produced on the screen by the driving beam shall be taken with the same headlamp alignment as for measurements under paragraph 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 illumination is centred on the point of intersection of lines HH and VV; such a headlamp needs meet only the requirements referred to in paragraph 6.3. Test voltages are the same as in paragraph 6.2.5.1.

6.3.2. It is possible to use several light sources for the driving beam, these light sources being listed in either Regulation No 37 or Regulation No 99. The following provisions shall be met:

6.3.2.1. The point of intersection (HV) of the lines HH and VV shall be situated within the isolux representing 80 per cent of the maximum illuminance. This maximum illuminance, hereunder designated as Emax, shall lie between 70 and 180 lux.

6.3.2.2. The reference mark referred to in paragraph 4.2.2.7 above shall be obtained by means of the formula:

Reference mark = 0,208 Emax

This value shall be rounded off to the value: 17,5 — 20 — 25 — 27,5 — 30 — 37,5.

6.3.2.3. Starting from point HV, horizontally to the right and left, the illuminance shall be not less than 40 lux up to a distance of 1,125 m and not less than 10 lux up to a distance of 2,25 m.

6.4. The screen illuminance values mentioned in paragraphs 6.2.6 to 6.3.2.3 above shall be measured by means of a photo-receptor, the effective area of which shall be contained within a square of 65 mm side.

6.5. *Provisions concerning movable reflectors*

6.5.1. With the lamp fixed according to all the positions described in paragraph 2.1.4, the headlamp must meet the photometric requirements of paragraph 6.2 or 6.3, or both.

6.5.2. Additional tests are made after the reflector has been tilted vertically upwards by the angle quoted in paragraph 2.1.4 or 2 degrees, whichever is smaller, by means of the headlamp aiming devices. The headlamp is then re-aimed downwards (by means of the goniometer), and the photometric specifications must be met at the following points:

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

Driving beam: Emax, HV as percent of Emax

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

6.5.3. The reflector is brought back to its nominal angular position as defined in paragraph 6.2.2, and the goniometer is set back to its position of origin. The reflector is tilted vertically downwards by the angle quoted in paragraph 2.1.4, or 2 degrees, whichever is smaller, by means of the headlamp aiming device. The headlamp is then re-aimed upwards (by means of the goniometer for example) and points as in paragraph 6.5.2 are checked.

7. GAUGING OF DISCOMFORT

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

⁽¹⁾ This requirement will be the subject of a recommendation for the benefit of the administrations.

C. FURTHER ADMINISTRATIVE PROVISIONS**8. MODIFICATION OF THE HEADLAMP TYPE AND EXTENSION OF APPROVAL**

8.1. Every modification of the headlamp type including the ballast shall be notified to the administrative department which approved the headlamp type. The said department may then either:

8.1.1. 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

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

8.2. Confirmation or refusal or approval, specifying the alterations, shall be communicated by the procedure specified in paragraph 4.1.5 above to the Contracting Parties to the Agreement which apply this Regulation.

8.3. 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 Contracting Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in annex 1 to this Regulation.

9. CONFORMITY OF PRODUCTION

9.1. Headlamps approved under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set forth in paragraph 6.

9.2. In order to verify that the requirements of paragraph 9.1 are met, suitable controls of the production shall be carried out.

9.3. The holder of the approval shall in particular:

9.3.1. ensure the existence of procedures for the effective control of the quality of products:

9.3.2. have access to the control equipment necessary for checking the conformity to each approved type;

9.3.3. 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;

9.3.4. analyze 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;

9.3.5. ensure that for each type of product at least the tests prescribed in annex 8 to this Regulation are carried out;

- 9.3.6. ensure that any collecting of samples giving evidence of nonconformity 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.
- 9.4. The competent authority which has granted type approval may at any time verify the conformity control methods applicable to each production unit.
- 9.4.1. In every inspection, the test books and production survey records shall be presented to the visiting inspector.
- 9.4.2. 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 results of the manufacturer's own checks.
- 9.4.3. 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 9.4.2 above, the inspector shall select samples, to be sent to the technical service which has conducted the type approval tests, using the criteria of annex 9.
- 9.4.4. 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 9.
- 9.4.5. 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.
- 9.5. Headlamps with apparent defects are disregarded.
- 9.6. The reference mark is disregarded.
- 9.7. The measuring points 14 to 21 from paragraph 6.2.6 of this Regulation are disregarded.
10. PENALTIES FOR NON-CONFORMITY OF PRODUCTION
- 10.1. 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.
- 10.2. 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.

11. PRODUCTION DEFINITELY 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 Contracting Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in annex 1 to this Regulation.

12. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS

The Contracting 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 administrative departments 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.

ANNEX I

Communication

[maximum format: A4 (210 x 297 mm)]



issued by: Name of administration:

.....

.....

.....

Concerning ⁽²⁾: APPROVAL GRANTED

APPROVAL EXTENDED

APPROVAL REFUSED

APPROVAL WITHDRAWN

PRODUCTION DEFINITELY DISCONTINUED

of a type of headlamp pursuant to Regulation No. 98

Approval No. Extension No.

