

AUTOMOTIVE INDUSTRY STANDARD

**Provisions concerning the Approval of
Headlamps emitting an Asymmetrical
Passing Beam or a Driving Beam or both
and equipped with Filament Lamps
and/or LED Modules**

(Revision 1)

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ON BEHALF OF
AUTOMOTIVE INDUSTRY STANDARDS COMMITTEE

UNDER
CENTRAL MOTOR VEHICLE RULES – TECHNICAL STANDING COMMITTEE

SET-UP BY
MINISTRY OF ROAD TRANSPORT & HIGHWAYS
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GOVERNMENT OF INDIA

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INTRODUCTION

0 The Government of India felt the need for a permanent agency to expedite the publication of standards and development of test facilities in parallel when the work on the preparation of the standards is going on, as the development of improved safety critical parts can be undertaken only after the publication of the standard and commissioning of test facilities. To this end, the erstwhile Ministry of Surface Transport (MOST) has constituted a permanent Automotive Industry Standards Committee (AISC) vide order No. RT-11028/11/97-MVL dated September 15, 1997. The standards prepared by AISC will be approved by the permanent CMVR Technical Standing Committee (CTSC). After approval, the Automotive Research Association of India, (ARAI), Pune, being the Secretariat of the AIS Committee, has published this standard. For better dissemination of this information ARAI may publish this document on their Web site.

0.1 Accordingly AIS-010 covering mandatory requirements regarding performance of lighting and light-signalling devices for use in two and three wheelers has been published in 2004 and has been implemented thereafter in 2005.

0.2 With technological developments in lighting and light-signalling devices, AIS-010 was taken up for revision and now is prepared in five parts.

This part covers the approval of headlamps emitting an asymmetrical passing beam or a driving beam or both and equipped with filament lamps and/or LED modules as applicable to all categories of vehicles. The permission to use headlamps covered by this standard for a vehicle category is governed by requirements specified by the standard for installation requirements of that category of vehicles.

0.3 This part is based on the following ECE regulation:

ECE R 112, Revision 1, Amendment No. 4, (Supplement 9 to the original version of the Regulation - Date of entry into force: 15 October 2008)

0.4 While preparing this standard attempts have been made to align with the above ECE regulation. However, certain changes were necessary in the Indian context.

0.5 The following standards contain provisions, which through reference in this text constitute provisions of the standard.

AIS-053	Automotive Vehicles – Types – Terminology
AIS-008 (Rev.1): 2010	Installation Requirements of Lighting and Light –Signalling Devices for Motor Vehicle having more than Three Wheels, Trailer and Semi -Trailer excluding Agricultural Tractor and Special Purpose Vehicle

AIS-009	Automotive Vehicles - Installation Requirements of Lighting and Light - Signalling Devices for 2 and 3 Wheelers, their Trailers and Semi-Trailers
AIS-034 (Part 1) (Rev. 1):2010	Provisions concerning the Approval of Filament Lamps for use in Approved Lamp Units on Power Driven Vehicles and their Trailers
AIS-083	Headlamps Cleaners and their Fitment on Power-Driven Vehicles with regard to Headlamps Cleaners
AIS-010 (Part 5) (Rev. 1):2010	Requirements of Chromaticity Co-ordinates of Colour of Light Emitted from Lighting and Light-Signalling Devices
AIS-037	Procedure for Type Approval and Establishing Conformity of Production for Safety Critical Components
ISO 105	Textiles - Tests for Colour Fastness -- Part E03: Colour Fastness to Chlorinated Water (Swimming-pool Water)
CIE - Publication 84 – 1989	The Measurement of Luminous Flux

0.6 The AISC panel and Automotive Industry Standards Committee (AISC) responsible for preparation of this standard are given in Annex V and Annex W respectively.

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Provisions Concerning the Approval of Headlamps emitting an Asymmetrical Passing Beam or a Driving Beam or both and equipped with Filament Lamps and/or LED Modules

0. SCOPE

This standard applies to headlamps for vehicles of categories L, M, N and A, as defined in AIS-053.

Note 1 : The permission to use headlamps covered by this standard are governed by requirements specified by the standard for installation of requirements of that category of vehicles.

Note 2 : Type of headlamps suitable for both left and right hand traffic conditions covered by ECE R112 are not permitted and hence not covered in this standard. However, this does not exclude approval and use of such headlamp where the change depending on the traffic can only be done at the factory setting. Such headlamp need to comply with the requirements of "left hand" traffic specified in this standard.

1. DEFINITIONS

In addition to the following definition, the definitions given in AIS-008, AIS-009, AIS-010 (Part 5) and their amendments in force at the time of application for type approval shall apply to this standard.

- 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""** mean headlamps which differ in such essential respects as:
 - 1.3.1. the trade name or mark;
 - 1.3.2. the characteristics of the optical system;
 - 1.3.3. the inclusion or elimination of components capable of altering the optical effects by reflection, refraction, absorption and/or deformation during operation;
 - 1.3.4. Reserved
 - 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;
 - 1.3.7. the category of filament lamp used and/or the LED module specific identification code(s).

- 1.3.8 However, a device intended for the installation on the left side of the vehicle and the corresponding device intended for the installation on the right side of the vehicle shall be considered to be of the same type
- 1.4 **"Headlamps of different "Classes" (A or B)"** mean headlamps identified by particular photometric provisions.
- 1.5 References made in this standard to standard (étalon) filament lamp(s) and to AIS-034 (Part1)(Rev. 1) shall refer to AIS-034(Part1)(Rev. 1) and its amendments in force at the time of application for type approval
- 2. APPLICATION FOR APPROVAL OF HEADLAMP**
- 2.1 Information to be submitted at the time of applying for type approval of the headlamp shall be as given in Annex A.
- 2.2. Every application for approval shall be accompanied by:
 - 2.2.1. Reserved
 - 2.2.1.1. Reserved
 - 2.2.2. Reserved
 - 2.2.3. two samples of each type of headlamp, one sample intended for the installation on the left side of the vehicle and one sample intended for the installation of the right side of the vehicle.
 - 2.2.4. For the test of plastic material of which the lenses are made:
 - 2.2.4.1. fourteen lenses;
 - 2.2.4.1.1. ten of these lenses may be replaced by ten samples of material at least 60 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;
 - 2.2.4.1.2. every such lens or sample of material shall be produced by the method to be used in mass production.
 - 2.2.4.2. a reflector to which the lenses can be fitted in accordance with the manufacturer's instructions.
 - 2.2.5. For testing the ultraviolet (UV)-resistance of light transmitting components made of plastic material against UV radiation of LED modules inside the headlamp.
 - 2.2.5.1. one sample of each of the relevant material as being used in the headlamp or one headlamp sample containing these. Each material sample shall have the same appearance and surface treatment, if any, as intended for use in the headlamp to be approved.
 - 2.2.5.2. the UV-resistance testing of internal materials to light source radiation is not necessary if no LED modules other than low-UV-types as specified in Annex K of this standard are being applied or if provisions are taken, to shield the relevant headlamp components from UV radiation, e.g. by glass filters.

- 2.2.6. One electronic light source control gear, if applicable.
- 2.3. The materials making up the lenses and coatings, if any, shall be accompanied by the test report of the characteristics of these materials and coatings if they have already been tested.

3. MARKING

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

3.2 They shall comprise, on the lens and on the main body, spaces of sufficient size for the approval mark and the additional symbols referred to in 4; these spaces shall be indicated on the drawings referred to in A.10

If the lens cannot be detached from the main body of the headlamp, a unique marking as per 4.2.5 shall be sufficient.

3.3. Reserved

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

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

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

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

This specific identification code shall comprise the starting letters "MD" for "MODULE" followed by the approval marking as per AIS-037 and in the case several non identical light source modules are used, followed by additional symbols or characters. This specific identification code shall be shown in the drawings mentioned in Annex A. The approval marking does not have to be the same as the one on the lamp in which the module is used, but both markings shall be from the same headlamp manufacture.

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

3.7 On the prototype for type approval, the markings may be provided by suitable temporary methods and need not necessary be obtained from the tools used for series production.

4 APPROVAL

4.1. General

4.1.1 If all the samples of a type of headlamp submitted pursuant to 2.0 satisfy the provisions of this standard, approval shall be granted.

4.1.2 Where grouped, combined or reciprocally incorporated lamps satisfy the requirements of more than one parts of this standard or other AIS, a single 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, as prescribed in AIS-037

4.1.4 Reserved

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 Annex A the applicant shall be obliged by the testing agency to inform the user in a proper way about the correct mounting position(s).

4.1.5 In addition to the mark prescribed in 3.1, an approval mark as described in 4.1.3, 4.2 & 4.3 shall be affixed in the spaces referred to in 3.2 above to every headlamp conforming to a type approved under this standard.

4.2 Composition of the approval mark

The approval mark shall consist of:

4.2.1 the approval number prescribed in 4.1.3 above

4.2.2. the following additional symbol (or symbols):

4.2.2.1. An optional marking, 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. Reserved

4.2.2.3. on headlamps meeting the requirements of this standard in respect of the passing beam only, the letters "C" for Class A headlamp or "HC" for Class B headlamp;

4.2.2.4 on headlamps meeting the requirements of this standard in respect of the driving beam only, the letters "R" for Class A headlamp or "HR" for Class B headlamp;

4.2.2.5. on headlamps meeting the requirements of this standard in respect of both the passing beam and the driving beam, the letters "CR" for Class A headlamp or "HCR" for Class B headlamp;

- 4.2.2.6. on headlamps incorporating a lens of plastic material, the group of letters "PL" to be affixed near the symbols prescribed in 4.2.2.3 to 4.2.2.5 above;
- 4.2.2.7. on headlamps meeting the requirements of this standard in respect of the driving beam, an indication of the maximum luminous intensity expressed by a reference mark, as defined in 6.3.3.1.2 below.

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

- 4.2.3. In every case the relevant operating mode used during the test procedure according to D-1.1.1.1 of Annex D and the permitted voltage(s) according to D-1.1.1.2 of Annex D shall be included in the test report.

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

- 4.2.3.1. on headlamps meeting the requirements of this standard which are so designed that the filament or LED module(s) producing the principal passing beam shall not be lit simultaneously with that of any other lighting function with which it may be reciprocally incorporated: an oblique stroke (/) shall be placed behind the passing lamp symbol in the approval mark.
- 4.2.3.2. on headlamps equipped with filament lamps and meeting the requirements of Annex D to this standard 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. Reserved

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

4.3 **Arrangement of the approval mark**

- 4.3.1. Independent lamps

Annex 2 of the ECE R 112 Revision 1, Amendment 4 (Supplement 9 to the original version of the Regulation - Date of entry into force: 15 October 2008) may be used for the relative location of approval marking and other marking.

- 4.3.2 Grouped, combined or reciprocally incorporated lamps:
- 4.3.2.1 Where grouped, combined or reciprocally incorporated lamps have been found to comply with the requirements of several standards, a single approval mark may be affixed. This approval mark may be located anywhere on the grouped, combined or reciprocally incorporated lamps, provided that:
- 4.3.2.1.1 it is visible as per 4.2.5.
- 4.3.2.1.2 no part of the grouped, combined or reciprocally incorporated lamps that transmits light can be removed without at the same time removing the approval mark.
- 4.3.2.2. The identification symbol for each lamp appropriate to each standard under which approval has been granted, and if necessary, the required arrow shall be marked.
- 4.3.2.2.1 either on the appropriate light-emitting surface,
- 4.3.2.2.2. or in a group, in such a way that each of the grouped, combined or reciprocally incorporated lamps may be clearly identified.
- 4.3.2.3. The size of the components of a single approval mark shall not be less than the minimum size required for the smallest of the individual marks by the standard under which approval has been granted.
- 4.3.2.4 Reserved
- 4.3.2.5 Figure 11 of Annex 2 of the ECE R 112 – Revision 1, Amendment 4 (Supplement 9 to the original version of the Regulation - Date of entry into force: 15 October 2008) may be used as guidance for the arrangements of approval marks for grouped, combined or reciprocally incorporated lamps with all the abovementioned 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 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 3.2 above and bears the approval marks of the actual functions.
- If different types of headlamps comprise the same main body, the latter may bear the different approval marks.
- 4.3.3.2 Figure 12 of Annex 2 of the ECE R 112- Revision 1, Amendment 4 (Supplement 9 to the original version of the Regulation - Date of entry into force: 15 October 2008) may be used as guidance for the arrangements of approval marks relating to the above case.

