

AUTOMOTIVE INDUSTRY STANDARD

**Performance Requirements
for Direction Indicators
for Motor Vehicles**

(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
(DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS)
GOVERNMENT OF INDIA

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INTRODUCTION

0.1 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.

0.2 Accordingly AIS-012 covering performance requirements of lighting and light-signalling devices for motor vehicles having more than three wheels, trailers and semi-trailers has been published in 2004 and implemented thereafter in 2005.

With technological advancement in lighting and light-signalling devices and updation in ECE regulations, AIS-012 was taken up for revision and now is prepared in ten parts. This part covers performance requirements for direction indicators for motor vehicles.

0.3 While preparing this standard considerable assistance has been derived from following ECE regulation.

ECE R 6 - Addendum 5 - Revision 4 - Amendment 1- Corrigendum 2 - Supplement 16 to the 01 series of amendments - Date of entry into force: 10 March 2009	Uniform Provisions Concerning the Approval of Direction Indicators for Power-Driven Vehicles and their Trailers
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0.4 The following standards contain provisions, which through reference in this text constitute provisions of the standard.

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-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-010 (Part 5) (Rev. 1):2010	Requirements of Chromaticity Co-ordinates of Colour of Light Emitted from Lighting and Light-Signalling Devices
AIS-037:2004	Procedure for Type Approval and Establishing Conformity of Production for Safety Critical Components
IEC Publication 60061,	Lamp Caps and Holders together with Gauges for the Control of Interchangeability and Safety.

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

**Performance Requirements for Direction Indicators
for Motor Vehicles**

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Performance Requirements for Direction Indicators for Motor Vehicles

0. SCOPE

This standard applies to direction indicators for vehicles of categories L, M, N, T and A^{1/}.

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

1. DEFINITIONS

For the purpose of this standard:

- 1.1 The definitions given in AIS-008(Rev.1) and its amendments in force at the time of application for type approval shall apply to this standard.
- 1.2. "**Direction indicator**" means a device mounted on a motor vehicle or trailer which, when operated by the driver, signals the latter's intention to change the direction in which the vehicle is proceeding. The present standard applies solely to fixed-position flashing light devices whose flashing is obtained by the intermittent supply of electric current to the lamp.
- 1.3. "**Direction indicators of different types**" means lamps which differ in such essential respects as:
 - (a) The trade name or mark;
 - (b) The characteristics of the optical system (levels of intensity, light distribution angles, category of filament lamp, light source module, etc.);
 - (c) The category of direction indicator lamps;
 - (d) The variable intensity control, if any.

A change of the colour of the filament lamp or the colour of any filter does not constitute a change of type.
- 1.4. References made in this standard shall be referred to AIS-034(Part 1) (Rev.1) and its amendments at the time of application for type approval.

^{1/} As defined in AIS-053: Automotive Vehicles - Types - Terminology

2. APPLICATION FOR APPROVAL

- 2.1. The application for approval of a type of direction indicator shall be submitted by the applicant. It shall specify to which category or to which of the categories 1, 1a, 1b, 2a, 2b, 3, 4, 5 or 6 according to Annex A, the direction indicator belongs and, if it belongs to category 2, whether it has steady luminous intensity (category 2a) or whether it has variable luminous intensity (category 2b) and if the direction indicator may also be used in an assembly of two lamps of the same category. At the choice of the lamp manufacturer, it will also specify that the device may be installed on the vehicle with different inclinations of the reference axis in respect to the vehicle reference planes and to the ground or rotate around its reference axis; these different conditions of installation shall be indicated in the technical information (see Annex B).
- 2.2. For each type of direction indicator the application shall be accompanied by the following:
- 2.2.1. drawings, in triplicate, in sufficient detail to permit identification of the type and category and showing geometrically in what position(s) the direction indicator may be mounted on the vehicle; the axis of observation to be taken as the axis of reference in the tests (horizontal angle $H = 0$ degrees, vertical angle $V = 0$ degrees); and the point to be taken as the centre of reference in the said tests. The drawings shall show the position intended for the approval number and the additional symbols in relation to the approval mark;
- 2.2.2. A brief technical description stating in particular, with the exception of lamps with non-replaceable light sources:
- (a) The category or categories of filament lamp(s) prescribed; this filament lamp category shall be one of those contained in AIS-034 (Part 1)(Rev. 1) and its amendments at the time of application for type approval; and/or
 - (b) The light source module specific identification code.
- 2.2.3. For a direction indicator of category 2b, a concise description of the variable intensity control, an arrangement diagram and a specification of the characteristics of the system ensuring the two levels of intensity;
- 2.2.4. For a direction indicator lamp of categories 1, 1a, 1b, 2a and 2b, information regarding the signal according to paragraph 6.4.2 below.
- 2.2.5. Two samples; if the approval is applied for devices which are not identical but are symmetrical and suitable for mounting one on the left and one on the right side of the vehicle, the two samples submitted may be identical and be suitable for mounting only on the right or only on the left side of the vehicle.

For a direction indicator of category 2b, the application shall also be accompanied by variable intensity control or a generator providing the same signal(s).

3. MARKINGS

Devices submitted for approval shall:

- 3.1. Bear the trade name or mark of the lamp manufacturer; this marking shall be clearly legible and indelible;
- 3.2. With the exception of lamps with non-replaceable light sources, bear a clearly legible and indelible marking indicating:
 - (a) The category or categories of filament lamp(s) prescribed; and/or
 - (b) The light source module specific identification code.
- 3.3. Comprise a space of sufficient size for the approval marking and the additional symbols prescribed in paragraph 4.2. below; this space shall be shown in the drawings mentioned in paragraph 2.2.1. above;
- 3.4. In case of lamps with an electronic light source control gear or a variable intensity control and/or non-replaceable light sources and/or light source module(s), bear the marking of the rated voltage or range of voltage and rated maximum wattage.
- 3.5. In the case of lamps with light source module(s), the light source module(s) shall bear:
 - 3.5.1. The trade name or mark of the lamp manufacturer; this marking shall be clearly legible and indelible;
 - 3.5.2. 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 and, in the case several non identical light source modules are used, followed by additional symbols or characters; this specific identification code shall be shown in the drawings mentioned in paragraph 2.2.1. above.

The approval marking does not have to be the same as the one on the lamp in which the module is used, but both markings shall be from the same lamp manufacturer.
 - 3.5.3. The marking of the rated voltage or range of voltage and rated maximum wattage.
- 3.6. An electronic light source control gear or a variable intensity control being part of the lamp but not included into the lamp body shall bear the name of the manufacturer and its identification number.
- 3.7. On the Prototype for type approval, the markings may be provided by suitable temporary methods and need not be obtained from the tools used for series production.

4. APPROVAL

4.1. General

4.1.1. If the two devices submitted for approval in pursuance of paragraph 2.2.4. above meet the requirements of this standard, approval shall be granted.

4.1.2. Where grouped, combined or reciprocally incorporated lamps have been found to comply with the requirements of several standards of AIS-012 or AIS-010 (Parts as applicable), approval mark may be applied provided that such lamps are not grouped, combined or reciprocally incorporated with a lamp or lamps not satisfying any one of these standards.

4.2. Composition of the approval mark

4.2.1. The Approval marking shall be as per the provisions of AIS-037.

4.2.2. The following additional symbol (or symbols):

4.2.2.1. One or more of the numbers: 1, 1a, 1b, 2a, 2b, 3, 4, 5 or 6, according to whether the device belongs to one or more categories 1, 1a, 1b, 2a, 2b, 3, 4, 5 or 6 for which approval is sought in accordance with paragraph 2.1.;

4.2.2.2. On devices which may not be mounted on either side of the vehicle indiscriminately, a horizontal arrow showing in which position the device is to be mounted (the arrow shall be directed outwards from the vehicle in the case of devices of categories 1, 1a, 1b, 2a and 2b and towards the front of the vehicle in the case of devices of categories 3, 4, 5 and 6). In addition, for devices of category 6 an indication "R" or "L" shall in this case be shown on the device, indicating the right or left side of the vehicle.