1. Trade name or mark of the headlamp:
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:

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

(2) Strike out what does not apply.

6. Technical service responsible for conducting approval tests:
7. Date of test report:
8. Number of test report:
9. Brief description:
- 9.1. Headlamp submitted for approval as type⁽¹⁾:
- 9.2. The passing beam light source may/may not⁽²⁾ be lit simultaneously with the driving beam light source and/or another reciprocally incorporated headlamp.
- 9.3. The rated voltage of the device is:
- 9.4. Category (or categories) of light source(s):
- 9.5. Trade name and identification number of separate ballast(s) or part(s) of ballast(s):
- 9.6. Remarks (if any):
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 Administration Service which has granted approval is annexed to this communication and may be obtained on request.

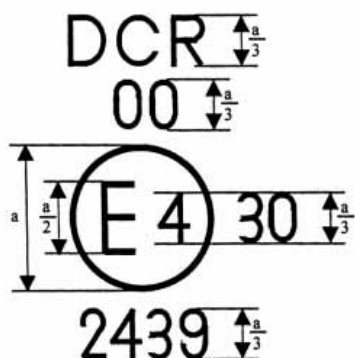
⁽¹⁾ Indicate the appropriate marking selected from the list below:

DC	DC/D	C/PL	DR	DCR	DC/R	DC PL	DR PL	DCR PL
DC/R PL	DC	DCR	DC/R	DC/	DC PL	DCR PL	DC/R PL	DC/PL
DC/PL	DC	DCR	DC/R	DC/	DCR PL	DC/R PL	DC/PL	
→	↔	↔	↔	↔	↔	↔	↔	↔

⁽²⁾ Strike out what does not apply.

ANNEX 2

Examples of arrangements of approval marks



$a = 8 \text{ mm min.}$

Figure 1

The headlamp bearing the approval mark shown above is a headlamp approved in the Netherlands (E4), under approval number 2439, meeting the requirements of this Regulation in its original form (00). The passing beam is designed for right-hand traffic only.

The figure 30 indicates that the maximum luminous intensity of the driving beam is between 86 250 and 101 250 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.

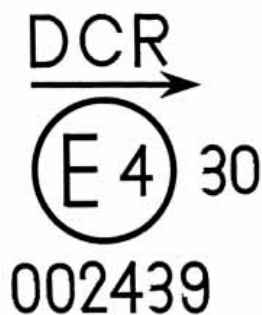


Figure 2

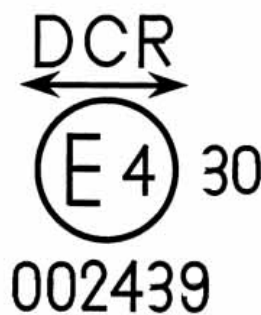


Figure 3a

The headlamp bearing the approval marking shown above is a headlamp meeting the requirements of this Regulation with respect to both the passing beam and the driving beam and designed:

For left-hand traffic only

For left-hand traffic only For both traffic systems, by means of an adjustment as desired of the setting of the optical unit or the light source on the vehicle



Figure 3b



Figure 4



Figure 5

The headlamp bearing the approval marking shown above is a headlamp meeting the requirements of this Regulation in its original form with a gas discharge light source for the passing beam only and is equipped with a lens of plastic material, and designed:

For both traffic systems	For right-hand traffic only
--------------------------	-----------------------------

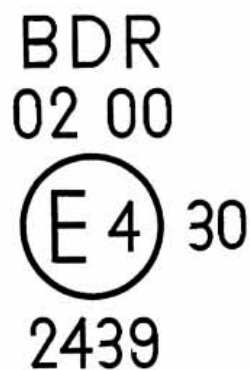


Figure 6

The headlamp bearing the approval marking shown above is a headlamp meeting the requirements of this Regulation in its original form with gas discharge light sources for the driving beam, and is combined or grouped or reciprocally incorporated with a front fog lamp.



Figure 7a

Figure 7b

The headlamp bearing the above approval marking shown above is a headlamp meeting the requirements of this Regulation.

With a gas discharge light source in respect of the passing beam only and is designed for left-hand traffic only	Same arrangement as figure 6, but the front fog lamp cannot be lit simultaneously with the driving beam
--	---

DC/HR PL
00 04
(E 4) 30
2439

Figure 8

DC/PL
↔
(E 4)
00 2439

Figure 9

Identification of a passing beam headlamp meeting the requirements of this Regulation and incorporating a lens of plastic material.