5 GENERAL SPECIFICATIONS

5.1 Each sample shall conform to the specifications set forth in **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.

Note : This is a general requirement and no verification is needed for this paragraph to approve the headlamp for compliance to this standard.

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

Where a headlamp providing a principal passing beam and a headlamp providing a driving beam, each equipped with its own filament lamp or LED module(s), 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 6.3.of this standard apply.

5.3 The headlamp shall be equipped with:

5.3.1. Filament lamp(s) approved according to AIS-034 (Part 1) (Rev. 1) Any filament lamp covered by AIS-034 (Part 1) (Rev. 1) may be used, provided that no restriction on the use is made in AIS-034(Part 1) (Rev. 1) at the time of application for type approval.

5.3.1.1 The design of the device shall be such that the filament lamp can be fixed in no other position but the correct one.

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

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

Note: Conditions of 5.3.1.2 are to be verified by using appropriate gauge or a standard reference filament lamp.

5.3.2. and/or LED module(s):

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

- 5.3.2.2. the headlamp, if equipped with LED modules, and the LED module(s) themselves shall comply with the relevant requirements specified in Annex K of this standard. The compliance with the requirements shall be tested.
- 5.3.2.3. The total objective luminous flux of all LED modules producing the principal passing beam and measured as described in 5 of Annex K shall be equal or greater than 1,000 lumens.
- 5.4 Reserved.
- 5.5 Complementary tests shall be done according to the requirements of Annex D to ensure that in use there is no excessive change in photometric performance
- 5.6. Light transmitting components made of plastic material shall be tested according to the requirements of Annex F
- 5.7. On headlamps designed to provide alternately a driving beam and a passing beam, or a passing beam and/or a driving beam designed to become bend lighting, any mechanical, electromechanical or other device incorporated in the headlamp for these purposes shall be so constructed that:
- 5.7.1 the device is robust enough to withstand 50,000 operations under normal conditions of use. In order to verify compliance with this requirement, the testing agency responsible for approval tests may
- (a) require the applicant to supply the equipment necessary to perform the test;
 - (b) forego the test if the headlamp presented by the applicant is accompanied by a test report, issued by a testing agency responsible for approval tests for headlamps of the same construction (assembly), confirming compliance with this requirement.
- 5.7.2 in the case of failure, the illumination above the line H-H shall not exceed the values of a passing beam according to 6.2.4; in addition, on headlamps designed to provide a passing and/or a driving beam to become a bend lighting, a minimum illumination of at least 3 lux shall be fulfilled in test point 25 V (VV line, D 75 cm)
- When performing the tests to verify compliance with these requirements, the testing agency responsible for approval tests shall refer to the instructions supplied by the applicant.
- 5.7.3. either the passing beam or the driving beam shall always be obtained without any possibility of the mechanism stopping in between two positions;
- 5.7.4. the user cannot, with ordinary tools, change the shape or position of the moving parts.
- 5.8 Reserved

- 5.9. In case of a passing beam headlamp incorporating a light source or LED module(s) producing the principal passing beam and having a total objective luminous flux which exceeds 2,000 lumen a reference shall be made in the test report. Whether the passing beam headlamp has complied with AIS-083 or not, shall be recorded in the test report.

The objective luminous flux of LED modules shall be measured as described in 5 of Annex K.

6. ILLUMINATION

6.1 General provisions

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

Note: Compliance to the requirement of the first sentence of 6.1.1, is deemed to be established if the photometric requirements in this standard are complied with.

- 6.1.2. The illumination produced by the headlamp shall be determined by means of a flat vertical screen set up 25 m forward of the headlamp, at right angles to its axes as shown in Annex C to this standard, the test screen shall be sufficiently wide to allow examination and adjustment of the "cut-off" of the passing beam over at least 5° on either side of the V-V line.
- 6.1.3. Apart from LED module(s), the headlamps shall be checked by means of an uncoloured standard (étalon) filament lamp designed for a rated voltage of 12 V. During the checking of the headlamp, the voltage at the terminals of the filament lamp shall be regulated so as to obtain the reference luminous flux as indicated for each filament lamp at the relevant data sheet of AIS-034 (Part 1)(Rev. 1). The headlamp shall be considered acceptable if it meets the requirements of 6 with at least one standard (étalon) filament lamp, which may be submitted with the headlamp
- 6.1.4. LED module(s) shall be measured at 6.3 V, 13.2 V or 28.0 V respectively, if not otherwise specified within this Standard. LED module(s) operated by an electronic light source control gear, shall be measured as specified by the applicant.
- The values obtained by the LED module(s) shall be multiplied by a factor of 0.7 prior to check for compliance.
- 6.1.5. In the case of headlamps equipped with LED module(s) and filament lamps, the part of the headlamp with filament lamp(s) shall be tested according to 6.1.3 and the part of the headlamp with LED module(s) shall be evaluated according to the provisions of 6.1.4 and then added to the previous result obtained from the filament lamp(s) tested

6.2. **Provisions concerning passing beams**

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

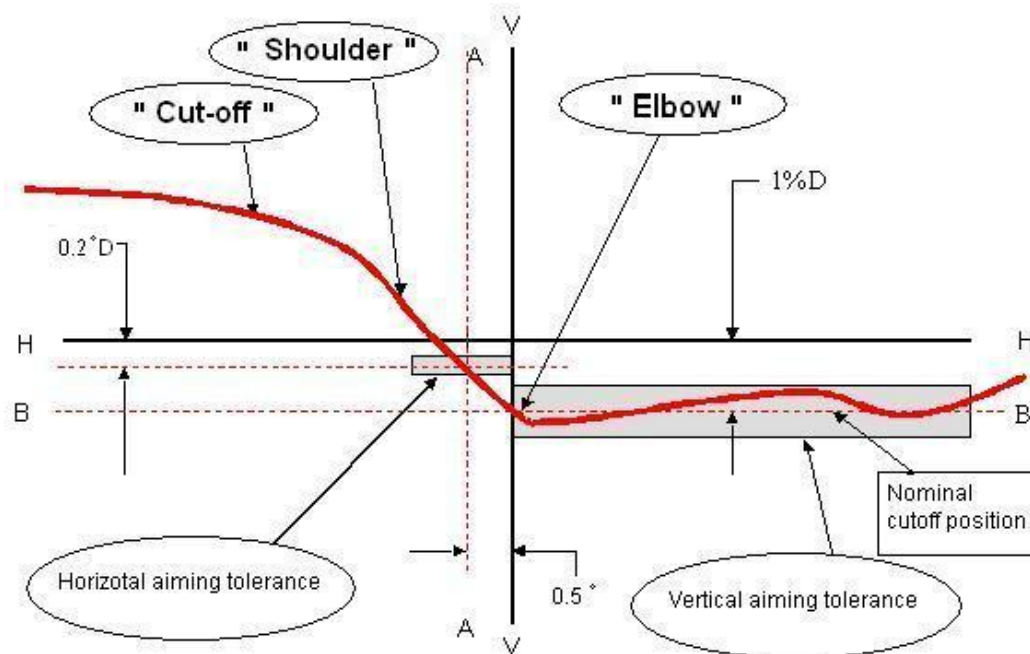
The "cut-off" shall provide:

- (a) Reserved.
- (b) For "left hand" traffic beams:
 - (i) a straight "horizontal part" towards the right;
 - (ii) a raised "elbow - shoulder" part towards the left.

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

6.2.2. The headlamp shall be visually aimed by means of the "cut-off" (see Figure 1) as follows:

6.2.2.1. for vertical adjustment: the horizontal part of the "cut-off" is moved upward from below line B and adjusted to its nominal position one per cent (25 cm) below the H-H line;



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

Figure 1
(See 6.2.2.)

6.2.2.2. for horizontal adjustment: the "elbow - shoulder" part of the "cut-off" shall be moved:

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

- (a) above the line $0.2^\circ D$ its "shoulder" shall not exceed the line A to the right;
- (b) on the line $0.2^\circ D$ or below its "shoulder" cross the line A; and
- (c) the kink of the "elbow" should be primarily on the V-V line;

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

Horizontally from line A by more than:

- (a) Reserved.
- (b) 0.5° to the right or 0.75° to the left, for "left hand"; and

vertically not more than 0.25° up or down from line B.

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

6.2.3. When so aimed, the headlamp, if its approval is sought solely for provision of a passing beam, (See 6.2.3.1) need comply only with the requirements set out in 6.2.4 to 6.2.6 below; if it is intended to provide both a passing beam and a driving beam, it shall comply with the requirements set out in 6.2.4 to 6.2.6 and 6.3

6.2.3.1 Such a special "passing beam" headlamp shall not incorporate a driving beam not subject to requirements.

6.2.4 The illumination produced on the screen by the passing beam shall meet the requirements given in Table 1.

Table 1
(See 6.2.4)

Photometric requirements for passing beam for Class A & B headlamps

Point on measuring screen	Required illumination in lux	
	Class A headlamp	Class B headlamp
Point B 50 R	≤ 0.4	≤ 0.4
Point 75 L	≥ 6	≥ 12
Point 75 R	≤ 12	≤ 12
Point 50 R	≤ 15	≤ 15
Point 50 L	≥ 6	≥ 12
Point 50 V	-	≥ 6
Point 25 R	≥ 1.5	≥ 2
Point 25 L	≥ 1.5	≥ 2
Any point in zone III	≤ 0.7	≤ 0.7
Any point in zone IV	≥ 2	≥ 3
Any point in zone I	≤ 20	$\leq 2E^{*/}$
*/ E is the actually measured value in points 50R respectively 50L		

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

6.2.6 The illumination values in zones "A" and "B" as shown in Figure C in Annex C 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: (See note below)

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

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

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

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

Note : Illumination values in any point of zones A and B, which also lies within zone III, shall not exceed 0.7 lux.

6.2.7 Reserved.

6.2.8 The requirements in 6.2.4 above shall also apply to headlamps designed to provide bend lighting and/or that include the additional light source or LED module(s) referred to in 6.2.9.2 In the case of a headlamp designed to provide bend lighting its alignment may be changed, provided that the axis of the beam is not displaced vertically by more than 0.2°

- 6.2.8.1 If bend lighting is obtained by
 - 6.2.8.1.1 swivelling the passing beam or moving horizontally the kink of the elbow of the cutoff, the measurements shall be carried out after the complete headlamp assembly has been re-aimed horizontally, e.g. by means of a goniometer;
 - 6.2.8.1.2. moving one or more optical parts of the headlamp without moving horizontally the kink of the elbow of the cut-off, measurements shall be carried out with these parts being in their extreme operating position;
 - 6.2.8.1.3 means of one additional filament light source or one or more LED module(s) without moving horizontally the kink of the elbow of the cut-off, measurements shall be carried out with this light source or LED module(s) activated.
- 6.2.9. Only one filament light source or one or more LED module(s) are permitted for the principal passing beam. Additional light sources or LED modules are permitted only as follows (see Annex K):
 - 6.2.9.1. one additional light source according to AIS-034(Part 1) (Rev. 1) or one or more additional LED module(s) may be used inside the passing beam headlamp to contribute to bend lighting;
 - 6.2.9.2. one additional light source according to AIS-034 (Part 1) (Rev. 1) and/or one or more LED module(s), inside the passing beam headlamp, may be used for the purposes of generating infrared radiation. It/they shall only be activated at the same time as the principal light source or LED module(s). In the event that the principal light source or (one of) the principal LED module(s) fails, this additional light source and/or LED module(s) shall be automatically switched off;
 - 6.2.9.3. in the event of failure of an additional filament light source or one or more additional LED module(s), the headlamp shall continue to fulfill the requirements of the passing beam
- 6.3 **Provisions concerning driving beams**
 - 6.3.1 In the case of a headlamp designed to provide a driving beam and a passing beam, measurements of the illumination produced on the screen by the driving beam shall be taken with the same headlamp alignment as for measurements under 6.2.4 to 6.2.6 above; in the case of a headlamp providing a driving beam only, it shall be so adjusted that the area of maximum illumination is centred on the point of intersection of lines H-H and V-V; such a headlamp need meet only the requirements referred to in 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. Irrespective of the type of light source (LED module(s) or filament light source(s)) used to produce the principal passing beam, several light sources
 - (a) Either filament light sources listed in AIS-034 (Part 1) (Rev. 1) ; or
 - (b) LED module(s) may be used for each individual driving beam.
 - 6.3.3 The illumination produced on the screen by the driving beam shall meet the following requirements