4.2.2.3. On devices which may be used as part of an assembly of two lamps, the additional letter "D" to the right side of the symbol mentioned in paragraph 4.2.2.1.;

4.2.2.4. On devices with reduced light distribution in conformity to paragraph D 2.1.3. of Annex D to this standard a vertical arrow starting from a horizontal segment and directed downwards.

4.2.2.5. The two digits of the approval number which indicate the amendments at the time of issue of the approval and, if necessary, the required arrow may be marked close to the above additional symbols;

4.2.2.6. The marks and symbols referred to in paragraphs 4.2.1. and 4.2.2. above shall be clearly legible and be indelible even when the device is fitted in the vehicle.

4.3. **Arrangement of the approval mark**

4.3.1. Independent lamps

4.3.1.1. It is visible after their installation.

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

4.3.1.3. 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 under which approval has been granted.

4.3.1.4. The main body of the lamp shall include the space described in paragraph 3.3. above and shall bear the approval mark of the actual function(s).

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 applied as per the provisions of AIS-037. This approval mark may be located anywhere on the grouped, combined or reciprocally incorporated lamps, provided that:

4.3.2.1.1. it is visible after the installation of the lamps;

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

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

4.3.2.2.1. Either on the appropriate light-emitting surface;

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

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

4.3.3. Lamps reciprocally incorporated with other lamps, of which the lens may also be used for other types of headlamps

The provisions laid down in paragraph 4.3.2. above are applicable.

- 4.3.3.1. In addition, where the same lens is used, the latter may bear the different approval marks relating to the different types of headlamps or units of lamps, provided that the main body of the headlamp, even if it cannot be separated from the lens, also comprises the space described in paragraph 3.3. 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.

- 4.4. The approval marking shall be clearly legible and indelible. It may be placed on an inner or outer part (transparent or not) of the device which may not be separated from the transparent part of the device emitting the light. In any case the marking shall be visible when the device is fitted on the vehicle or when a movable part such as the hood or boot lid or a door is opened.

5. GENERAL SPECIFICATIONS

- 5.1. Each device supplied shall conform to the specifications set forth in paragraphs 6. and 8. below.
- 5.2. The devices shall be so designed and constructed that under normal conditions of use and notwithstanding the vibrations to which they may be subjected in such use, their satisfactory operation remains assured and they retain the characteristics prescribed by this standard.
- 5.3. In case of light source modules, it shall be checked that:
 - 5.3.1. The design of the light source module(s) shall be such as:
 - (a) That each light source module may only be fitted in no other position than the designated and correct one and may only be removed with the use of tool(s);
 - (b) If there are more than one light source module used in the housing for a device, light source modules having different characteristics may not be interchanged within the same lamp housing.
 - 5.3.2. The light source module(s) shall be tamperproof.
- 5.4. In case of failure of the variable intensity control of a direction indicator of category 2b emitting more than the maximum value of category 2a, requirements of steady luminous intensity of category 2a shall be fulfilled automatically.
- 5.5. In case of replaceable filament lamp(s):
 - 5.5.1. Any category or categories of filament lamp(s) approved according to 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) and its amendment at the time of application for type approval.

- 5.5.2. The design of the device shall be such that the filament lamp may be fixed in no other position but the correct one.
- 5.5.3. 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.

6. INTENSITY OF LIGHT EMITTED

- 6.1. The light emitted by each of the two devices supplied shall be in the case of direction indicators of categories 1, 1a, 1b, 2a, 2b, 3 or 4 in the reference axes, in the case of direction indicators of categories 5 or 6 in direction A according to Annex A of not less than the minimum intensity and of not more than the maximum intensity specified below:

Direction indicator of category	Minimum luminous intensity in cd	Maximum luminous intensity in cd when used as		
		Single lamp	Lamp (single) marked "D" (see paragraph 4.2.2.3.)	Total for the assembly of two lamps (see paragraph 4.2.2.3.)
1	175	700	500	1000
1a	250	800	600	1200
1b	400	860	600	1200
2a (steady)	50	350	250	500
2b (variable)	50	700	500	1000
3 to the front	175	700	500	1000
to the rear	50	200	140	280
4 to the front	175	700	500	1000
to the rear	0.6	200	140	280
5	0.6	200	140	280
6	50	200	140	280

- 6.1.1. For an assembly of two or more direction indicator lamps the total intensity shall not exceed the maximum value prescribed for a single lamp, multiplied by 1.4. This shall not apply to lamps of category 2a.
- 6.1.2. When an assembly of two or more lamps having the same function is deemed to be a single lamp it shall comply with the requirements for:
 - (a) Maximum intensity when all lamps together are lit (last column of the table);
 - (b) Minimum intensity if one lamp has failed.

- 6.2. In case of failure of a single lamp of the categories 1, 1a, 1b, 2a and 2b, containing more than one light source the following provisions shall apply:
- 6.2.1. A group of light sources, wired so that the failure of any one of them causes all of them to stop emitting light, shall be considered to be one light source.
- 6.2.2. A signal for activation of the tell-tale prescribed in paragraph 6.5.8 of AIS-008 (Rev. 1) shall be produced if:
- (a) Any one light source has failed or
 - (b) In case of a lamp designed for only two filament light sources, the intensity in the axis of reference is less than 50 per cent of the minimum intensity, or
 - (c) As a consequence of a failure of one or more light sources, the intensity in one of the following directions as indicated in Annex D to this standard is less than the minimum intensity required:
 - (i) $H=0^\circ, V=0^\circ$
 - (ii) $H=20^\circ$ to the outside of the vehicle, $V=+5^\circ$
 - (iii) $H=10^\circ$ to the inside of the vehicle, $V=0^\circ$.
- 6.3. When all light sources are illuminated the maximum intensity specified for a single lamp be exceeded provided that the single lamp is not marked "D" and the maximum intensity specified for an assembly of two or more lamps is not exceeded.
- 6.4. Outside the reference axis, within the angular fields specified in the arrangement diagrams in Annex A to this standard, the intensity of the light emitted by each of the two devices supplied shall:
- 6.4.1. In each direction corresponding to the points in the relevant table of luminous-intensity distribution reproduced in Annex D to this standard, be not less than the minimum specified in paragraph 6.1. above multiplied by the percentage specified in the said table for the direction in question;
- 6.4.1.1. In divergence from paragraphs 6.2. and 6.2.1., for categories 4 and 5 direction indicators, to the rear, a minimum value of 0.6 cd is required throughout the fields specified in Annex A;
- 6.4.2. In no direction within the area from which the indicator lamp is visible, exceed the maximum specified in paragraph 6.1. above;
- 6.4.3. Moreover,
- 6.4.3.1. Throughout the fields defined in the diagrams in Annex A, the intensity of the light emitted shall be not less than 0.7 cd for devices of category 1b, not less than 0.3 cd for devices of categories 1, 1a, 2a, 2b, 3, 4 towards the front and for those of category 2b by day; it shall not be less than 0.07 cd for devices of category 2b by night;

- 6.4.3.2. For devices of categories 1 and 2b and, to the front, for devices of categories 3 and 4, the intensity of the light emitted outside the zone defined by the measuring points $\pm 10^\circ\text{H}$ and $\pm 10^\circ\text{V}$ (10° -field) shall not exceed the following values:

Direction indicator of category	Maximum luminous intensity in cd outside the 10° -field		
	Single lamp	Lamp (single) marked "D" (see paragraph 4.2.2.3.)	Total for the assembly of two lamps (see paragraph 4.2.2.3.)
1, 2b, 3 and 4	400	280	560

Between the boundaries of the 10° -field ($\pm 10^\circ\text{H}$ and $\pm 10^\circ\text{V}$) and the 5° -field ($\pm 5^\circ\text{H}$ and $\pm 5^\circ\text{V}$), the maximum admissible values of the intensities are linearly increased up to the values as defined in paragraph 6.1.