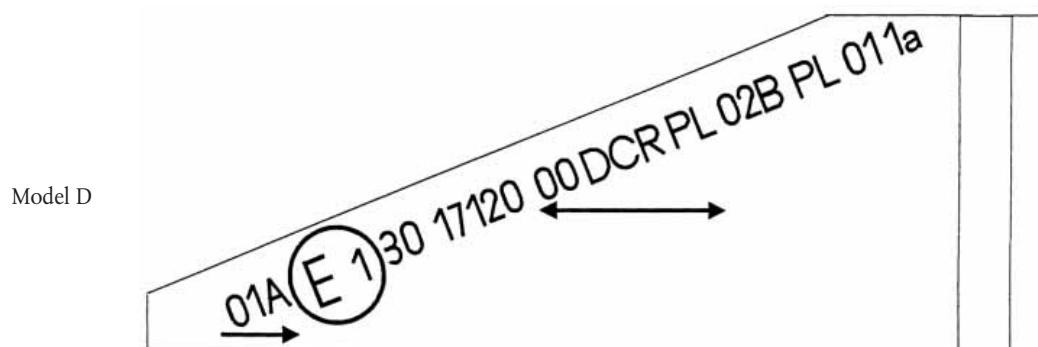
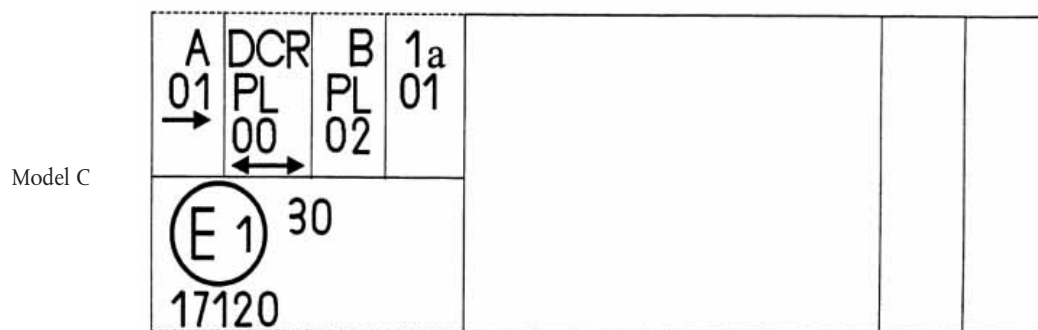
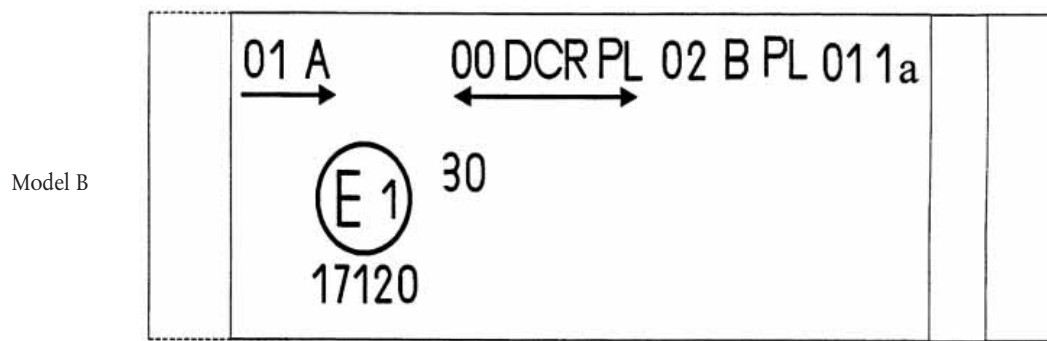
and combined or grouped or reciprocally incorporated with R 8 halogen driving beam. The passing beam shall not be lit simultaneously with the halogen driving beam. The passing beam is designed for right-hand traffic only	designed for both traffic systems The passing beam shall not be lit simultaneously with another reciprocally incorporated headlamp
---	---

Examples of possible simplified marking for grouped, combined or reciprocally incorporated lamps fitted to the front of the vehicle.

Figure 10

(The vertical and horizontal lines schematise the shape and overall arrangement of the light-signalling device. They are not part of the approval mark.)

Model A	(E 1) 30 17120		
	01 A ↔ 00 DCR PL ↔ 02 B PL 01 1a		



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

A front position lamp approved in accordance with the 01 series of amendments to Regulation No. 7, for left-hand installation;

a headlamp with a gas discharge passing beam designed for right-hand and left-hand traffic and a gas discharge driving beam with a maximum intensity comprised between 86 250 and 101 250 candelas (as indicated by the number 30), approved in accordance with this Regulation in its original form and incorporating a lens of plastic material;

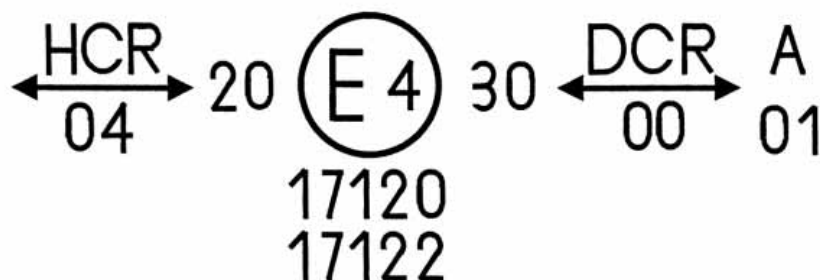
a front fog lamp approved in accordance with the 02 series of amendments to Regulation No. 19 and incorporating a lens of plastic material;

a front direction indicator lamp of category 1a approved in accordance with the 01 series of amendments to Regulation No 6.