- 6.3.3.1 The point of intersection (HV) of lines H-H and V-V shall be situated within the isolux 80 per cent of maximum illumination. This maximum value (E_M) shall not be less than 32 lux for class A headlamps and 48 lux for class B headlamps. The maximum value shall in no circumstances exceed 240 lux. In addition, in the case of a combined passing and driving headlamp, this maximum value shall not be more than 16 times the illumination measured for the passing beam at point 75 L .
- 6.3.3.1.1 The maximum intensity (I_M) of the driving beam expressed in thousands of candelas shall be calculated by the formula:
 $I_M = 0.625 E_M$
- 6.3.3.1.2. The reference mark (I'_M) of this maximum intensity, referred to in 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
- 6.3.3.2 Starting from point HV, horizontally to the right and left, the illumination shall be not less than 16 lux for Class A headlamps and 24 lux for class B headlamps upto a distance of 1.125 m and not less than 4 lux for Class A headlamps and 6 lux for class B headlamps upto a distance of 2.25 m.
- 6.4. In the case of headlamps with adjustable reflector the requirements of 6.2. and 6.3. are applicable for each mounting position indicated according to 2.1.3. For verification the following procedure shall be used:
- 6.4.1. Each applied position is realized on the test goniometer with respect to a line joining the centre of the light source and point HV on a aiming screen. The adjustable reflector is then moved into such a position that the light pattern on the screen corresponds to the aiming prescriptions of 6.2.1. to 6.2.2.3. and/or 6.3.1;
- 6.4.2. with the reflector initially fixed according to 6.4.1., the headlamp shall meet the relevant photometric requirements of 6.2. and 6.3;
- 6.4.3. additional tests are made after the reflector has been moved vertically $\pm 2^\circ$ or at least into the maximum position, if less than 2° , from its initial position by means of the headlamps adjusting device. Having re-aimed the headlamp as a whole (by means of the goniometer for example) in the corresponding opposite direction the light output in the following directions shall be controlled and lie within the required limits
 passing beam : points HV and 75 L;
 driving beam : E_M and point HV (percentage of E_M).
- 6.4.4 if the applicant has not indicated more than one mounting position, the procedure of 6.4.1. to 6.4.3. shall be repeated for all other positions

6.4.5 if the applicant has not asked for special mounting positions, the headlamp shall be aimed for measurements of 6.2. and 6.3. with the headlamps adjusting device in its mean position. The additional test of 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 6.2.4 to 6.2.6 and 6.3 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.

7 COLOUR

7.1 The colour of the light emitted shall be white. (Refer AIS-010 (Part 5) (Rev.1) for requirement of chromaticity coordinates)

8 Reserved

9. EXTENSION OF TYPE APPROVAL

9.1 Every modification pertaining to the information, even if the changes are not technical in nature declared in accordance with 2 shall be intimated by the manufacturer to the testing agency.

If the changes are in parameters not related to the provisions, no further action need be taken.

If the changes are in parameters related to the provisions, the Testing Agency, which has issued the certificate of compliance, shall then consider, whether,

9.1.1 the device with the changed specifications still complies with provisions, or

9.1.2 Any further verification is required to establish compliance.

9.2 For considering whether testing is required or not, guidelines given in 9.5 (Criteria for Extension of Approval) shall be used.

9.3 In case of 9.1.2, tests for only those parameters which are affected by the modifications need be carried out

9.4 In case of fulfillment of criterion of 9.1.1 or after results of further verification as per 9.1.2 are satisfactory, the approval of compliance shall be extended for the changes carried out.

9.5 Criteria for extension of approval

The Criteria shall be as agreed between the testing agency and applicant.

10. CONFORMITY OF PRODUCTION

The conformity of production procedures shall comply with those set out in the AIS-037 with the following requirements:

- 10.1. Headlamps approved under this Standard shall be so manufactured as to conform to the type approved by meeting the requirements set forth in 6 and 7.
- 10.2. the minimum requirements for conformity of production control procedures set fourth in Annex E to this Standard shall be complied with.
- 10.3. The minimum requirements for sampling by testing agency set forth in Annex G to this Standard shall be complied with.
- 10.4. The normal frequency of these verifications shall be once every two years.
- 10.5. Headlamps with apparent defects are disregarded.
- 10.6. The reference mark is disregarded.

11. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

Penalties for non-conformity of production shall be as prescribed in AIS-037.

- 12. Reserved.
- 13. Reserved.

14. TRANSITIONAL PROVISION

- 14.1 At the request of the applicant, type approvals for compliance to AIS-010 (Part 1) (Rev.1):2010, shall be granted by test agencies from 27th October 2010 (date of adoption in CMVR-TSC). Such type approvals shall be deemed to be compliance to Annex F or Annex G of AIS-010:2004 or Class A or Class B of AIS-012:2004.
- 14.2 At the request of applicant, type approval to the compliance to Annex F or Annex G of AIS-010:2004 or Class A or Class B of AIS-012:2004 shall be granted up to the notified date of implementation of AIS-010 (Part 1) (Rev.1):2010
- 14.3 Type approvals issued for compliance to Annex F and Annex G of AIS-010 : 2004 and Class A or Class B of AIS-012:2004 shall be extended to approval of AIS-010 (Part 1) (Rev.1):2010 subject to satisfactory compliance of the following:
 - 14.3.1 Marking as per 3.0 and sub-clauses for 4.0 applicable for marking.
 - 14.3.1.1 Verification of recording whether headlamp is complied with AIS-083 or not, as per paragraph 5.9.
 - 14.3.2 In case of “E/e” approved devices, requirements specified in 15.
 - 14.3.3 Type approved headlamps as per Annex F of AIS-010:2004

- a) Photometric requirements for points 75R, 50R as per Table 1 of 6.2 and 6.2.6 in case of passing beam.

Note: Additional verification for the above need not be carried out, if compliance to the above requirements has already been established during the type approval as per Annex F or Annex G of AIS-010:2004 or Class A or Class B of AIS-012:2004.

14.4 Extension of Approvals for engineering and administrative changes:

14.4.1 In the case of 14.1, extensions shall be granted subject to the conditions of AIS-010 (Part 1) (Rev.1):2010. Such extensions shall be deemed to be compliance to AIS-010:2004 or AIS-012: 2004.

14.4.2 In the case of 14.2, extensions shall be granted subject to conditions of AIS-010:2004 or AIS-012: 2004 till the notified date of implementation.

14.5 Type approvals for compliance to AIS-037, already been granted, shall continue to be valid for AIS-010 (Part 1) (Rev.1):2010.

Note: Necessary corrections to the reference of verification reports as per this standard shall be incorporated while issuing the next COP certificate. In the meantime for issuing of vehicle certificate, test/verification report as per this standard shall be deemed to be the proof of compliance of AIS-037.

15. ESTABLISHING COMPLIANCE OF “E”/“e” APPROVED HEAD LAMPS TO THIS STANDARDS

15.1 As an exception to 7.4 of AIS-037, (or related administrative decisions) for certifying compliance of “E”/“e” approved headlamps to this standard, the test for the following shall be carried out by testing agency

15.1.1 Provision concerning passing beam. (6.2 of this standard)

15.1.2 Provision concerning driving beam. (6.3 of this standard)

15.1.3 In the case of 15.1.1 and 15.1.2 above, no measured value shall deviate unfavourably by more than 20 per cent from the value prescribed in this Standard. For values B 50 R and zone III, the maximum unfavourable deviation shall be:

B 50 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

15.1.4 Tests for stability of photometric performance of headlamps in operation (5.5 and Annex D of this standard)

16 AMENDMENTS TO ECE REGULATIONS AFTER THE LEVEL DESCRIBED IN 0.3 OF FOREWORD

16.1 Supplements

In case of changes in ECE regulation, which are issued as supplements (Supplements do not affect the earlier type approvals) at the request of applicant, approval of compliance to this standard shall be issued taking into account the changes arising out of such supplement(s) to ECE regulation with approval from Chairman AISC.

This shall be incorporated in the test report.

Note : Such changes will be considered for inclusion in this standard at the time of its next amendment /revision.

16.2 Series of amendments

Changes in ECE regulation, which are issued as series of amendments (series of amendments may affect the earlier type approvals) will not be considered for issuing approval to this standard.

However, Chairman, AISC may, on a case to case basis, permit to accept latest series of amendments.

This shall be incorporated in the test report.

Note : Such changes will be considered for inclusion in this standard at the time of its next revision.

ANNEX A
(See 2.1)

**INFORMATION AND SAMPLES TO BE SUBMITTED AT
THE TIME OF APPLICATION FOR TYPE APPROVAL**

- A-1.** Trade name or mark of the device:
- A-2.** Manufacturer's name for the type of device:
- A-3.** Manufacturer's name and address:
 - A-3.1** Telephone No
 - A-3.2** FAX. No.
 - A-3.3** E mail address
 - A-3.4** Contact person
- A-4.** If applicable, name and address of manufacturer's representative:
- A-5** whether the headlamp is intended to provide both a passing beam and a driving beam or only one of these beams;
- A-6** whether it concerns a Class A or B headlamp
- A-7** the category of the filament lamp(s), used, as listed in AIS-034 (Part 1) (Rev.1). and/or if available, the light source module specific identification code(s) for LED modules, as applicable.
- A-8** 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; and in case of LED module(s) also the space reserved for the specific identification code(s) of the module(s).
- A-9** Number and specific identification code(s) of LED module(s)
- A-10** Number and specific identification code(s) of electronic light source control gear(s)
- A-11** Total objective luminous flux of light source exceeds 2 000 lumen: yes/no
- A-12** if the headlamp is equipped with an adjustable reflector, an indication of the mounting position(s) of the headlamp in relation to the ground and the longitudinal median plane of the vehicle, if the headlamp is for use in that (those) position(s) only;

A-13 a brief technical description including, in the case where headlamps are used to produce bend lighting, the extreme positions according to 6.2.9
In the case of LED module(s) this shall include:

- (a) a brief technical specification of the LED module(s);
- (b) a drawing with dimensions and the basic electrical and photometric values and the objective luminous flux;
- (c) in case of electronic light source control gear, information on the electrical interface necessary for approval testing;

ANNEX B (Reserved)

ANNEX C

MEASURING SCREEN

(See 6.1.2 & 6.2.2.2)