- 6.4.3.3. For devices of category 1a and 1b, the intensity of the light emitted outside the zone defined by the measuring points $\pm 15^\circ\text{H}$ and $\pm 15^\circ\text{V}$ (15° -field) shall not exceed the following values:

Direction indicator of category	Maximum values in cd outside the 15° -field		
	Single lamp	Lamp (single) marked "D" (see paragraph 4.2.2.3.)	Total for the assembly of two lamps (see paragraph 4.2.2.3.)
1a	250	175	350
1b	400	280	560

Between the boundaries of the 15° -field ($\pm 15^\circ\text{H}$ and $\pm 15^\circ\text{V}$) and the 5° -field ($\pm 5^\circ\text{H}$ and $\pm 5^\circ\text{V}$), the maximum values are increased linearly up to the values as defined in paragraph 6.1.

- 6.4.3.4. The provisions of D 2.2 to this standard on local variations of intensity shall be observed.
- 6.5. In general the intensities shall be measured with the light source(s) continuously alight.

However, depending on the construction of the device, for example, the use of light-emitting diodes (LED), or the need to take precautions to avoid overheating, it is allowed to measure the lamps in flashing mode.

This shall be achieved by switching with a frequency of $f = 1.5 \pm 0.5$ Hz with the pulse width greater than 0.3 s, measured at 95 per cent peak light intensity.

In the case of replaceable filament lamps, the filament lamps shall be operated at reference luminous flux during on time. In all other cases the voltage as required in paragraph 7.1.1. shall be switched with a rise time and fall time shorter than 0.01 s; no overshoot is allowed.

In the case of measurements taken in flashing mode the reported luminous intensity shall be represented by the maximum intensity.

- 6.6. In the case of devices of category 2b the time that elapses between energising the light source(s) and the light output measured on the reference axis to reach 90 per cent of the value measured in accordance with paragraph 6.3. above shall be measured for the extreme levels of luminous intensity produced by the direction indicator. The time measured to obtain the lowest luminous intensity shall not exceed the time measured to obtain the highest luminous intensity.
- 6.7. The variable intensity control shall not generate signals which cause luminous intensities:
 - 6.7.1. Outside the range specified in paragraph 6.1. above and
 - 6.7.2. Exceeding the category 2a maximum specified in paragraph 6.1.:
 - (a) For systems depending only on daytime and night time conditions: under night time conditions
 - (b) For other systems: under reference conditions as demonstrated by the manufacturer ^{1/}.
- 6.8. Annex D, referred to in paragraph 6.2.1. above, gives particulars of the measurement methods to be used.

7. TEST PROCEDURE

- 7.1. All measurements, photometric and colorimetric, shall be made:
 - 7.1.1. In the case of a lamp with replaceable light source, if not supplied by an electronic light source control gear or a variable intensity control, with an uncoloured or coloured standard filament lamp of the category prescribed for the device, supplied with the voltage necessary to produce the reference luminous flux required for that category of filament lamp,
 - 7.1.2. In the case of a lamp equipped with non-replaceable light sources (filament lamps and other), at 6.75 V, 13.5 V or 28.0 V respectively.

^{1/} Good visibility (meteorological optical range MOR > 2,000 m defined according to WMO, Guide to Meteorological Instruments and Methods of Observation, Sixth Edition, ISBN: 92-63-16008-2, pp 1.9.1/1.9.11, Geneva 1996) and clean lens.

- 7.1.3. In the case of a system that uses an electronic light source control gear or a variable intensity control, being part of the lamp ^{1/} applying at the input terminals of the lamp the voltage declared by the manufacturer or, if not indicated, 6.75 V, 13.5 V or 28.0 V respectively.
- 7.1.4. In the case of a system that uses an electronic light source control gear or a variable intensity control, not being part of the lamp with the voltage declared by the manufacturer applied to the input terminals of the lamp.
- 7.2. However in the case of a direction indicator of category 2b operated by a variable intensity control to obtain variable luminous intensity, photometric measurements shall be performed according to the lamp manufacturer's description.
- 7.3. The test laboratory shall require from the manufacturer the light source control gear or a variable intensity control needed to supply the light source and the applicable functions.
- 7.4. The voltage to be applied to the lamp shall be noted in the communication form in Annex B of this standard.
- 7.5. The limits of the apparent surface in the direction of the reference axis of a light-signalling device shall be determined.

8. COLOUR OF LIGHT EMITTED

The colour of the light emitted inside the field of the light distribution grid defined in paragraph D 2. of Annex D shall be amber. For testing see Annex E to this standard. Outside this field, no sharp variation of colour shall be observed. These requirements shall also apply within the range of variable luminous intensity produced by direction indicators of category 2b.

9. MODIFICATIONS OF THE TYPE OF DIRECTION INDICATOR FOR MOTOR VEHICLES AND THEIR TRAILERS AND EXTENSION OF APPROVAL

- 9.1. Every modification pertaining to the information, even if the changes are not technical in nature declared in accordance with para. 2 of this standard 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,

^{1/} For the purpose of this standard "being part of the lamp" means to be physically included in the lamp body or to be external, separated or not, but supplied by the lamp manufacturer as part of the lamp system.

- 9.1.1. The device with changed specification 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 criteria for extension of approval shall be used.
- 9.3. In case of 9.1.2 above for further verification, only those parameters which are affected by the modifications need be carried out.
- 9.4. In case of fulfilment of 9.1.1 or 9.1.2 above, the approval for compliance shall be extended for the changes carried out.

9.5 CRITERIA FOR EXTENSION OF APPROVAL

The criteria shall be as agreed between the test agency and lamp manufacturer.

10. CONFORMITY OF PRODUCTION

- 10.1. Every device bearing an approval mark as prescribed under this standard shall conform to the type approved and shall comply with the requirements of this standard. However, in the case of a device picked at random from series production, the requirements as to the respectively, minimum and maximum intensities of the light emitted (measured with a standard filament lamp as referred to in 6. above) shall be at least 80 per cent of the minimum values specified and not exceed 120 per cent of the maximum values allowed.
- 10.2. The conformity of production procedures shall comply with those set out in the AIS-037 with the following requirements:
 - 10.2.1. During the verification as per 10.2, if tests are required, the following tests shall be carried out:
 - 10.2.1.1. Intensity of light emitted (See 6).
 - 10.2.1.2. Colour of light emitted (See 8).
- 10.3. Devices with apparent defects are disregarded.
- 10.4. The reference mark is disregarded.
- 10.5. The normal frequency of these verifications shall be once every two years.

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 PROVISIONS

- 14.1. At the request of the lamp manufacturer, type approvals for compliance to AIS-012(Part 5)(Rev. 1): 2011 shall be granted by test agencies from 22nd February 2011 (date of adoption of this standard in CMVR-TSC). Such type approvals shall be deemed to be compliance to AIS-012:2004.
- 14.2. At the request of lamp manufacturer, type approval to the compliance to AIS-012:2004 shall be granted up to the notified date of implementation of AIS-012(Part 5)(Rev. 1): 2011.
- 14.3. Type approvals issued for compliance to AIS-012:2004 shall be extended to approval of AIS-012(Part 5)(Rev. 1): 2011 subject to satisfactory compliance of the following:
- 14.3.1. Marking as per 3.0 and sub-clauses for 4.0 applicable for marking.
- 14.3.2. In case of “E/e” approved devices, requirements specified in 15.
- 14.3.3. In the case of front direction indicator lamps of categories, 1, 1a, and 1b, the photometric requirements, in particular those prescribed in 7.1.1 of this standard.