Figure 11

Lamp reciprocally incorporated or grouped with a headlamp

Example 1



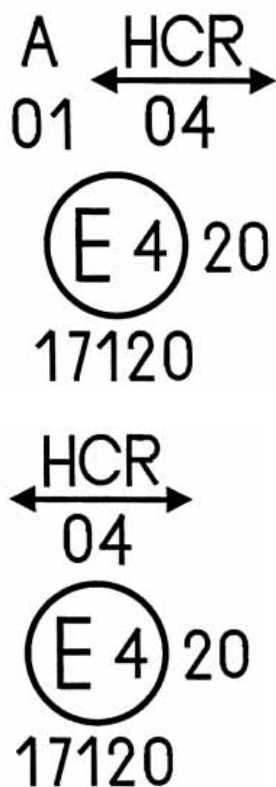
The above example corresponds to the marking of a lens intended to be used in different types of headlamps namely:

either: a headlamp with a passing beam designed for both traffic systems and a driving beam with a maximum luminous intensity comprised between 52 500 and 67 500 candelas (as indicated by the number 20) approved in the Netherlands (E 4) in accordance with the requirements of Regulation No 8 as amended by the 04 series of amendments, and a front position lamp approved in accordance with the 01 series of amendments to Regulation No 7,

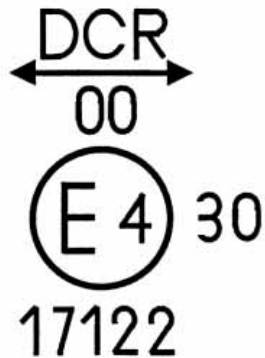
or: a headlamp with a gas discharge passing beam and a driving beam with a maximum luminous intensity comprised between 86 250 and 101 250 candelas (as indicated by the number 30), designed for both traffic systems and approved in the Netherlands in accordance with the requirements of this Regulation in its original form, 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:



or



or

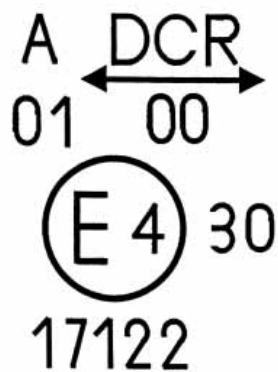
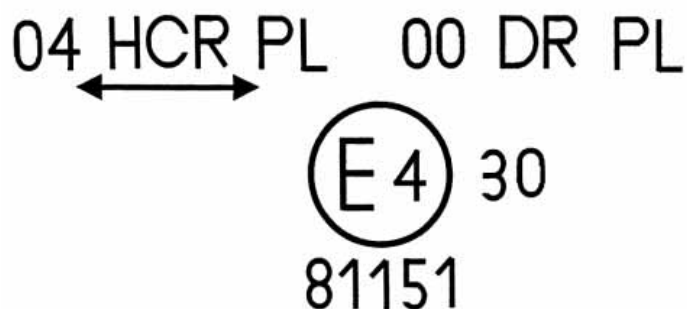


Figure 11 (following)

Example 2



The above example corresponds to the marking of a lens of plastic material and used in an assembly of two headlamps approved in the Netherlands (E4) under approval number 81151, consisting of:

a headlamp emitting a halogen passing beam designed for both traffic systems and a halogen driving beam with a maximum luminous intensity between x and y candelas, meeting the requirements of Regulation No 8 and,

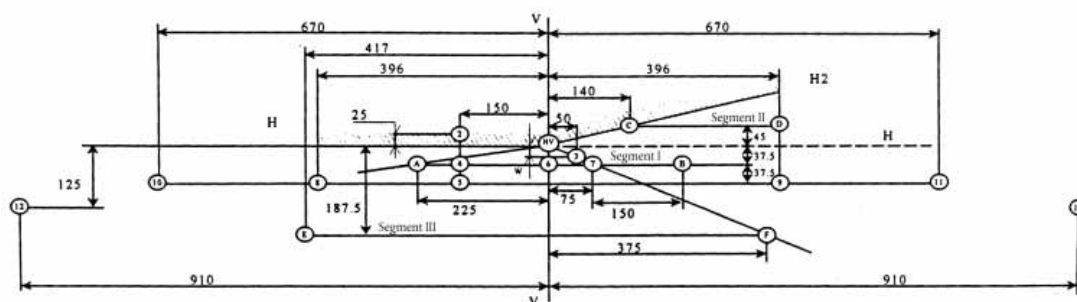
a headlamp emitting a gas discharge driving beam with a maximum luminous intensity comprised between w and z candelas, meeting the requirements of this Regulation in its original form, the maximum luminous intensities of the driving beam contributors as a whole being comprised between 86 250 and 101 250 candelas as shown by the number 30.

ANNEX 3

Figure A: Measuring screen 1

* Do not scale.