A – Reserved

B. Headlamp for “left hand” traffic
 (dimension in mm with screen at 25 m distance)
 STANDARD EUROPEAN BEAM

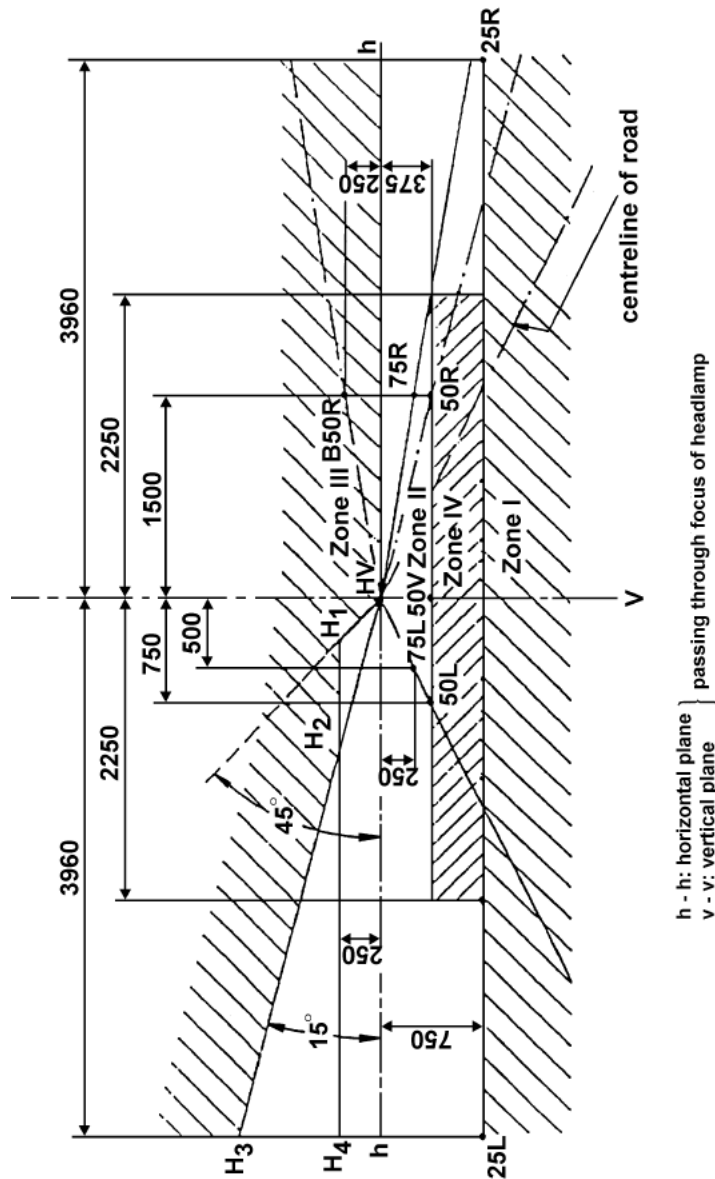
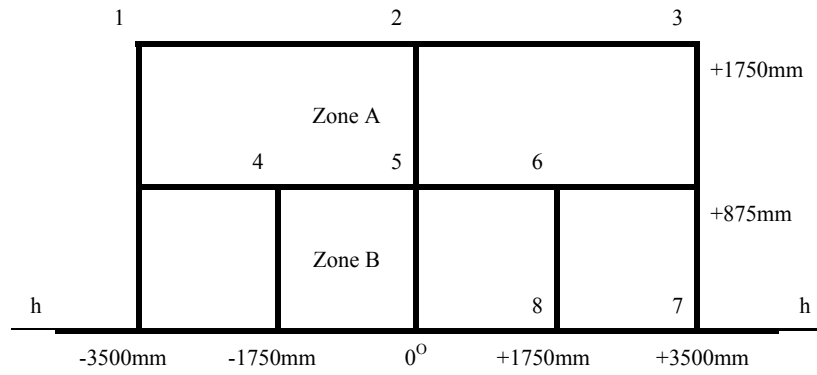


Figure C



ANNEX D

(See 5.5)

TESTS FOR STABILITY OF PHOTOMETRIC PERFORMANCE OF HEADLAMPS IN OPERATION

D-0 Test on complete headlamps

Once the photometric values have been measured according to the prescriptions of this Standard, in the point for Emax for driving beam and in points HV, 50L and B50R for passing beam 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.

D-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.

D-1.1 Clean headlamp

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

D-1.1.1. Test Procedure: (For Test schedule See Annex H)

The headlamp shall be operated for a period according to the specified time, so that:

D-1.1.1.1.

- (a) In the case where only one lighting function (driving or passing beam or front fog lamp) is to be approved, the corresponding filament and/or LED module(s) is (are) lit for the prescribed time. (See note below)

Note : When tested headlamp includes signalling lamps, the later shall be lit for the duration of the test, except for daytime running lamp. In case of direction indicator lamp, it shall be lit in flashing mode with an on/off time of approximately one to one.

- (b) In the case of a headlamp with a passing beam and one or more driving beams or in the case of a headlamp with a passing beam and a front fog lamp:
 - (i) the headlamp shall be subjected to the following cycle until the time specified is reached:
 - 15 minutes, principal passing-beam filament or principal passing beam LED module(s) lit;
 - 5 minutes, all filaments and/or LED module(s) lit.
 - (ii) if the applicant declares that the headlamp is to be used with only the passing beam lit or only the driving beam(s) lit {See note below} at a time, the test shall be carried out in accordance with this

condition, activating {See note under D-1.1.1.1 (a)} successively the passing beam half of the time and the driving beam(s) (simultaneously) for half the time specified in D-1.1 above.

Note : Should two or more lamp filaments and/or LED module(s) be simultaneously lit when headlamp flashing is used, this shall not be considered as being normal use of the filaments and/or LED module(s) simultaneously.

- (c) In the case of a headlamp with a front fog lamp and one or more driving beams:
 - (i) the headlamp shall be subjected to the following cycle until the time specified is reached:
 - 15 minutes, front fog lamp lit;
 - 5 minutes, all filaments and/or all LED modules lit.
 - (ii) if the applicant declares that the headlamp is to be used with only the front fog lamp lit or only the driving beam(s) lit {See note under D-1.1.1.1 (b)} at a time, the test shall be carried out in accordance with this condition, activating {See note under D-1.1.1.1 (a)} successively the front fog lamp half of the time and the driving beam(s) (simultaneously) for half the time specified in D-1.1 above.
- (d) In the case of a headlamp with a passing beam, one or more driving beams and a front fog lamp:
 - (i) the headlamp shall be subjected to the following cycle until the time specified is reached:
 - 15 minutes, principal passing-beam filament or principal passing beam LED module(s) lit;
 - 5 minutes, all filaments and/or all LED modules lit.
 - (ii) if the applicant declares that the headlamp is to be used with only the passing beam lit or only the driving beam(s) {See note under D-1.1.1.1 (b)} lit at a time, the test shall be carried out in accordance with this condition, activating {See note under D-1.1.1.1 (a)} successively the passing beam half of the time and the driving beam(s) for half the time specified in D-1.1 above, while the front fog lamp is subjected to a cycle of 15 minutes off and 5 minutes lit for half of the time and during the operation of the driving beam;

- (iii) if the applicant declares that the headlamp is to be used with only the passing beam lit or only the front fog lamp {See note under D-1.1.1.1 (b)} lit at a time, the test shall be carried out in accordance with this condition, activating {See note under D-1.1.1.1 (a)} successively the passing beam half of the time and the front fog lamp for half of the time specified in D-1.1 above, while the driving beam(s) is(are) subjected to a cycle of 15 minutes off and 5 minutes lit for half of the time and during the operation of the passing beam;
- (iv) if the applicant declares that the headlamp is to be used with only the passing beam lit or only the driving beam(s) {See note under D-1.1.1.1 (b)} lit or only the front fog lamp {See note under D-1.1.1.1 (b)} lit at a time, the test shall be carried out in accordance with this condition, activating {See note under D-1.1.1.1 (a)} successively the passing beam one third of the time, the driving beam(s) one third of the time and the front fog lamp for one third of the time specified in D-1.1 above.
- (e) In the case of a passing beam designed to provide bend lighting with the addition of a filament light source and/or one or more LED module(s), this light source and/or LED module(s) shall be switched on for one minute, and switched off for nine minutes during the activation of the passing beam only (see D-3 of Annex D).

D-1.1.1.2. Test voltage

For LED module(s) the test conditions set out in 6.1.4 of this standard shall apply.

For filament lamps according to AIS-034 (Part 1) (Rev. 1) the voltage shall be adjusted so as to supply 90 per cent of the maximum wattage specified in AIS-034 (Part 1) (Rev. 1) for the filament lamp(s) used.

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.

D-1.1.2. Test results

D-1.1.2.1. Visual inspection

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

D-1.1.2.2. **Photometric test**

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

Passing beam: 50 L - B 50 R - HV for headlamps

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 D-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.

D-1.2. **Dirty headlamp**

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

D-1.2.1. **Preparations of the headlamp**

D-1.2.1.1. **Test mixture**

D-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:

- (a) 9 parts by weight of silica sand with a particle size of 0-100 μm ,
- (b) 1 part by weight of vegetal carbon dust (beechwood) with a particle size of 0-100 μm ,
- (c) 0.2 parts by weight of NaCMC (See D-1.2.1.1.3) , and
- (d) an appropriate quantity of distilled water, with a conductivity of ≤ 1 mS/m.

The mixture shall not be more than 14 days old.

D-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:

- (a) 9 parts by weight of silica sand with a particle size of 0-100 μm ,
- (b) 1 part by weight of vegetal carbon dust (beechwood) with a particle size of 0-100 μm ,
- (c) 0.2 part by weight of NaCMC (See D-1.2.1.1.3)
- (d) 13 parts by weight of distilled water with a conductivity of ≤ 1 mS/m, and

- (e) 2 ± 1 parts by weight of surface-actant (See D-1.2.1.1.4)

The mixture shall not be more than 14 days old.

- D-1.2.1.1.3 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.

- D-1.2.1.1.4 The tolerance on quantity is due to the necessity of obtaining a dirt that correctly spreads out on all the plastic lens.

- D-1.2.1.2. Application of the test mixture to the headlamp

The test mixture shall be uniformly applied to the entire light-emitting surface of the headlamp and then left to dry. This procedure shall be repeated until the illumination value has dropped to 15-20 per cent of the values measured for each following point under the conditions described in this annex:

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

50 L and 50 V for a passing lamp only,

Note: Point 50 V is situated 375 mm below HV on the vertical line v-v on the screen at 25 m distance.

- D-1.2.1.3 **Measuring equipment**

The measuring equipment shall be equivalent to that used during headlamp approval tests. A standard (étalon) filament lamp and/or the LED module(s) as submitted with the headlamp shall be used for the photometric verification.

- D-2. Test for change in vertical position of the cut-off line under the influence of heat**

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

The headlamp tested in accordance with D-1, shall be subjected to the test described in D-2.1., without being removed from or readjusted in relation to its test fixture.

- D-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 or the LED module as submitted with the headlamp, which have been aged for at least one hour the headlamp shall be operated on the principal 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 D-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 50R) 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.

D-2.2. Test results

D-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).