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 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-012(Part 5)(Rev. 1): 2011. Such extensions shall be deemed to be compliance to AIS-012:2004.
- 14.4.2. In the case of 14.2, extensions shall be granted subject to conditions of AIS-012:2004 till the notified date of implementation of AIS-012(Part 5)(Rev. 1): 2011.
- 14.5. Type approvals for compliance to AIS-037, already been granted, shall continue to be valid for AIS-012(Part 5)(Rev. 1): 2011.

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 deemed to be the proof of compliance of AIS-037.

15. ESTABLISHING COMPLIANCE OF “E”/“e” APPROVED DIRECTION INDICATORS TO THIS STANDARD

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

15.1.1. Photometric requirements measured with a standard filament lamp as referred to in 7 above shall be at least 80 per cent of the minimum values specified and shall not exceed 120 per cent of the maximum values specified in 6.0.

15.1.2. Colorimetric requirements shall be specified in 8.0 within the limits specified.

16. AMENDMENTS TO ECE REGULATION AFTER THE LEVEL DESCRIBED IN 0.3 OF INTRODUCTION

16.1. Supplements

Note: In case of changes in ECE regulation, which are issued as supplements (Supplements do not affect the earlier type approvals) at the request of lamp manufacturer, 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.

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)

CATEGORIES OF DIRECTION INDICATORS: MINIMUM ANGLES REQUIRED FOR LIGHT DISTRIBUTION IN SPACE OF THESE CATEGORIES OF DIRECTION INDICATORS ^{1/}

In all cases, the minimum vertical angles of light distribution in space of direction indicator lamps are 15° above and 15° below the horizontal except:

- (a) Direction indicator lamps with a mounting height of equal to or less than 750 mm above the ground, for which they are 15° above and 5° below the horizontal;
- (b) Direction indicator lamps of Category 6, for which they are 30° above and 5° below the horizontal.

MINIMUM HORIZONTAL ANGLES OF LIGHT DISTRIBUTION IN SPACE:

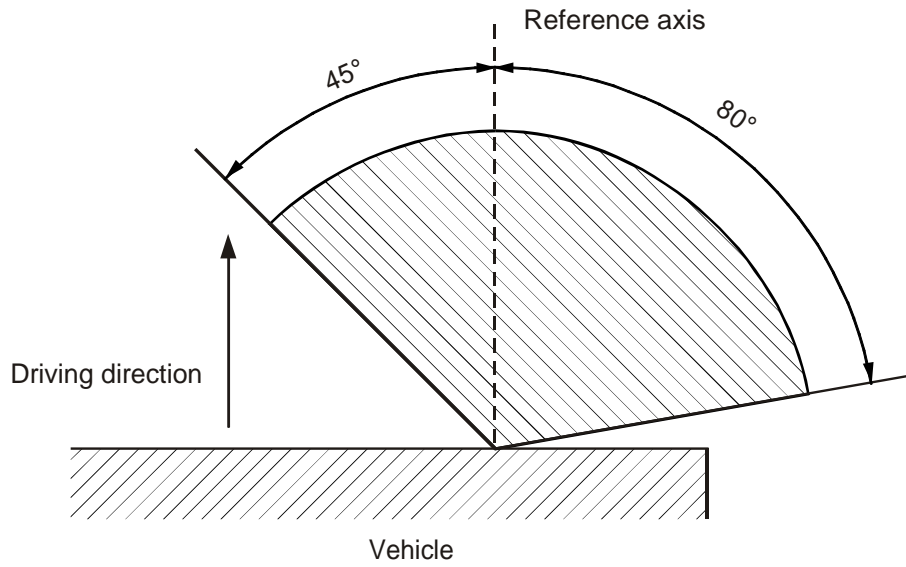
Categories 1, 1a and 1b: Direction indicators for the front of the vehicle

Category 1: For use at a distance not less than 40 mm from the headlamp

Category 1a: For use at a distance greater than 20 mm but less than 40 mm from the headlamp

Category 1b: For use at a distance less than 20 mm from the headlamp

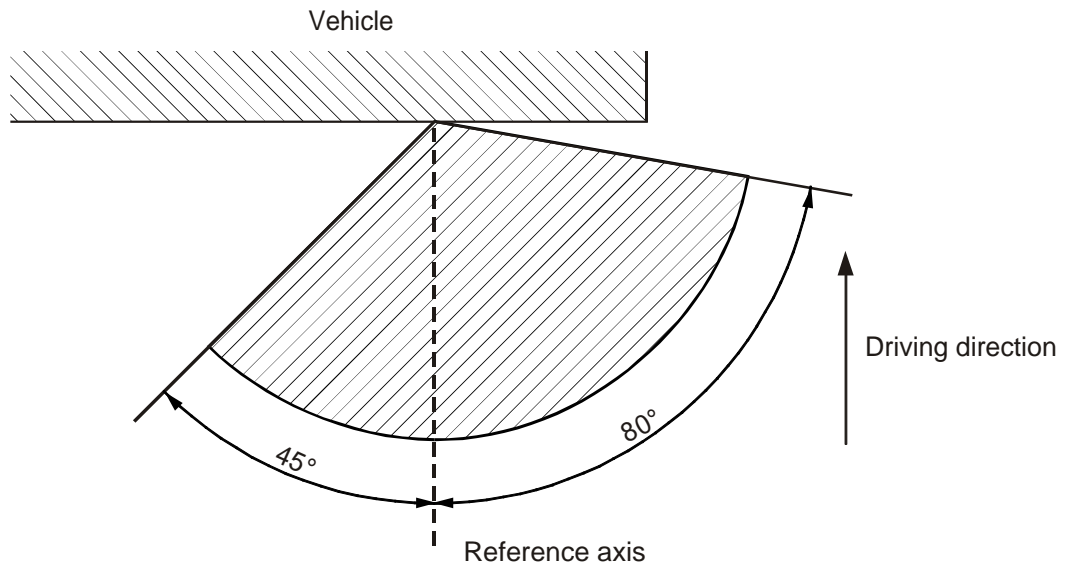
^{1/} The angles shown in these arrangements are correct for devices to be mounted on the right side of the vehicle. The arrows in these diagrams point towards the front of the vehicle.



Categories 2a and 2b: Direction indicators for the rear of the vehicle

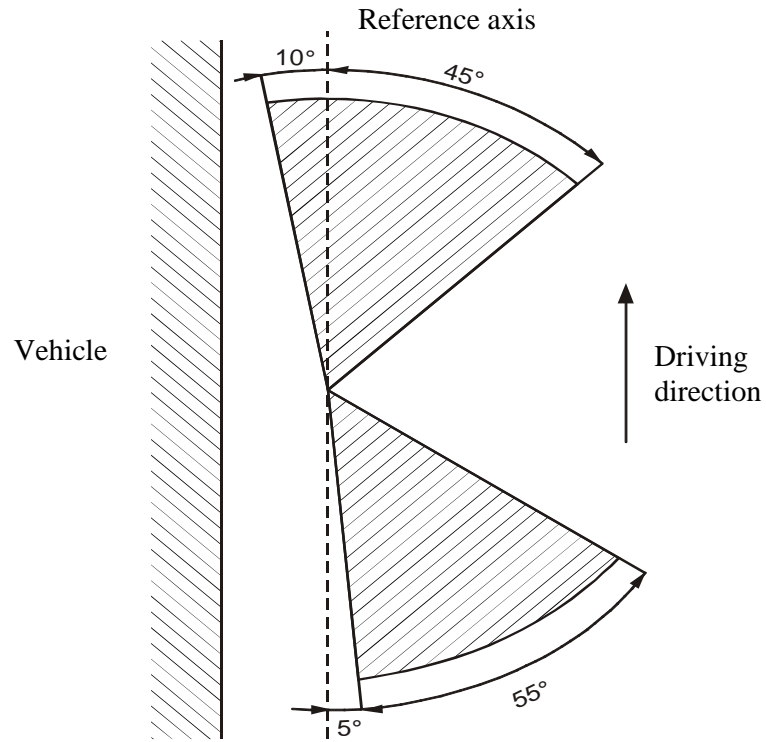
Category 2a: Rear direction indicator lamps with steady luminous intensity