Passing beam

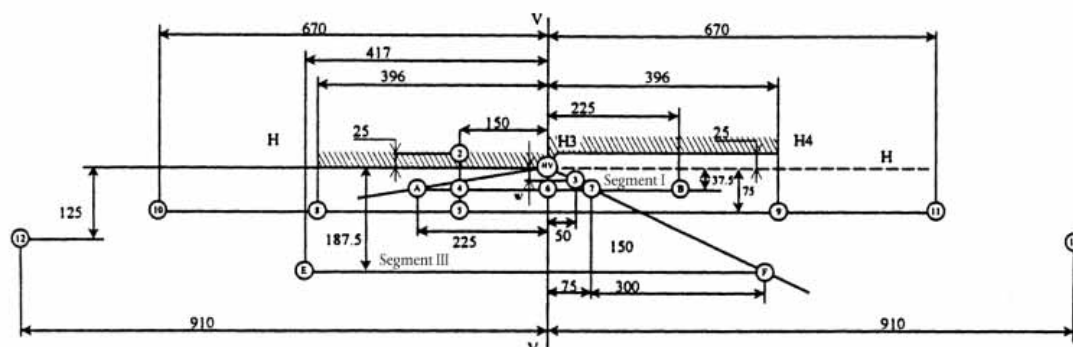


Dimensions are in cm on a flat vertical screen at 25 m. The HH and VV lines are the intersections with this screen of the horizontal and vertical planes passing through the axis of reference of the passing beam as declared by the applicant. The above screen describes a right-hand traffic passing beam. The screen for left-hand traffic passing beam is mirrored about the VV line. Angle HVH2-HH = 15°.

Figure B: Measuring screen 2

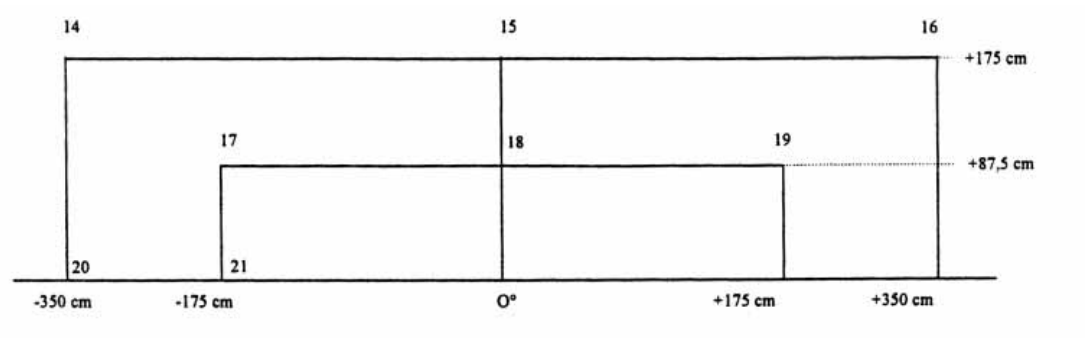
* Do not scale.

Passing beam



Dimensions are in cm on a flat vertical screen at 25 m. The HH and VV lines are the intersections with this screen of the horizontal and vertical planes passing through the axis of reference of the passing beam as declared by the applicant. The above screen describes a right-hand traffic passing beam. The screen for left-hand traffic passing beam is mirrored about the VV line. Angle HVH2-HH = 15°.

Figure C: Measuring points for illumination values



ANNEX 4

Tests for stability of photometric performance of headlamps in operation

TEST ON COMPLETE HEADLAMPS

Once the photometric values have been measured according to the prescriptions of this Regulation, in the point for $E_{\max}$ for driving beam and in points HV, 50 R and 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 ballast(s) and those surrounding body parts and lamps which could influence its thermal dissipation.

1. TEST OF STABILITY OF PHOTOMETRIC PERFORMANCE

The tests shall be carried out in a dry and still atmosphere at an ambient temperature of $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$, the complete headlamp being mounted on a base representing the correct installation on the vehicle.

1.1. *Clean headlamp*

The headlamp shall be operated for 12 hours as described in subparagraph 1.1.1 and checked as prescribed in subparagraph 1.1.2.

1.1.1. *Test Procedure*

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) is to be approved, the corresponding light source is lit for the prescribed time⁽¹⁾
- b) in the case of a reciprocally incorporated passing beam lamp and driving beam lamp or in the case of a reciprocally incorporated front fog lamp and driving beam headlamp: If the applicant declares that the headlamp is to be used with a single light source lit⁽²⁾ at a time, the test shall be carried out in accordance with this condition, activating⁽¹⁾ each specified function successively for half the time specified in paragraph 1.1, in all other cases⁽¹⁾⁽²⁾ the headlamp shall be subjected to the following cycle until the time specified is reached:
- 15 minutes, passing beam lit
- 5 minutes, all functions lit;
- c) In the case of grouped lighting functions, all the individual functions shall be lit simultaneously for the time specified for individual lighting functions (a), also taking into account the use of reciprocally incorporated lighting functions (b), according to the manufacturer's specifications.