D-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 D-2.1 after being subjected three consecutive times to the cycle as described below, in order to stabilize the position of mechanical parts of the headlamp on a base representative of the correct installation on the vehicle:

Operation of the passing beam for one hour, (the voltage shall be adjusted as specified in D-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

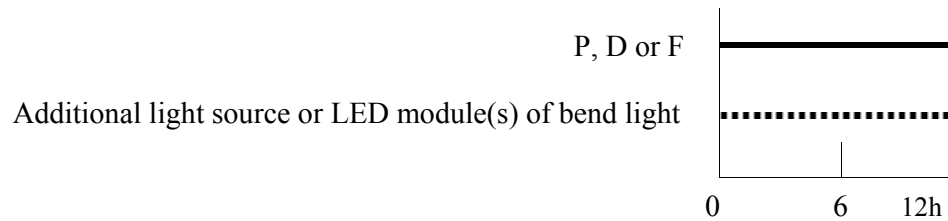
$$\left(\frac{\Delta r_I + \Delta r_{II}}{2} \leq 1 \text{ mrad} \right)$$

D-3 Overview of operational periods concerning tests for stability of photometric performance

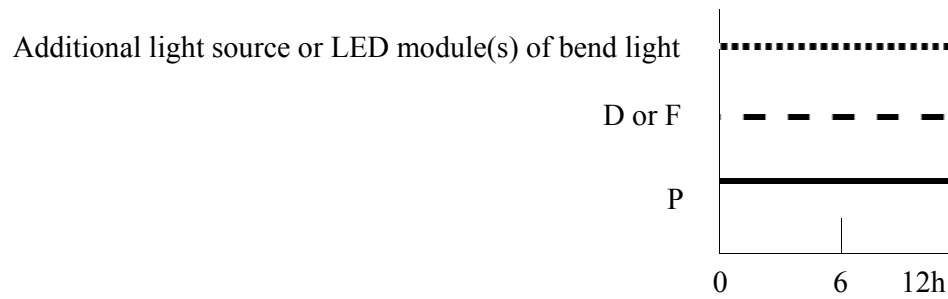
- Abbreviations:
- P: passing beam lamp
 - D: driving beam lamp (D₁ + D₂ means two driving beams)
 - F: front fog lamp
 - — — — means a cycle of 15 minutes off and 5 minutes lit
 - means a cycle of 9 minutes off and 1 minute lit

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

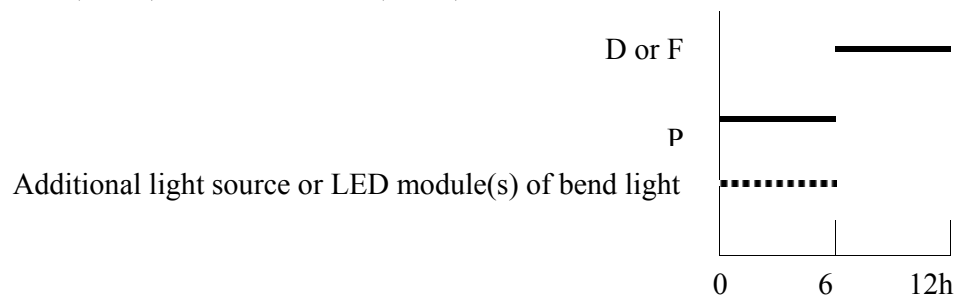
1. P or D or F (HC or HR or B)



2. P+F (HC B) or P+D (HCR)



3. P+F (HCB/) or HC/B or P+D (HC/R)



ANNEX E
(See 10.2)

**MINIMUM REQUIREMENTS FOR CONFORMITY OF
PRODUCTION CONTROL PROCEDURES**

E-1. General

E-1.1. The conformity requirements shall be considered satisfied from a mechanical and a geometrical standpoint, if the differences do not exceed inevitable manufacturing deviations within the requirements of this Standard. This condition also applies to colour.

E-1.2. With respect to photometric performances, the conformity of mass-produced headlamps shall not be contested if, when testing photometric performances of any headlamp chosen at random and equipped with a standard (étalon) filament lamp and/or LED module(s), as present in the lamp.

E-1.2.1 No measured value deviates unfavourably by more than 20 per cent from the value prescribed in this Standard. For values B 50 R and zone III, the maximum unfavourable deviation may be respectively:

B 50 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

E-1.2.2 or if

E-1.2.2.1 for the passing beam, the values prescribed in this Standard 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 R (with a tolerance of + 0.1 lx), 75 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;

E-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 6.3.2 of this standard

E-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.

E-1.2.4 If in the case of a lamp equipped with a replaceable filament light source the results of the tests described above do not meet the requirements, tests shall be repeated using another standard (étalon) filament lamp.

E-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 D-2.1 of Annex D after being subjected three consecutive times to the cycle described in D-2.2.2 of Annex D.

The headlamp shall be considered as acceptable if Δr does not exceed 1.5 mrad.

If this value exceeds 1.5 mrad but is not more than 2.0 mrad, a second sample shall be subjected to the test after which the mean of the absolute values recorded on both samples shall not exceed 1.5 mrad.

E-1.4. If, however, vertical adjustment cannot be performed repeatedly to the required position within the tolerances described in 6.2.2.3 of this Standard, one sample shall be tested according to the procedure described in J-2 and J-3 of Annex J.

E-2. Minimum requirements for verification of conformity by the manufacturer

For each type of headlamp the holder of the approval mark shall carry out at least the following tests, at appropriate intervals. The tests shall be carried out in accordance with the provision of this standard.

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.

E-2.1. Nature of tests

Tests of conformity in this Standard shall cover the photometric characteristics and for Class B, C and D headlamps the verification of the change in vertical position of the cut-off line under influence of heat.

E-2.2. Methods used in tests

E-2.2.1. Tests shall generally be carried out in accordance with the methods set out in this Standard.

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

E-2.2.3. The application of E-2.2.1 and E-2.2.2 requires regular calibration of test apparatus and its correlation with measurement made by a testing agency .

E-2.2.4. In all cases the reference methods shall be those of this Standard, particular for the purpose of administrative verification and sampling

E-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.

E-2.4. Measured and recorded photometric characteristics

The sampled headlamps shall be subjected to photometric measurements at the points provided for in the Standard, the reading being limited at the points E_{\max} , HV (See E-2.4.1) , HL, HR (See E-2.4.2) in the case of a driving beam, and to points B 50 R, HV, 50 V, 75 L and 25 R in the case of the passing beam (see Figure in Annex C).

E-2.4.1 When the driving beam is reciprocally incorporated with the passing beam, HV in the case of driving beam shall be same measuring point as in the case of passing beam

E-2.4.2 HL and HR : points “hh” located at 1.125 m to the left and to the right of point HV respectively.

E-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 testing agency, criteria governing acceptability of his products in order to meet the specification laid down for verification of conformity of products in 10.1 of this Standard.

The criteria governing acceptability shall be such that, with a confidence level of 95 per cent, the minimum probability of passing a spot check in accordance with Annex G (first sampling) would be 0.95.

ANNEX F

(See 5.6)

REQUIREMENTS FOR HEADLAMPS INCORPORATING LENSES OF PLASTIC MATERIAL- TESTING OF LENS OR MATERIAL SAMPLES AND OF COMPLETE HEADLAMPS

F-1 General specifications

- F-1.1 The samples supplied pursuant to 2.2.4 of this Standard shall satisfy the specifications indicated in F-2.1 to F-2.5 below.
- F-1.2 The two samples of complete headlamps supplied pursuant to 2.2.3 of this Standard and incorporating lenses of plastic material shall, with regard to the lens material, satisfy the specifications indicated in F-2.6 below.
- F-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 A of Table F1 of this Annex.
- F-1.4 However, if the headlamp manufacturer can prove that the product has already passed the tests prescribed in F-2.1 to F-2.5 below, or the equivalent tests pursuant to another Standard, those tests need not be repeated; only the tests prescribed in B of Table F-1, shall be mandatory.

F-2 Tests

F-2.1 Resistance to temperature changes

F-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 $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and 85-95 per cent RH;

1 hour at $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and 60-75 per cent RH;

15 hours at $-30^{\circ}\text{C} \pm 2^{\circ}\text{C}$; (Rev. 1)

1 hour at $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and 60-75 per cent RH;

3 hours at $80^{\circ}\text{C} \pm 2^{\circ}\text{C}$;

1 hour at $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and 60-75 per cent RH;

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

Note: The periods of one hour at $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ shall include the periods of transition from one temperature to another which are needed in order to avoid thermal shock effects.

F-2.1.2 **Photometric measurements**

F-2.1.2.1 **Method**

Photometric measurements shall be carried out on the samples before and after the test.

These measurements shall be made using a standard (étalon) lamp and/or LED module(s), as present in the headlamp, at the following points:

B 50R and 50L for passing beam of a passing headlamp or a passing/driving headlamp

E_{max} for the driving beam of a driving headlamp or a passing/driving headlamp.

F-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.

F-2.2 **Resistance to atmospheric and chemical agents**

F-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 $50^\circ\text{C} \pm 5^\circ\text{C}$. In order to ensure a regular exposure, the samples shall revolve around the source of radiation at a speed between 1 and 5 1/min.

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

spraying: 5 minutes; drying: 25 minutes.

F-2.2.2 **Resistance to chemical agents:**

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

F-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).

F-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 F-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 x 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.

F-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 F-2.3 (Resistance to detergents) 23°C ± 5°C.

Afterwards the samples shall be carefully rinsed with distilled water containing not more than 0.2 per cent impurities at 23°C ± 5°C and then wiped off with a soft cloth.

F-2.2.3. **Results**

F-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 (Δt)

$$\Delta t = \frac{T_2 - T_3}{T_2}$$

measured on the three samples according to the procedure described in F-4 shall not exceed 0.020 ($\Delta t \leq 0.020$).

F-2.2.3.2 After the test of resistance to chemical agents, the samples shall not bear any traces of chemical staining likely to cause a variation of flux diffusion, whose mean variation

$$\Delta d = \frac{T_5 - T_4}{T_2}$$

measured on the three samples according to the procedure described in F-4 shall not exceed 0.020 ($\Delta d \leq 0.020$).

F-2.2.4. **Resistance to light source radiations**

The following test shall be done:

Flat samples of each light transmitting plastic component of the headlamp are exposed to the light of the LED module(s). The parameters such as angles and distances of these samples shall be the same as in the headlamp. These samples shall have the same colour and surface treatment, if any, as the parts of the headlamp.

After 1500 hours of continuous operation, the colorimetric specifications of the transmitted light shall be met, and the surfaces of the samples shall be free of cracks, scratches, scalings or deformation

F-2.3 **Resistance to detergents and hydrocarbons**

F-2.3.1 **Resistance to detergents**

The outer face of three samples (lenses or samples of material) shall be heated to $50^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and then immersed for five minutes in a mixture maintained at $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and composed of 99 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 $50^{\circ}\text{C} \pm 5^{\circ}\text{C}$. The surface of the samples shall be cleaned with a moist cloth.

F-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.

F-2.3.3 **Results**

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

$$\Delta t = \frac{T_2 - T_3}{T_2}$$

measured on the three samples according to the procedure described in F-4. to this annex shall not exceed 0.010 ($\Delta t_m \leq 0.010$).

F-2.4 **Resistance to mechanical deterioration**

F-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 F-5.

F-2.4.2 **Results**

After this test, the variations:
in transmission

$$\Delta t = \frac{T_2 - T_3}{T_2}$$

and in diffusion:

$$\Delta d = \frac{T_5 - T_4}{T_2}$$

shall be measured according to the procedure described in F-4 in the area specified in 2.2.4.1.1 of this Standard. The mean value of the three samples shall be such that:

$$\Delta t_m \leq 0.100;$$

$$\Delta d_m \leq 0.050$$

F-2.5 **Test of adherence of coatings, if any**F-2.5.1 **Preparation of the sample**

A surface of 20 mm x 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 x 2 mm. The pressure on the blade or needle shall be sufficient to cut at least the coating.

F-2.5.2 **Description of the test**

Use an adhesive tape with a force adhesion of 2 N/(cm of width) \pm 20% measured under the standardized conditions specified in F-6 of 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 F-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 \pm 0.2 m/s.

F-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.

F-2.6 Tests of the complete headlamp incorporating a lens of plastic material

F-2.6.1 Resistance to mechanical deterioration of the lens surface

F-2.6.1.1 Tests

The lens of headlamp sample No. 1 shall be subjected to the test described in F-2.4.1 above.

F-2.6.1.2 Results

After the test, the results of photometric measurements carried out on the headlamp in accordance with this Standard shall not exceed by more than:

30 per cent the maximum values prescribed at points B50R and HV and not be more than 10% below the minimum values prescribed at Point 75L.

F-2.6.2 Test of adherence of coatings, if any

The lens of headlamp sample No. 2 shall be subjected to the test described in F-2.5 above.

F-3 Verification of the conformity of production

F-3.1 With regard to the materials used for the manufacture of lenses, the headlamps of a series shall be recognized as complying with this standard if:

F-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 F-2.2.2., F-2.3.1 and F-2.3.2.);

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

F-3.2 If the test results fail to satisfy the requirements, the tests shall be repeated on another sample of headlamps selected at random.

F-4.0 Method of Measurement of the Diffusion and Transmission of Light

F-4.1 Equipment (see Figure F1)

The beam of a collimator K with a half divergence

$$\beta/2 = 17.4 \times 10^{-4} \text{ rd}$$

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_τ with the receiver R; the diameter of the lens L_2 shall be such that it does not diaphragm the light diffused by the sample in a cone with a half top angle of

$$\beta/2 = 14^\circ$$

An annular diaphragm D_D with angles

$$\frac{\alpha_0}{2} = 1^\circ \text{ and } \frac{\alpha_{\max}}{2} = 12^\circ$$

is placed in an image focal plane of the lens L_2 .