Category 2b: Rear direction indicator lamps with variable luminous intensity

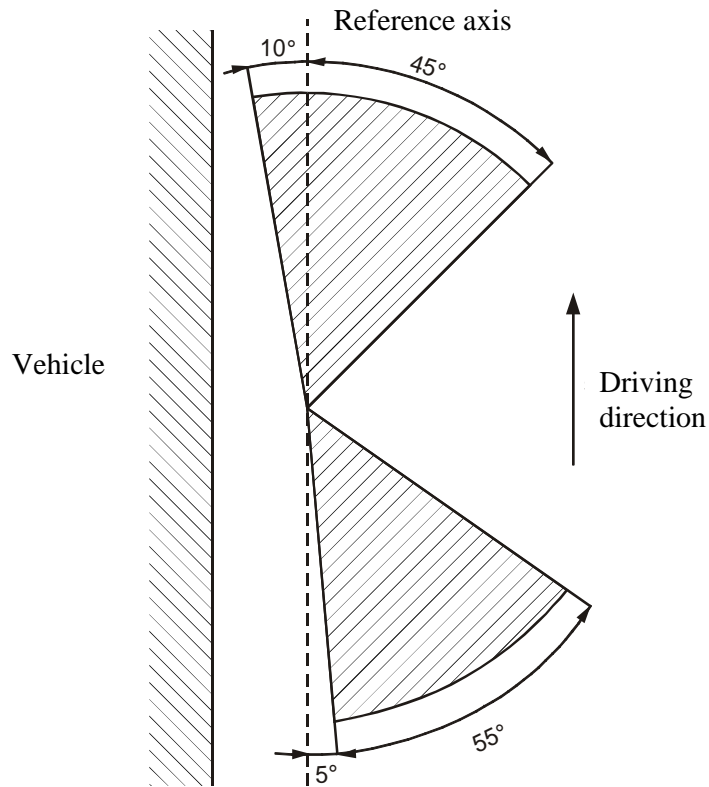


Categories 3 and 4: Front- side direction indicators

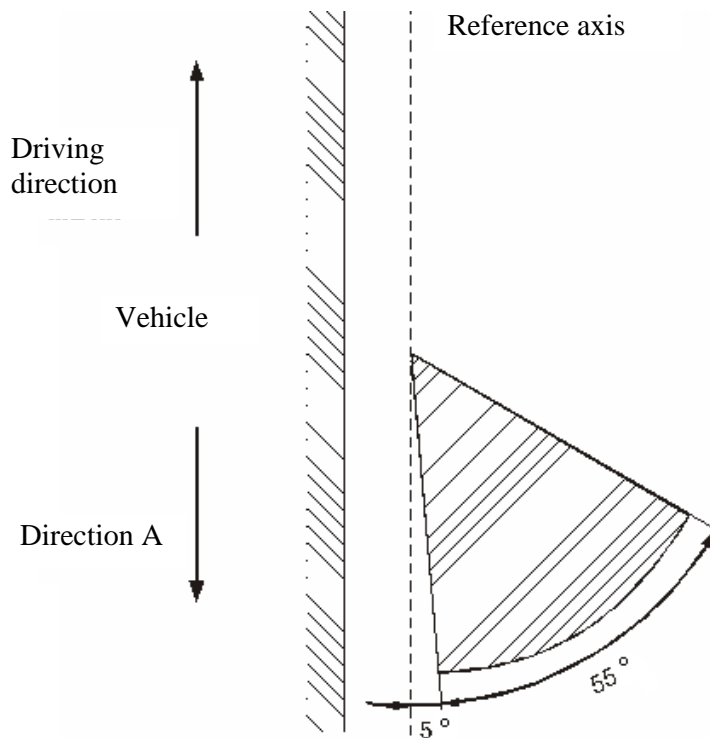
Category 3: Front-side direction indicators for use on a vehicle equipped with this category of direction indicator only



Category 4: Front-side direction indicators for use on a vehicle also equipped with category 2a or 2b direction indicators



Categories 5 and 6: Supplementary side direction indicators for use on a vehicle also equipped with categories 1, 1a or 1b and 2a or 2b direction indicators



ANNEX B
(See 2.0)

APPLICATION FOR APPROVAL

Technical Information to be submitted by the Applicant
at the time of Approval

- B 1. Trade name or mark of the device:
- B 2. Manufacturer's name for the type of device:
- B 3. Manufacturer's name and address:
- B 4. If applicable, name and address of the manufacturer's
representative:
- B 5. Submitted for approval on:
- B 6. Concise description:
 Category: 1, 1a, 1b, 2a, 2b, 3, 4, 5, 6 1/, 2/
 Number, category and kind of light source(s):
 Voltage and wattage:
 Light source module specific identification code:
 Only for limited mounting height of equal to or less than 750 mm above
 the ground: yes/no 1/
 Geometrical conditions of installation and relating variations, if any:
 Application of an electronic light source control gear/variable intensity
 control:
 (a) Being part of the lamp: yes/no 1/
 (b) Being not part of the lamp: yes/no 1/
 Input voltage(s) supplied by an electronic light source control
 gear/variable intensity control:
 Electronic light source control gear/variable intensity control
 manufacturer and identification number (when the light source control
 gear is part of the lamp but is not included into the lamp body):
 Variable luminous intensity: yes/no 1/

1/ Strike out what does not apply.

2/ For direction indicator lamps of categories 1, 1a, 1b, 2a, and 2b, information regarding
the signal according to paragraph 6.4.2.

- B 7 Position of the approval mark:
- B 8. Reason(s) for extension (if applicable):
- B 9. Approval granted/extended/refused/non conformity established: 1/
- B 10. Place:.....
- B 11. Date:
- B 12. Signature:
- B 13. The list of documents deposited with the Administrative Service which has granted approval is annexed to this communication and may be obtained on request.

1/ Strike out what does not apply.