1.1.1.2. **Test voltage**

The test voltage for the ballast is $13,5 \pm 0,1$ volts for 12 V network system, or otherwise specified in the application for approval. If there are reciprocally incorporated filament lamps, the voltage producing the reference flux shall be used.

⁽¹⁾ When the tested headlamp is grouped and/ or reciprocally incorporated with 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 operation mode with an on/ off time ratio of approximately one to one.

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

1.1.2. Test results

1.1.2.1. Visual inspection

Once the headlamp has been stabilised 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 - HV for headlamps designed for right-hand traffic

50 L - B 50 R - HV for headlamps designed for left-hand traffic,

Driving beam: Point of Emax.

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).

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 headlamp

After being tested as specified in subparagraph 1.1 above, the headlamp shall be operated for one hour as described in subparagraph 1.1.1, after being prepared as prescribed in subparagraph 1.2.1, and checked as prescribed in subparagraph 1.1.2.

1.2.1. Preparation 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⁽¹⁾, 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⁽¹⁾,

⁽¹⁾ 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.

13 parts by weight of distilled water with a conductivity of ≤ 1 mS/m,

and

2 ± 1 parts by weight of surface-actant⁽¹⁾

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 illuminating value has dropped to 15-20 per cent of the values measured for each following point under the conditions described in this annex:

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

50 R and 50 V⁽²⁾ for a passing lamp only, designed for right-hand traffic,

50 L and 50 V⁽²⁾ for a passing lamp only, designed for left-hand traffic.

1.2.1.3. **Measuring equipment**

The measuring equipment shall be equivalent to that used during headlamp approval tests. The gas-discharge light source supplied by the applicant shall be used for the photometric verification.

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 passing lamp. 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. If the headlamp has a moving reflector, only the position closest to the average vertical angular stroke is chosen for this test.

2.1. *Test for passing beam headlamps*

The test shall be carried out in a dry and still atmosphere at an ambient temperature of $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

Using a mass production gas-discharge light source which has been aged for at least 15 hours, the headlamp shall be operated on passing beam function 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 VV 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).

⁽¹⁾ The tolerance on quantity is due to the necessity of obtaining a dirt that correctly spreads out on all the plastic lens.

⁽²⁾ 50 V is situated 375 mm below HV on the vertical line VV on the screen at 25m distance.

- 2.2.2. However, if this value is more than 1,0 mrad but not more than 1,5 mrad ($1,0 \text{ mrad} < \Delta r_I \leq 1,5 \text{ mrad}$), a second 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 stabilise 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);

Period of rest for one hour.

The headlamp type shall be considered as 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 1,0 mrad.

$[(\Delta r_I + \Delta r_{II}) / 2 \leq 1,0 \text{ mrad}]$.

ANNEX 5

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 the 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 the 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.
- 1.5. If the headlamps are designed for right-hand installation only, or for left-hand installation only, tests pursuant to this annex may be done on one sample only, at the choice of the applicant.

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 $40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and 85-95 per cent RH;
- 1 hour at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and 60-75 per cent RH;
- 15 hours at $-30\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$;
- 1 hour at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and 60-75 per cent RH;
- 3 hours at $80\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$;
- 1 hour at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and 60-75 per cent RH;

Before this test, the samples shall be kept at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and 60-75 per cent RH for at least four hours.

Note: The periods of one hour at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ 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 lamp, at the following points:

- B 50 L and 50 R for the passing beam of a passing lamp or a passing/driving lamp (B 50 R and 50 L in the case of headlamps intended for left-hand traffic),
- Emax for the driving beam of a driving lamp or a passing/driving lamp.

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 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 $1\,200\text{ W/m}^2 \pm 200\text{ W/m}^2$ for a period such that the luminous energy that they receive is equal to $4\,500\text{ MJ/m}^2 \pm 200\text{ MJ/m}^2$. Within the enclosure, the temperature measured on the black panel placed on a level with the samples shall be $50\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$. In order to ensure a regular exposure, the samples shall revolve around the source of radiation at a speed between 1 and $5 \pm t/\text{min}-1$.

The samples shall be sprayed with distilled water of conductivity lower than 1 mS/m at a temperature of $23\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$, 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 $14 \times 14\text{ mm}$.

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 $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. Afterwards the samples shall be carefully rinsed with distilled water containing not more than 0,2 per cent impurities at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ 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 $\Delta d_m = (T_5 - T_4)/T_2$, 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 gas-discharge light source. The parameters such as angles and distances of these samples shall be the same as in the headlamp. These samples shall have the same colour and surface treatment, if any, as the parts of the headlamp.

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

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 $50\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and then immersed for five minutes in a mixture maintained at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ 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 $50\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. 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 2.2.4 above. 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 of adhesion of 2 N/(cm of width) ± 20 per cent measured under the standardised 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 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 by more than 30 per cent the maximum values prescribed at points B 50 L and HV and not be 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).

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.