The non-transparent central art 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 $L_2 D_\tau$ and the focal length F_2 (see note below) of the lens L_2 shall be so chosen that the image of D_2 completely covers the receiver R.

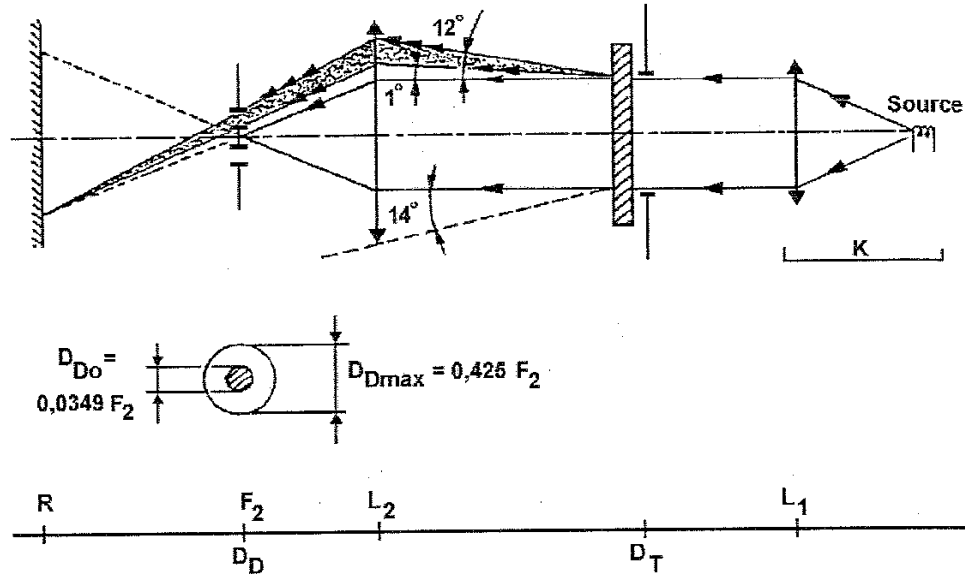
When the initial incident flux is referred to 1000 units, the absolute precision of each reading shall be better than 1 unit.

Note : For L_2 the use of a focal distance of about 80 mm is recommended.

F-4.2 **Measurements**

The following readings shall be taken:

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



F-5.0 Spray testing method

F-5.1. Test equipment

F-5.1.1. Spray gun

The spray gun used shall be equipped with a nozzle 1.3 mm in diameter allowing a liquid flow rate of 0.24 ± 0.02 l/minute at an operating pressure of 6.0 bars $-0/+0.5$ bar.

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

F-5.1.2. 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.

F-5.2. Test

The outer surface of the headlamp 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 F-4, is such that:

$$\Delta d = \frac{T_5 - T_4}{T_2} = 0.0250 \pm 0.0025$$

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

F-6.0 Adhesive tape adherence test

F-6.1 Purpose

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

F-6.2 Principle

Measurement of the force necessary to unstick an adhesive tape from a glass plate at an angle of 90° .

F-6.3 Specified atmospheric conditions

The ambient conditions shall be at $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and 65 ± 15 per cent RH.

F-6.4 test pieces

Before the test, the sample roll of adhesive tape shall be conditioned for 24 hours in the specified atmosphere (see F-6.3 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.

F-6.5 Procedure

The test shall be under the ambient conditions specified in F-6.3.

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.

F-6.6 Results

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

Table F1
(See F 1.3)

CHRONOLOGICAL ORDER OF APPROVAL TESTS

A. Tests on plastic materials (lenses or samples of material supplied pursuant to 2.2.4 of this Standard.

Samples	Lenses or samples of material										Lenses			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Tests														
1.1 Limited photometry (para. F-2.1.2)											X	X	X	
1.1.1 Temperature change (para. F-2.1.1)											X	X	X	
1.2 Limited photometry (para F- 2.1.2)											X	X	X	
1.2.1 Transmission measurement	X	X	X	X	X	X	X	X	X					
1.2.2 Diffusion measurement	X	X	X				X	X	X					
1.3 Atmospheric agents (para. F- 2.2.1)	X	X	X											
1.3.1 Transmission measurement	X	X	X											
1.4 Chemical agents (para F-2.2.2)	X	X	X											
1.4.1 Diffusion measurements	X	X	X											
1.5 Detergents (para F-2.3.1)				X	X	X								
1.6 Hydrocarbons para. F-2.3.2)				X	X	X								
1.6.1 Transmission measurement				X	X	X								
1.7 Deterioration (para. F-2.4.1)							X	X	X					
1.7.1 Transmission measurement							X	X	X					
1.7.2 Diffusion measurement							X	X	X					
1.8 Adherence (para.F-2.5)														X
1.9 Resistance to light source radiations (para. F-2.2.4.)										X				

B. Tests on complete headlamps (supplied pursuant to 2.2.3 of this Standard)

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

ANNEX G
(See 10.3)

MINIMUM REQUIREMENTS FOR SAMPLING
BY TESTING AGENCY

G-1. General

G-1.1. The conformity requirements shall be considered satisfied from a mechanical and a geometrical standpoint in accordance with the requirements of this Standard, if any, if the differences do not exceed inevitable manufacturing deviations. This condition also applies to colour.

G-1.2. With respect to photometric performances, the conformity of mass-produced headlamps shall not be contested if, when testing photometric performances of any headlamp chosen at random and equipped with a standard filament lamp and/or LED module(s) present in the headlamp

G-1.2.1. No measured value deviates unfavourably by more than 20 per cent from the value prescribed in this standard, as applicable.

For values B50R and Zone III and the maximum unfavourable deviation may be respectively

B50R	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

G-1.2.2. or if

G-1.2.2.1. for the passing beam, the values prescribed in this Standard 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 R (with a tolerance of 0.1 lx), 75 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;

G-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 6.2.3 The reference mark is disregarded.

G-1.2.3. if the results of the test described above do not meet the requirements, the alignment of the headlamp may be changed, provided that the axis of the beam is not displaced laterally by more than 1° to the right or left. (See note below)

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

G-1.2.4. If the results of the tests described above do not meet the requirements, tests shall be repeated using another standard filament lamp and/or

LED module(s) present in the headlamp

G-1.2.5. Headlamps with apparent defects are disregarded.

G-1.2.6. The reference mark is disregarded.

G-1.3 If, however, vertical adjustment cannot be performed repeatedly to the required position within the tolerances described in 6.2.2.3 of this Standard, one sample shall be tested according to the procedure described in J-2 and J-3 of Annex J

G-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.

G-2.1. The conformity is not contested

G-2.1.1. Following the sampling procedure shown in Figure G-1 of this annex the conformity of mass-produced headlamps shall not be contested if the deviations of the measured values of the headlamps in the unfavourable directions are:

G-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

G-2.1.1.2. **sample B**

B1:	Both the headlamps		0 per cent
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G-2.1.2 or if the conditions of G-1.2.2 for sample A are fulfilled

G-2.2. The conformity is contested

G-2.2.1. Following the sampling procedure shown in Figure G-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:

G-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

G-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	not more than	20 per cent
	but	not more than	30 per cent

G-2.2.2. or if the conditions of G-1.2.2 for sample A are not fulfilled.

G-2.3. **Non conformity established**

Conformity shall be contested and **11** applied if, following the sampling procedure shown in Figure 1 of this annex, the deviations of the measured values of the headlamps are:

G-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

G-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 headlamp	more than	20 per cent

B6	in the case of A2		
	one headlamp		0 per cent
	one headlamp	more than	30 per cent

G-2.3.3. or if the conditions of **G-1.2.2** for samples A and B are not fulfilled.

G-3. repeated sampling

In the case of A3, B2, B3 a repeated sampling, third sample C of two headlamps, selected from stock manufactured after alignment, is necessary within two months' time after the notification.

G-3.1. **The conformity is not contested.**

G-3.1.1. Following the sampling procedure shown in Figure G-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:

G-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		

G-3.1.1.2. sample D

D1	in the case of C2		
	both headlamps		0 per cent

G-3.1.2. or if the conditions of **G-1.2.2** for sample C are fulfilled.

G-3.2. The conformity is contested

G-3.2.1. Following the sampling procedure shown in Figure G-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:

G-3.2.1.1. sample D

D2	in the case of C2		
	One headlamps	more than	0 per cent
	but	Not more than	20 per cent
	one headlamp	Not more than	20 per cent

G-3.2.1.2 or if the conditions of G-1.2.2 for sample C are not fulfilled.

G-3.3. **Non Conformity Established.**

Conformity shall be contested and 11 applied if, following the sampling procedure shown in Figure G-1 of this annex, the deviations of the measured values of the headlamps are

G-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

G-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

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

G-4. Change of the vertical position of the cut-off line

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

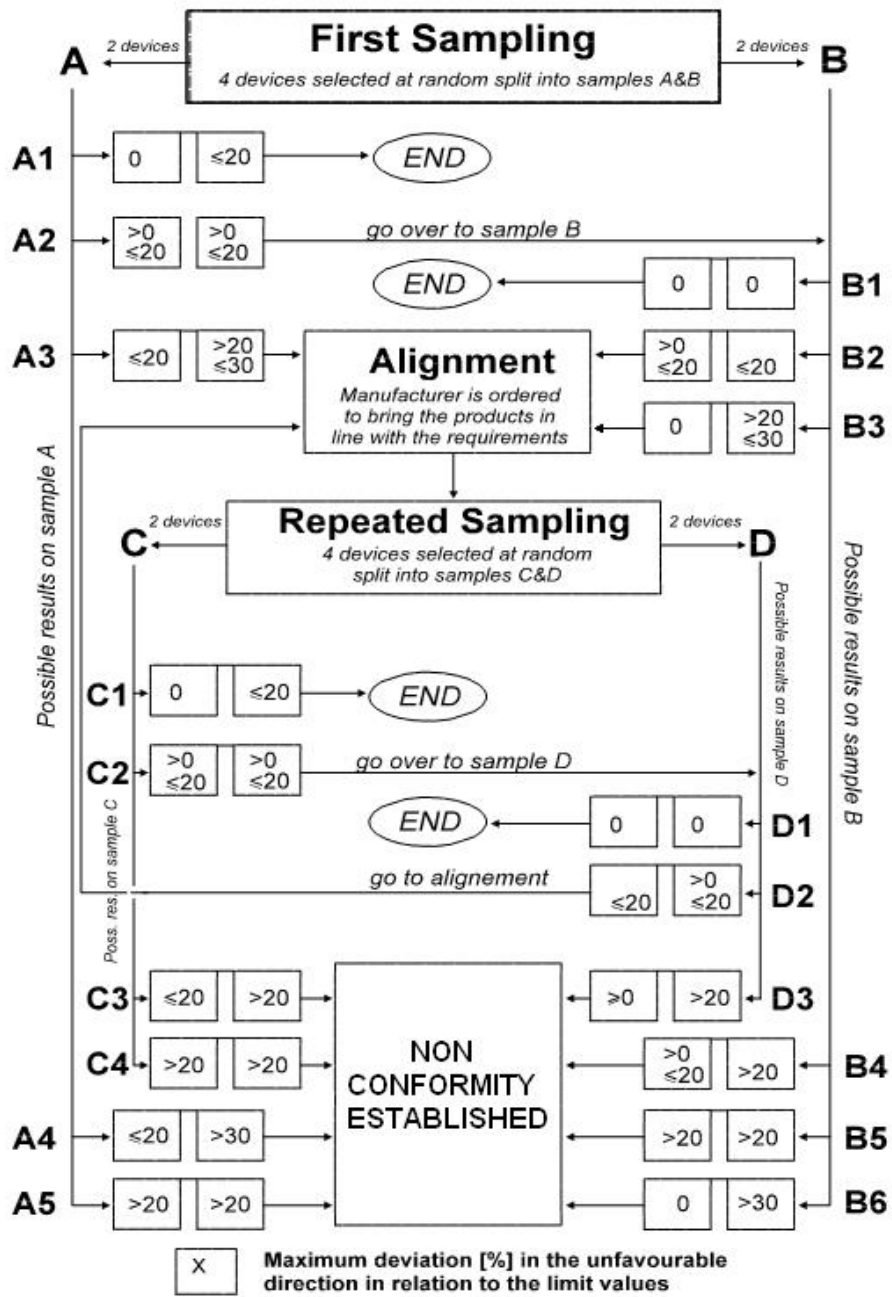
One of the headlamps of sample A after sampling procedure in Figure G-1 of this annex shall be tested according to the procedure described in D-2.1 of Annex D after being subjected three consecutive times to the cycle described in D-2.2.2 of Annex D.