ANNEX C
(Reserved)

ANNEX D

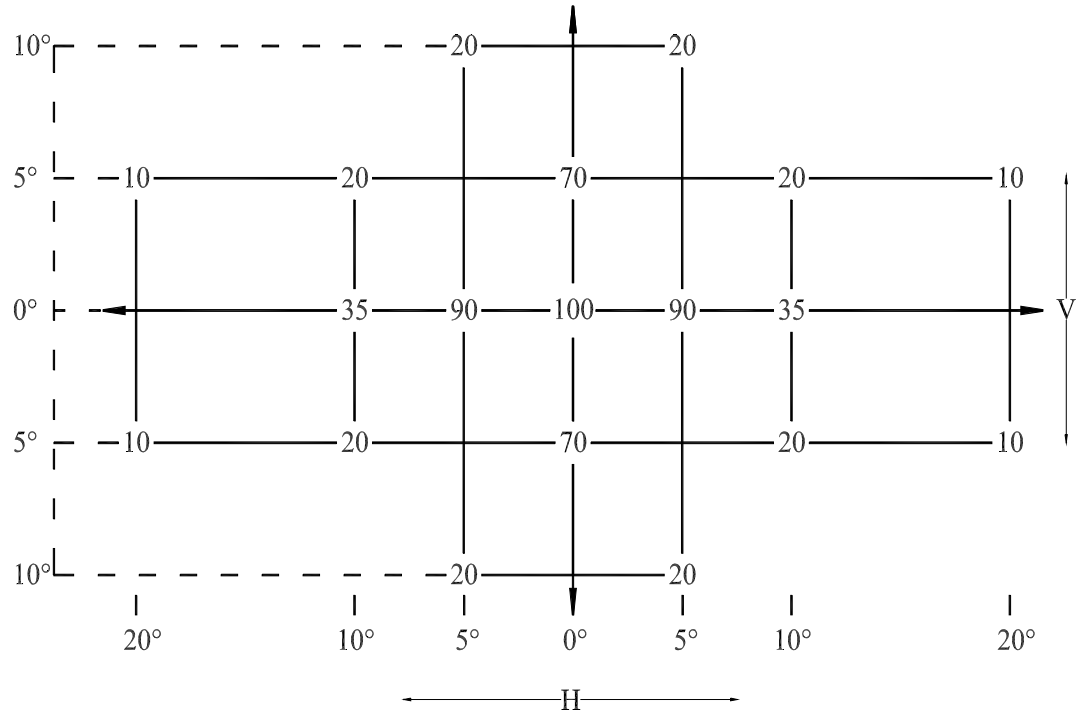
(See 6.2.2)

PHOTOMETRIC MEASUREMENTS

D 1. MEASUREMENT METHODS

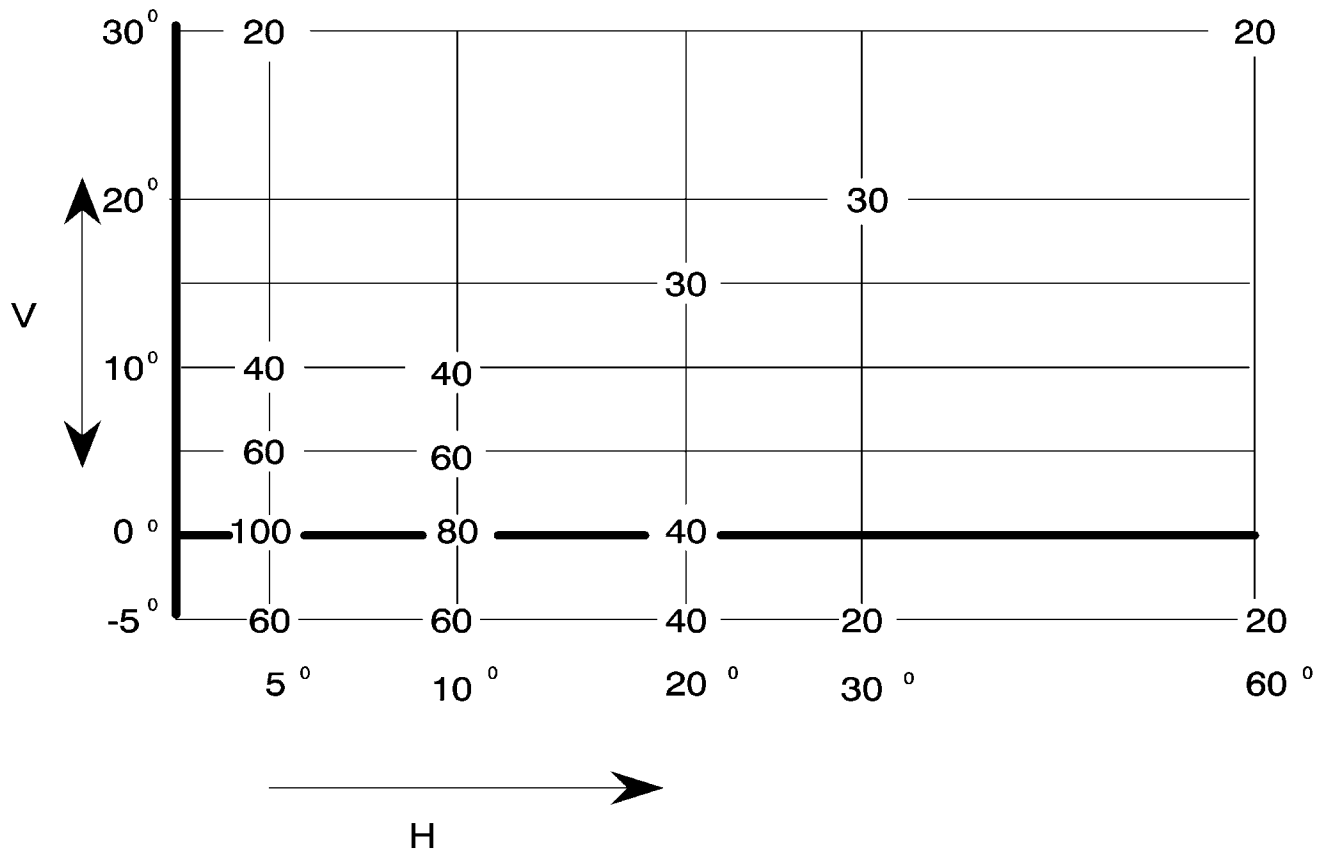
- D 1.1. During photometric measurements, stray reflections shall be avoided by appropriate masking.
- D 1.2. In case the results of measurements should be challenged, measurements shall be carried out in such a way as to meet the following requirements:
 - D 1.2.1. The distance of measurement shall be such that the law of the inverse of the square of the distance is applicable;
 - D 1.2.2. The measuring equipment shall be such that the angular aperture of the receiver viewed from the reference centre of the light is comprised between 10' and 1 degree;
 - D 1.2.3. The intensity requirement for a particular direction of observation shall be deemed to be satisfied if that requirement is met in a direction deviating by not more than one-quarter of a degree from the direction of observation.
- D 1.3. In the case where the device may be installed on the vehicle in more than one or in a field of different positions the photometric measurements shall be repeated for each position or for the extreme positions of the field of the reference axis specified by the manufacturer.

D 2. TABLE OF STANDARD LIGHT DISTRIBUTION IN SPACE FOR DIRECTION INDICATOR LAMPS OF CATEGORIES 1, 1A, 1B, 2A, 2B, 3 AND 4 (TOWARDS THE FRONT ONLY).



For direction indicators of category 6

(outer side of the vehicle)



- D 2.1. The direction $H = 0^\circ$ and $V = 0^\circ$ corresponds to the reference axis. (On the vehicle, it is horizontal, parallel to the median longitudinal plane of the vehicle and oriented in the required direction of visibility.) It passes through the centre of reference. The values shown in the tables give, for the various directions of measurement, the minimum intensities as a percentage of the minimum intensities required in the table in paragraph 6.1.:
- D 2.1.1. In the direction $H = 0^\circ$ and $V = 0^\circ$ for categories 1, 1a, 1b, 2a, 2b, 3 and in the case of category 4 to the front only;
- D 2.1.2. In the direction $H = 5^\circ$ and $V = 0^\circ$ for category 6.
- D 2.1.3. However, in the case where a device is intended to be installed at a mounting height of equal to or less than 750 mm above the ground, the photometric intensity is verified only up to an angle of 5° downwards.
- D 2.2. Within the field of light distribution of paragraph D2., schematically shown as a grid, the light pattern should be substantially uniform, i.e. in so far as the light intensity in each direction of a part of the field formed by the grid lines shall meet at least the lowest minimum value being shown on the grid lines surrounding the questioned direction as a percentage.