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)

Tests	Samples	Lenses or samples of material									Lenses				
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.1.	Limited photometry (paragraph 2.1.2)											X	X	X	
1.1.1.	Temperature change (paragraph 2.1.1)											X	X	X	
1.1.2.	Limited photometry (paragraph 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 (paragraph 2.2.1)	X	X	X											
1.3.1.	Transmission measurement	X	X	X											
1.4.	Chemical agents (paragraph 2.2.2)	X	X	X											
1.4.1.	Diffusion measurement	X	X	X											
1.5.	Detergents (paragraph 2.3.1)				X	X	X								
1.6.	Hydrocarbons (paragraph 2.3.2)				X	X	X								
1.6.1.	Transmission measurement				X	X	X								
1.7.	Deterioration (paragraph 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 (paragraph 2.5)														X
1.9.	Resistance to light source radiations (paragraph 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 (paragraph 2.6.1.1)	X	
2.2.	Photometry (paragraph 2.6.1.2)	X	
2.3.	Adherence (paragraph 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 DT with an opening of 6 mm against which the sample stand is placed.

A convergent achromatic lens L2, corrected for spherical aberrations, links the diaphragm DT with the receiver R; the diameter of the lens L2 shall be such that it does not diaphragm the light diffused by the sample in a cone with a half top angle of $\beta/2 = 14^\circ$.

An annular diaphragm DD with angles $\alpha/2 = 1^\circ$ and $\alpha_{\max}/2 = 12^\circ$ is placed in an image focal plane of the lens L2.

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 L2 DT and the focal length $F2^{(1)}$ of the lens L2 shall be so chosen that the image of DT 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 DD	Quantity represented
T1	No	No	Incident flux in initial reading
T2	Yes (before test)	No	Flux transmitted by the new material in a field of 24°
T3	Yes (before test)	No	Flux transmitted by the tested material in a field of 24°
T4	Yes (before test)	Yes	Flux diffused by the new material
T5	Yes (before test)	Yes	Flux diffused by the tested material

⁽¹⁾ For L2 it is recommended to use a focal distance of about 80 mm.

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 $0,24 \pm 0,02$ l/minute at an operating pressure of 6,0 bars -0, + 0,5 bar. Under these operation conditions the fan pattern obtained shall be $170 \text{ mm} \pm 50 \text{ mm}$ in diameter on the surface exposed to deterioration, at a distance of $380 \text{ mm} \pm 10 \text{ mm}$ from the nozzle.

1.2. *Test mixture*

The test mixture shall be composed of:

- 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;
- 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:

$$\Delta d = (T5 - T4)/T2 = 0,0250 \pm 0,0025.$$

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 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 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 lengthwise 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.

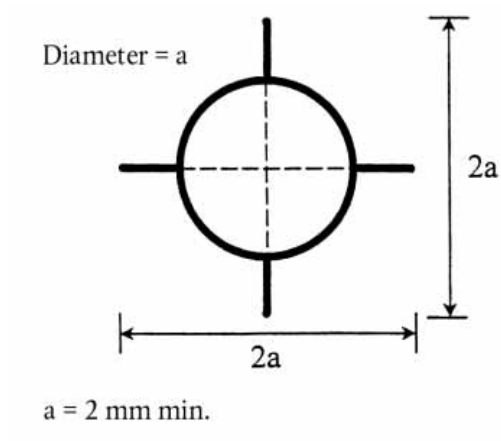
Pull to unstick at a speed of 300 mm/s ± 30 mm/s and record the force required.

6. RESULTS

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

ANNEX 6

Centre of reference



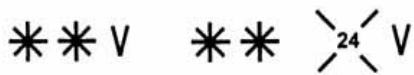
This optional mark of the centre of reference shall be positioned on the lens at its intersection with the reference axis of the passing beam, and also on the lenses of the driving beams when they are neither grouped nor combined nor reciprocally incorporated with a passing beam.

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

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ANNEX 7

Voltage markings



This marking must be placed on the main body of each headlamp containing only gas discharge light sources and ballast, and on each external part of the ballast. The ballast(s) is(are) designed for a ** Volts network system.	This marking must be placed on the main body of each headlamp containing at least one gas discharge light source and ballast. The ballast(s) is(are) designed for a ** Volts network system. None of the filament lamps which the headlamp contains is designed for a 24 Volts network system.
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ANNEX 8

Minimum requirements for conformity of production control procedures

1. GENERAL
 - 1.1. The conformity requirements shall be considered 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 performance, the conformity of mass produced headlamps shall not be contested if, when testing photometric performance of any headlamp chosen at random and measured at 13,5 V $\pm$ 0,1 V or as otherwise specified and:

either equipped with a removable standard gas-discharge light source according to paragraph 6.1.3. The luminous flux of this gas-discharge light source may differ from the reference luminous flux specified in Regulation No 99. In this case, the Illuminances shall be corrected accordingly.

or equipped with the serial production gas-discharge light source and the serial ballast. The luminous flux of this light source may deviate from the nominal luminous flux due to light source and ballast tolerances as specified in Regulation No 99; accordingly the measured Illuminances may be corrected by 20 per cent in the favourable direction.
 - 1.2.1. no illuminances value, if measured and corrected according to paragraph 1.2 above, deviates unfavourably by more than 20 per cent from the values prescribed in this Regulation. For values B 50 L (or R) and on line H/H2 (or H/H3/H4) and above, the maximum unfavourable deviation may be respectively:

B 50 L (or R)⁽¹⁾: 0,20 lx equivalent 20 per cent

0,30 lx equivalent 30 per cent

On line H/H2

(or line H/H3/H4)

and above: 0,30 lx equivalent 20 per cent

0,45 lx 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 $\pm$ 0,2 lx) and related to that aiming at 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 $\pm$ 0,1 lx), 75 R (or L), 50 V, 25 R1, 25 L2, and on segment I;
 - 1.2.2.2. and if, for the driving beam, HV being situated within the isolux line 0.75 Emax, a tolerance of $\pm$ 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 of this Regulation.
 - 1.2.3. If the results of the tests 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 0,5° to the right or left and not by more than 0,2° up or down.

⁽¹⁾ Letters in brackets refer to headlamps intended for left-hand traffic.

- 1.2.4. If the results of the tests described above do not meet the requirements, tests on the headlamp shall be repeated using another standard gas-discharge light source or gas-discharge light source and ballast, whatever is applicable according to paragraph 1.2 above.

- 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 (as defined in paragraphs 2.1 and 2.2 of annex 4 to this Regulation) does not exceed 1.5 mrad.

If this value exceeds 1.5 mrad but is not more than 2.0 mrad, a second headlamp 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. The chromaticity coordinates as specified in paragraph 6.1.6 of this Regulation shall be complied with.

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 provisions of this Regulation.

If any sampling shows non-conformity with respect 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 calibrations 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 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 to points Emax, HV ⁽¹⁾, HL, HR ⁽²⁾ in the case of the driving beam, and to points B 50 L (or R) ⁽³⁾ HV, 50 V, 75 R (or L) and 25 L2 (or R2) 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 the acceptability of his products in order to meet the specifications laid down for verification of conformity of products in paragraph 9.1 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 9 (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: point on 'hh' located at 1,125 m to the left and to the right of point HV respectively.

⁽³⁾ Letters in brackets refer to headlamps intended for left-hand traffic.

ANNEX 9

Minimum requirements for sampling by an inspector

1. GENERAL
 - 1.1. The conformity requirements shall be considered satisfied from a mechanical and a geometric standpoint, in accordance with the requirements of this Regulation, if any, if the differences do not exceed inevitable manufacturing deviations.
 - 1.2. With respect to photometric performance, the conformity of mass-produced headlamps shall not be contested if, when testing photometric performance of any headlamp chosen at random and measured at $13,5 \text{ V} \pm 0,1 \text{ V}$ or as otherwise specified and:

either equipped with a removable standard gas-discharge light source according to paragraph 6.1.3. The luminous flux of this gas-discharge light source may differ from the reference luminous flux specified in Regulation No 99. In this case, the illuminances shall be corrected accordingly.

or equipped with the serial production gas-discharge light source and the serial ballast. The luminous flux of this light source may deviate from the nominal luminous flux due to light source and ballast tolerances as specified in Regulation No 99, accordingly the measured illuminances may be corrected by 20 per cent in the favourable direction.
 - 1.2.1. no measured value deviates unfavourably by more than 20 per cent from the values prescribed in this Regulation. In the glare zone the maximum deviation may be respectively:

B 50 L (or R)⁽¹⁾: 0,20 lx equivalent 20 per cent

0,30 lx equivalent 30 per cent

On line H/H2

(or line H/H3/H4)

and above: 0,30 lx equivalent 20 per cent

0,45 lx 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 + 0,2 lx) and related to that aiming at one point of each area delimited on the measuring screen (at 25 m) by a circle of 15 cm in radius around points B 50 L (or R)⁽¹⁾ (with a tolerance of 0,1 lx), 75 R (or L), 50 V, 25 R1, 25 L2, and on segment I;
 - 1.2.2.2. and if, for the driving beam, HV being situated within the isolux $0,75 E_{\text{max}}$, 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 of this Regulation. The reference mark is disregarded.
 - 1.2.3. If the results of the tests 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 $0,5^\circ$ to the right or left and not by more than $0,2^\circ$ up or down.

⁽¹⁾ Letters in brackets refer to headlamps intended for left-hand traffic.

- 1.2.4. If the results of the tests described above do not meet the requirements, tests on the headlamp shall be repeated using another standard gas-discharge light source or gas-discharge light source and ballast, whatever is applicable according to paragraph 1.2 above.
- 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 acceptable if Δr (as defined in paragraphs 2.1 and 2.2 of annex 4 to this Regulation) does not exceed 1,5 mrad.
- If this value exceeds 1,5 mrad but is not more than 2,0 mrad, a second headlamp 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. The chromaticity coordinates as specified in paragraph 6.1.6 of this Regulation shall be complied with.
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.
- 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 deviation 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 10 applied if, following the sampling procedure 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 cases of A3, B2, B3 a repeated sampling, third sample C of two headlamps and fourth sample D 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 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 positions 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 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 in 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