The headlamp shall be considered as acceptable if Δr does not exceed 1.5 mrad.

If this value exceeds 1.5 mrad but is not more than 2.0 mrad, the second headlamp of sample A shall be subjected to the test after which the mean of the absolute values recorded on both samples shall not exceed 1.5 mrad.

However, if this value of 1.5 mrad on sample A is not complied with, the two headlamps of sample B shall be subjected to the same procedure and the value of Δr for each of them shall not exceed 1.5 mrad.

Figure G-1



ANNEX H

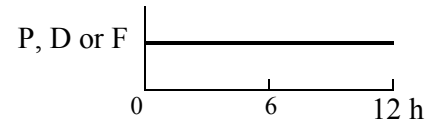
(See D-1.1.1 of Annex D)

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

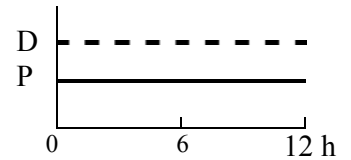
- Abbreviations: P: passing beam lamp
 D: driving beam lamp (D₁ + D₂ means two driving beams)
 F: front fog lamp
 - - - - - : means a cycle of 15 minutes off and 5 minutes lit.

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

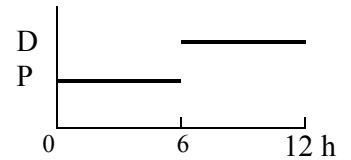
H-2.1. P or D or F (HC or HR or B)



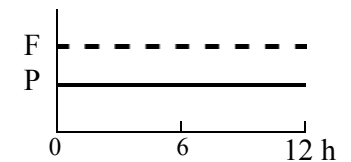
H-2.2. P+D (HCR) or P+D₁+D₂ (HCR HR)



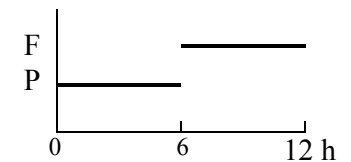
H-2.3. P+D (HC/R) or P+D₁+D₂ (HC/R HR)



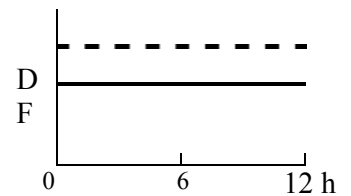
H-2.4. P+F (HC B)



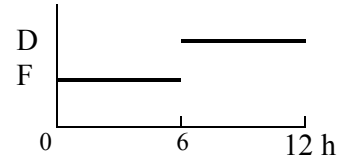
H-2.5. P+F (HC B/) or HC/B



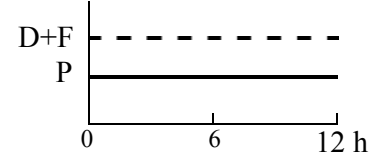
H-2.6. D+F (HR B) or D₁+D₂+F (HR HR B)



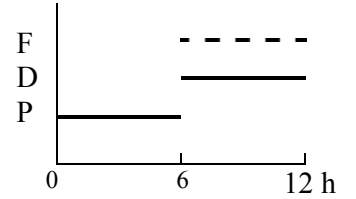
H-2.7. D+F (HR B/) or D₁+D₂+F (HR HR B/)



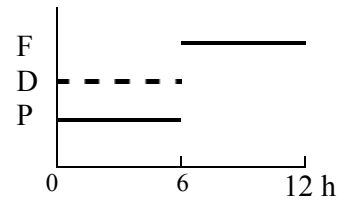
H-2.8. P+D+F (HCR B) or P+D₁+D₂+F (HCR HR B)



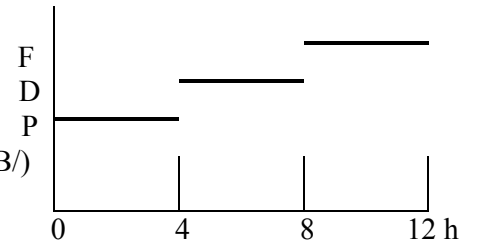
H-2.9. P+D+F (HC/R B) or P+D₁+D₂+F (HC/R HR B)



H-2.10. P+D+F (HCR B/) or P+D₁+D₂+F (HCR HR B/)



H-2.11 P+D+F (HC/R B/) or P+D₁+D₂+F (HC/R HR B/)



ANNEX J
(See 6.2.2.4.)

**INSTRUMENTAL VERIFICATION OF THE "CUT-OFF"
FOR PASSING BEAM HEADLAMPS**

J-1. GENERAL

In the case where 6.2.2.4 of this Standard applies, the quality of the "cut-off" shall be tested according to the requirements set out in J-2 below and the instrumental vertical and horizontal adjustment of the beam shall be performed according to the requirements set out in J-3 below.

Before carrying out the measurement of the quality of "cut-off" and the instrumental aiming procedure, a visual pre-aim in accordance with 6.2.2.1 and 6.2.2.2 of this Standard is required.

J-2 MEASUREMENT OF THE QUALITY OF THE "CUT-OFF"

To determine the minimum sharpness, measurements shall be performed by vertically scanning through the horizontal part of the "cut-off" in angular steps of 0.05° at either a measurement distance of:

- (a) 10 m with a detector having a diameter of approximately 10 mm or
- (b) 25 m with a detector having a diameter of approximately 30 mm.

The measuring distance at which the test was carried out shall be recorded in the test report.

To determine the maximum sharpness, measurements shall be performed by vertically scanning through the horizontal part of the "cut-off" in angular steps of 0.05° exclusively at a measurement distance of 25 m and with a detector having a diameter of approximately 30 mm.

The "cut-off" quality shall be considered acceptable if the requirements of J-2.1 to J-2.3 below comply with at least one set of measurements.

J-2.1. Not more than one "cut-off" shall be visible.

J-2.2. Sharpness of "cut-off"

The sharpness factor G is determined by scanning vertically through the horizontal part of the "cut-off" at 2.5° from the V-V where:

$G = (\log E_\beta - \log E_{(\beta + 0.1^\circ)})$ where β = the vertical position in degrees.

The value of G shall not be less than 0.13 (minimum sharpness) and not greater than 0.40 (maximum sharpness).

J-2.3. Linearity

The part of the horizontal "cut-off" that serves for vertical adjustment shall be horizontal between 1.5° and 3.5° from the V-V line (see Figure J-1).

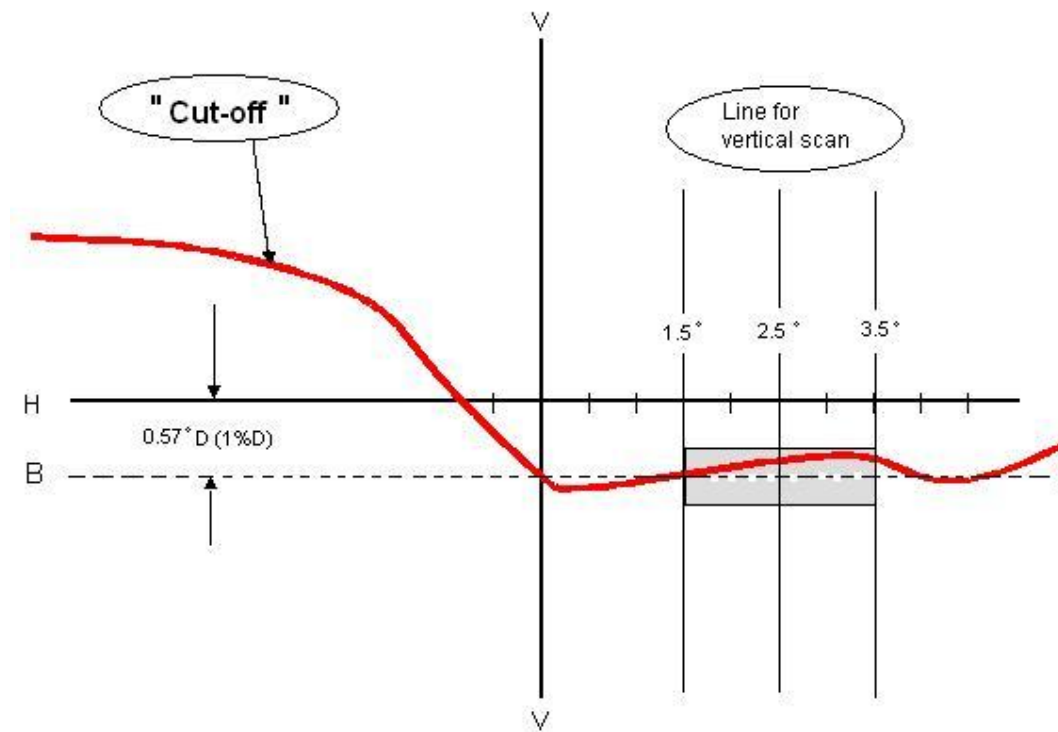
The inflection points of the "cut-off" gradient at the vertical lines at 1.5°, 2.5° and 3.5° shall be determined by the equation:

The maximum vertical distance between the inflection points determined shall not exceed 0.2 °.

$$(d^2 (\log E) / d\beta^2 = 0).$$

J-3. Vertical and horizontal adjustment

If the "cut-off" complies with the quality requirements of J-2 of this annex, the beam adjustment may be performed instrumentally



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

Figure J-1
Measurement of "cut-off" quality

J-3.1. **Vertical adjustment**

Moving upward from below the line B (see Figure J-2 below), a vertical scan is carried out through the horizontal part of the "cut-off" at 2.5° from V-V. The inflection point (where $d^2(\log E) / dv^2 = 0$) is determined and positioned on the line B situated one per cent below H-H.

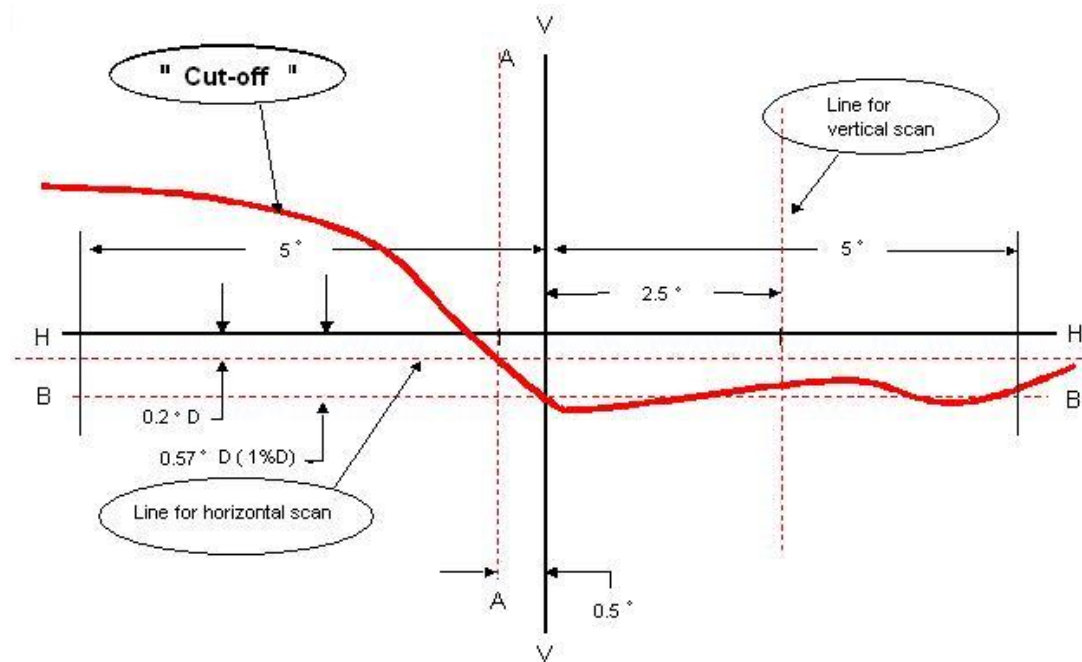
J-3.2. **Horizontal adjustment**

The applicant shall specify one of the following horizontal aim methods

- (a) The "0.2 D line" method (see Figure J-2 below).