D 3. PHOTOMETRIC MEASUREMENT OF LAMPS

The photometric performance shall be checked:

D 3.1. For non-replaceable light sources (filament lamps and other):

With the light sources present in the lamp, in accordance with the relevant sub-paragraph of paragraph 7.1. of this standard.

D 3.2. For replaceable filament lamps:

When equipped with filament lamps at 6.75 V, 13.5 V or 28.0 V, the luminous intensity values produced shall be corrected. The correction factor is the ratio between the reference luminous flux and the mean value of the luminous flux found at the voltage applied (6.75 V, 13.5 V or 28.0 V). The actual luminous fluxes of each filament lamp used shall not deviate more than ± 5 per cent from the mean value. Alternatively a standard filament lamp may be used in turn, in each of the individual positions, operated at its reference flux, the individual measurements in each position being added together.

D 3.3. For any direction indicator lamp except those equipped with filament lamp(s), the luminous intensities measured after one minute and after 30 minutes of operation in flashing mode ($f = 1.5$ Hz, duty factor 50 per cent), shall comply with the minimum and maximum requirements. The luminous intensity distribution after one minute of operation may be calculated by applying at each test point the ratio of luminous intensity measured in HV after one minute and after 30 minutes of operation as above described.

ANNEX E

(See 8.0)

COLOUR OF AMBER LIGHTS

For checking these colorimetric characteristics, the test procedure described in paragraph 7. of this standard shall be applied.

However, for lamps equipped with non-replaceable light sources (filament lamps and other), the colorimetric characteristics should be verified with the light sources present in the lamp, in accordance with the relevant sub-paragraph of paragraph 7.1. of this standard.

The limits of chromatic co-ordinates for Amber light are as specified in AIS-010 (Part 5)(Rev. 1).

ANNEX F

(See 10.)

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

F 1. GENERAL

- F 1.1. The conformity requirements shall be considered satisfied from a mechanical and geometric standpoint, if the differences do not exceed inevitable manufacturing deviations within the requirements of this standard.
- F 1.2. With respect to photometric performances, the conformity of mass-produced lamps shall not be contested if, when testing photometric performances of any lamp chosen at random according to paragraph 7. of this standard:
- F 1.2.1. No measured value deviates unfavourably by more than 20 per cent from the values prescribed in this standard.
- F 1.2.2. If, in the case of a direction indicator equipped with a replaceable light source and if results of the test described above do not meet the requirements, tests on direction indicators shall be repeated using another standard filament lamp.
- F 1.3. The chromaticity coordinates shall be complied when tested under conditions of paragraph 7. of this standard.

**F 2. MINIMUM REQUIREMENTS FOR VERIFICATION OF
CONFORMITY BY THE MANUFACTURER**

For each type of direction indicator the lamp manufacturer of the approval mark shall carry out at least the following tests, at appropriate intervals. The tests shall be carried out in accordance with the provisions of this 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.

F 2.1. Nature of tests

Tests of conformity in this standard shall cover the photometric and colorimetric characteristics.

F 2.2. Methods used in tests

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

F 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.

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

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

F 2.3. Nature of sampling

Samples of direction indicators shall be selected at random from the production of a uniform batch. A uniform batch means a set of direction indicators 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.

F 2.4. Measured and recorded photometric characteristics

The sampled lamp shall be subjected to photometric measurements for the minimum values at the points listed in Annex D, and the chromaticity coordinates.

F 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 the acceptability of his products in order to meet the specifications laid down for verification of conformity of products in paragraph 10 of this standard.

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

ANNEX G

(See F 2.5)

**MINIMUM REQUIREMENTS FOR SAMPLING BY
A TESTING AGENCY**

G 1. GENERAL

- G 1.1. The conformity requirements shall be considered satisfied from a mechanical and a geometric standpoint, in accordance with the requirements of this standard, if any, if the differences do not exceed inevitable manufacturing deviations.
- G 1.2. With respect to photometric performances, the conformity of mass-produced lamps shall not be contested if, when testing photometric performances of any lamp chosen at random according to paragraph 7. of this standard.
 - G 1.2.1. No measured value deviates unfavourably by more than 20 per cent from the values prescribed in this standard.
 - G 1.2.2. If, in the case of a direction indicator equipped with a replaceable light source and if results of the test described above do not meet the requirements, tests on direction indicators shall be repeated using another standard filament lamp.
 - G 1.2.3. Direction indicators with apparent defects are disregarded.
- G 1.3. The chromaticity coordinates shall be complied when tested under conditions of paragraph 7. of this standard.

G 2. FIRST SAMPLING

In the first sampling four direction indicators 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 1 of this annex the conformity of mass-produced direction indicators shall not be contested if the deviation of the measured values of the direction indicators in the unfavourable directions are:

G 2.1.1.1. Sample A

A1:	one direction indicator	0 per cent
	one direction indicator not more than	20 per cent
A2:	both direction indicators 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 direction indicators 0 per cent

G 2.1.2. or if the conditions of paragraph 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 1 of this annex the conformity of mass-produced direction indicators shall be contested and the manufacturer requested to make his production meet the requirements (alignment) if the deviations of the measured values of the direction indicators are:

G 2.2.1.1. Sample A

A3: one direction indicator not more than 20 per cent
 one direction indicator 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 direction indicator more than 0 per cent
 but not more than 20 per cent
 one direction indicator not more than 20 per cent

B3: In the case of A2
 one direction indicator 0 per cent
 one direction indicator more than 20 per cent
 but not more than 30 per cent

G 2.2.2. Or if the conditions of paragraph G 1.2.2. for sample A are not fulfilled.

G 2.3. **Non Conformity Established**

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

G 2.3.1. Sample A

A4: one direction indicator not more than 20 per cent
 one direction indicator more than 30 per cent

A5: both direction indicators more than 20 per cent

G 2.3.2. Sample B

- B4: in the case of A2
 one direction indicator more than 0 per cent
 but not more than 20 per cent
 one direction indicator more than 20 per cent
- B5: In the case of A2
 both direction indicators more than 20 per cent
- B6: In the case of A2
 one direction indicator 0 per cent
 one direction indicator more than 30 per cent

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

G 3. REPEATED SAMPLING

In the cases of A3, B2, B3 a repeated sampling, third sample C of two direction indicators and fourth sample D of two direction indicators, 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 1 of this annex the conformity of mass-produced direction indicators shall not be contested if the deviations of the measured values of the direction indicators are:

G 3.1.1.1. Sample C

- C1: one direction indicator 0 per cent
 one direction indicator not more than 20 per cent
- C2: both direction indicators 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 direction indicators 0 per cent

G 3.1.2. or if the conditions of paragraph 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 1 of this annex the conformity of mass-produced direction indicators shall be contested and the manufacturer requested to make his production meet the requirements (alignment) if the deviations of the measured values of the direction indicators are:

G 3.2.1.1. Sample D

D2: in the case of C2
 one direction indicator more than 0 per cent
 but not more than 20 per cent
 one direction indicator not more than 20 per cent

G 3.2.1.2. Or if the conditions of paragraph G 1.2.2. for sample C are not fulfilled.