A single horizontal line at 0.2° D shall be scanned from 5° left to 5° right after the lamp has been aimed vertically. The maximum gradient "G" determined using the formula $G = (\log E_{\beta} - \log E_{(\beta + 0.1^{\circ})})$ where β is the horizontal position in degrees, shall not be less than 0.08

The inflection point found on the 0.2 D line shall be positioned on the line A.



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

Figure J-2

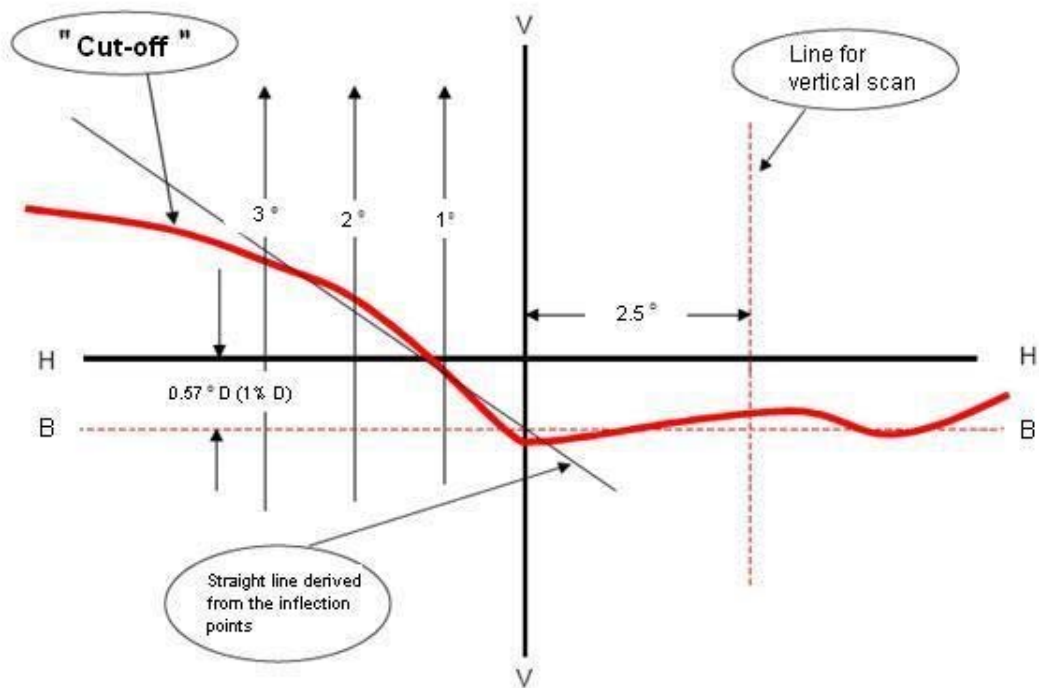
Instrumental vertical and horizontal adjustment- horizontal line scan method

(b) The "3 line" method (see Figure J-3)

Three vertical lines shall be scanned from 2° D to 2° U at 1°R, 2°R, and 3°R after the lamp has been aimed vertically. The respective maximum gradients "G" determined using the formula:

$$G = (\log E_{\beta} - \log E_{(\beta + 0.1^{\circ})})$$

where β is the vertical position in degrees, shall not be less than 0.08. The inflection points found on the three lines shall be used to derive a straight line. The intersection of this line and the line B found while performing vertical aim shall be placed on the V line.



Note: The scales are different for vertical and horizontal lines

Figure J-3
Instrumental vertical and horizontal adjustment-three line scan method

ANNEX K
(See 5.3.2.3, 5.9 & 6.2.9)

**REQUIREMENTS FOR LED MODULES AND
HEADLAMPS INCLUDING LED MODULES**

K-1. General specifications

- K-1.1. Each LED module sample submitted shall conform to the relevant specifications of this Standard when tested with the supplied electronic light source control-gear(s), if any.
- K-1.2. LED module(s) shall be so designed as to be and to remain in good working order when in normal use. They shall moreover exhibit no fault in design or manufacture. A LED module shall be considered to have failed if any one of its LEDs has failed.
- K-1.3. LED module(s) shall be tamperproof.
- K-1.4. The design of removable LED module(s) shall be such that:
 - K-1.4.1 when the LED module is removed and replaced by another module provided by the applicant and bearing the same light source module identification code, the photometric specifications of the headlamp shall be met;
 - K-1.4.2. LED modules with different light source module identification codes within the same lamp housing, shall not be interchangeable.

K-2. Manufacture

- K-2.1. The LED(s) on the LED module shall be equipped with suitable fixation elements.
- K-2.2. The fixation elements shall be strong and firmly secured to the LED(s) and the LED module.

K-3. Test conditions

- K-3.1. Application
 - K-3.1.1. All samples shall be tested as specified in K-4 below.
 - K-3.1.2. The kind of light sources on a LED module shall be light-emitting diodes (LED) as defined in **2.7.1** of AIS-008(Rev.1), in particular with regard to the element of visible radiation. Other kinds of light sources are not permitted.

K-3.2. Operating conditions

K-3.2.1 LED module operating conditions

All samples shall be tested under the conditions as specified in 6.1.4 and 6.1.5 of this Standard. If not specified differently in this annex LED modules shall be tested inside the headlamp as submitted by the manufacturer.

K-3.2.2. Ambient temperature

For the measurement of electrical and photometric characteristics, the headlamp shall be operated in a dry and still atmosphere at an ambient temperature of 23 °C ± 5 °C.

K-3.3. Ageing

Upon the request of the applicant the LED module shall be operated for 15 h and cooled down to ambient temperature before starting the tests as specified in this Standard

K-4. Specific requirements and tests

K-4.1. Colour rendering

K-4.1.1. Red content

In addition to measurements as described in 7 of this Standard.

The minimum red content of the light of a LED module or headlamp incorporating LED module(s) tested at 50 V shall be such that:

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

where:

$E_e(\lambda)$ (unit: W) is the spectral distribution of the irradiance;

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

(λ) (unit: nm) is the wavelength

This value shall be calculated using intervals of one nanometer.

K-4.2. UV-radiation

The UV-radiation of a low-UV-type LED module shall be such that:

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

S(λ)(unit: 1) is the spectral weighting function;
 k_m = 683 lm/W is the maximum value of the luminous efficacy of radiation.

(For definitions of the other symbols see K-4.1.1 above).

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

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

Table UV:

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

K-4.3. **Temperature stability**

K-4.3.1. **Illuminance**

K-4.3.1.1. A photometric measurement of the headlamp shall be made after 1 minute of operation for the specific function at the test point specified below. For these measurements, the aim can be approximate but shall be maintained for before and after ratio measurements.

Test points to be measured:

Passing beam 50 V

Driving beam H – V

K-4.3.1.2. The lamp shall continue operation until photometric stability has occurred. The moment at which the photometry is stable is defined as the point in time at which the variation of the photometric value is less than 3 per cent within any 15 minute period. After stability has occurred, aim for complete photometry shall be performed in accordance with the requirements of the specific device. Photometer the lamp at all test points required for the specific device.

K-4.3.1.3. Calculate the ratio between the photometric test point value determined in K-4.3.1.1 and the point value determined in K-4.3.1.2.

K-4.3.1.4. Once stability of photometry has been achieved, apply the ratio calculated above to each of the remainder of the test points to create a new photometric table that describes the complete photometry based on one minute of operation.

K-4.3.1.5. The illuminance values, measured after one minute and after photometric stability has occurred, shall comply with the minimum and maximum requirements.

K-4.3.2. **Colour**

The colour of the light emitted measured after one minute and measured after photometric stability has been obtained, as described in K-4.3.1.2 of this annex, shall both be within the required colour boundaries.

K-5. The measurement of the objective luminous flux of LED module(s) producing the principal passing beam shall be carried out as follows:

K-5.1. The LED module(s) shall be in the configuration as described in the technical specification as defined in A-12 of Annex A of this Standard. Optical elements (secondary optics) shall be removed by the testing agency at the request of the applicant by the use of tools. This procedure and the conditions during the measurements as described below shall be described in the test report.

K-5.2. Three LED modules of each type shall be submitted by the applicant with the light source control gear, if applicable, and sufficient instructions.

Suitable thermal management (e.g. heat sink) may be provided, to simulate similar thermal conditions as in the corresponding headlamp application.

Before the test each LED module shall be aged at least for seventy-two hours under the same conditions as in the corresponding headlamp application.

In the case of use of an integrating sphere, the sphere shall have a minimum diameter of one meter, and at least ten times the maximum dimension of the LED module, whichever is the largest. The flux measurements can also be performed by integration using a goniophotometer. The prescriptions in CIE - Publication 84 - 1989, regarding the room temperature, positioning, etc., shall be taken into consideration.

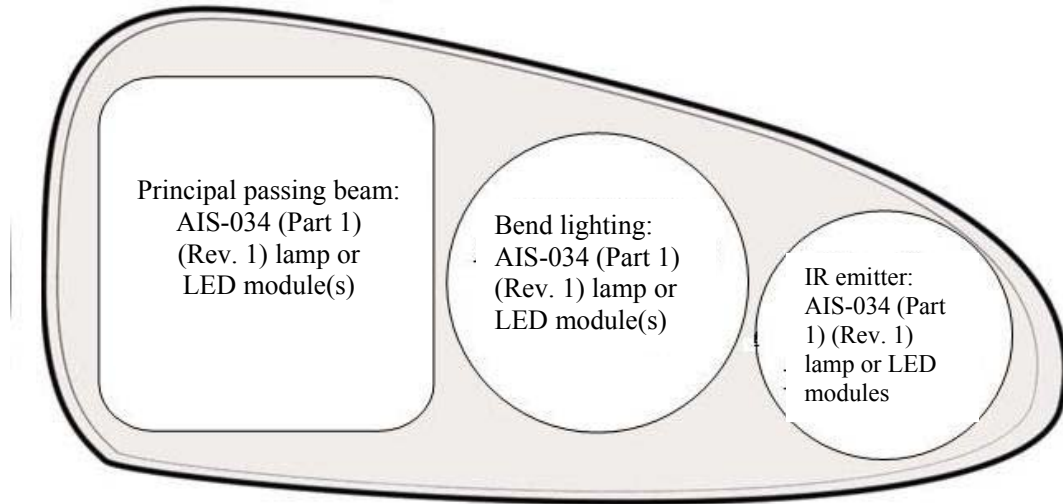
The LED module shall be burned in for approximately one hour in the closed sphere or goniophotometer.

The flux shall be measured after stability has occurred, as explained in K-4.3.1.2 of this annex

The average of the measurements of the three samples of each type of LED module shall be deemed to be its objective luminous flux.

ANNEX L

**A GENERAL ILLUSTRATION FOR PRINCIPAL PASSING BEAM
AND BEAM CONTRIBUTORS AND CORRELATED
LIGHT SOURCE OPTIONS**



ANNEX M

(See Introduction)

**COMPOSITION OF AISC PANEL ON
LIGHTING AND LIGHT SIGNALLING DEVICES***

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* At the time of approval of this Automotive Industry Standard (AIS)

ANNEX N
(See Introduction)

COMMITTEE COMPOSITION *

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* At the time of approval of this Automotive Industry Standard (AIS)