G 3.3. **Non Conformity Established**

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

G 3.3.1. Sample C

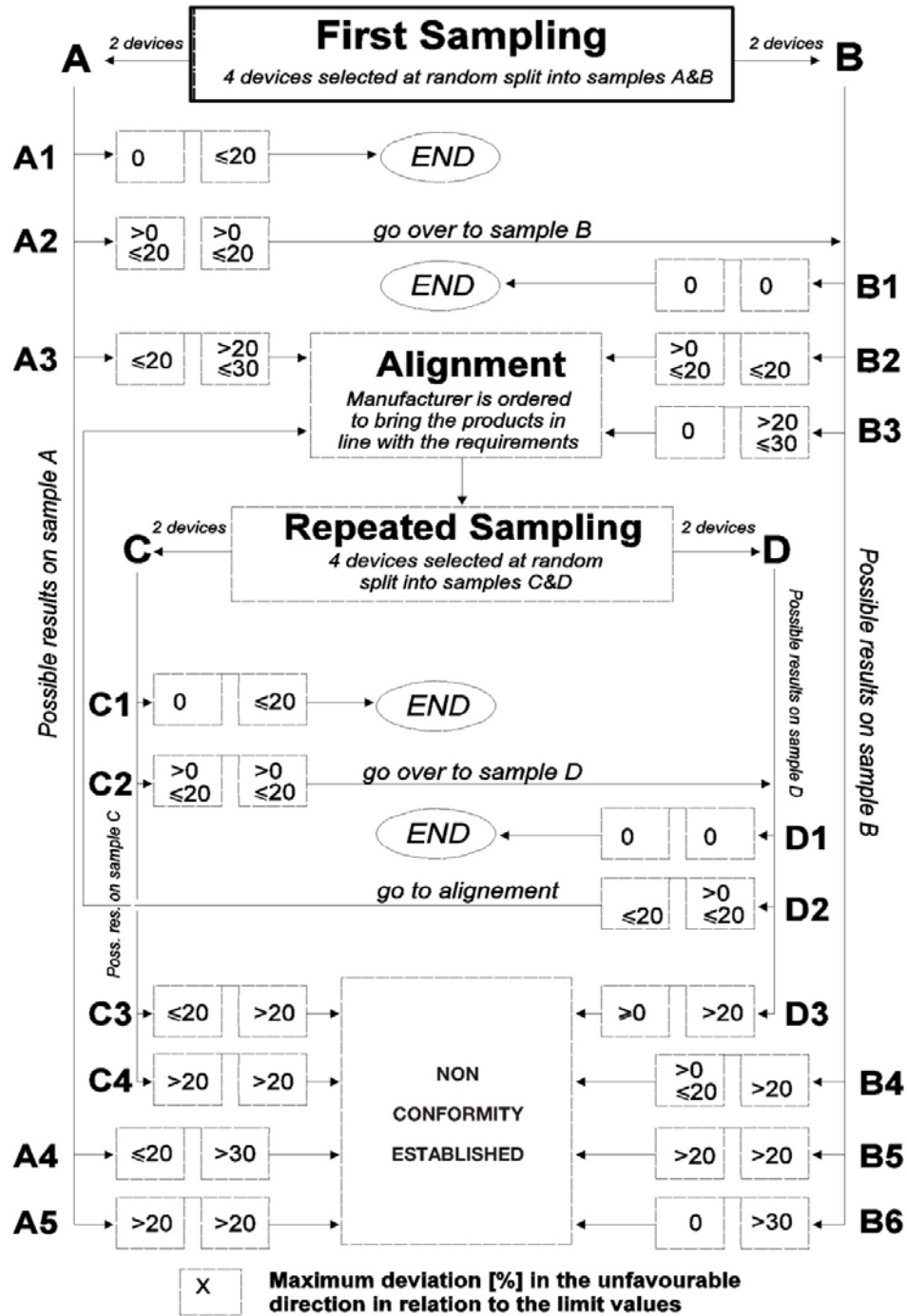
C3: one direction indicator not more than 20 per cent
 one direction indicator more than 20 per cent
 C4: both direction indicators more than 20 per cent

G 3.3.2. Sample D

D3: in the case of C2
 one direction indicator 0 or more than 0 per cent
 one direction indicator more than 20 per cent

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

Figure 1



ANNEX H
(See introduction)

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

Convener	
Mr. R. M. Kanitkar	Force Motors Ltd., (SIAM)
Members	Representing
Mr. A. S. Bhale	The Automotive Research Association of India (ARAI)
Mr. B. V. Shamsundara	The Automotive Research Association of India (ARAI)
Mr. D. P. Saste	Central Institute of Road Transport (CIRT)
Mr. V. D. Chavan	Central Institute of Road Transport (CIRT)
Dr. Madhusudan Joshi	International Centre for Automotive Technology (ICAT)
Mr. G.R.M. Rao	Vehicle Research & Dev. Estt. (VRDE)
Dr. N. Karuppaiah	National Automotive Testing and R&D Infrastructure Project (NATRIP)
Mr. K. K. Gandhi	Society of Indian Automobile Manufacturers (SIAM)
Mr. T. M. Balaraman	Society of Indian Automobile Manufacturers (SIAM) (Hero MotoCorp Ltd.)
Mr. G. K. Binani	Society of Indian Automobile Manufacturers (SIAM) (Tata Motors Ltd)
Mr. P. K. Banerjee	Society of Indian Automobile Manufacturers (SIAM) (Tata Motors Ltd)
Mr. Z. A. Mujawar	Society of Indian Automobile Manufacturers (SIAM) (Mahindra and Mahindra Ltd)
Mr. Nagendra H. V.	Society of Indian Automobile Manufacturers (SIAM) (Toyota Kirloskar Motor Pvt. Ltd)
Mr. Prakash Vemali	Society of Indian Automobile Manufacturers (SIAM) (Mercedes Benz India Ltd.)
Mr. Jitendra Malhotra	Society of Indian Automobile Manufacturers (SIAM) (Maruti Suzuki India Ltd)
Mr. Sumit Sharma	Society of Indian Automobile Manufacturers (SIAM) (Volkswagen India Private Ltd.)
Mr. Harjeet Singh	Society of Indian Automobile Manufacturers (SIAM) (Hero Honda Motors Ltd)
Mr. Harsh Agrawal	Society of Indian Automobile Manufacturers (SIAM) (Hero Honda Motors Ltd)
Mr. S Ramiah	Society of Indian Automobile Manufacturers (SIAM) (TVS Motor Company Limited)

Mr. T.C. Gopalan,	Tractor Manufacturers Association (TMA)
Mr. K. N. D. Nambudiripad	Automotive Component Manufacturers Association (ACMA)
Mr. G. V. George	FIEM Industries Ltd. (ACMA)
Mr. Rajagopalan	FIEM Industries Ltd. (ACMA)
Mr. Virendra Sachdev	Lumax Industries Ltd. (ACMA)
Mr. Sagar Kulkarni	Rinder India Pvt. Ltd. (ACMA)
Mr. T. V. Singh	Bureau of Indian Standards (BIS)
Mr. Rajiv Agarwal	All India Auto & Miniature Bulbs & Component Mfrs. Association
Mr. C. K. Choudhari	All India Auto & Miniature Bulbs & Component Mfrs. Association

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

ANNEX J
(See introduction)

COMMITTEE COMPOSITION*
Automotive Industry Standards Committee

Chairman	
Shri Shrikant R. Marathe	Director The Automotive Research Association of India, Pune
Members	Representing
Representative from	Ministry of Road Transport & Highways (Dept. of Road Transport & Highways), New Delhi
Representative from	Ministry of Heavy Industries & Public Enterprises (Department of Heavy Industry), New Delhi
Shri S. M. Ahuja	Office of the Development Commissioner, MSME, Ministry of Micro, Small & Medium Enterprises, New Delhi
Shri T. V. Singh	Bureau of Indian Standards, New Delhi
Director Shri D. P. Saste (Alternate)	Central Institute of Road Transport, Pune
Dr. M. O. Garg	Indian Institute of Petroleum, Dehra Dun
Shri C. P. Ramnarayanan	Vehicles Research & Development Establishment, Ahmednagar
Representatives from	Society of Indian Automobile Manufacturers
Shri T.C. Gopalan	Tractor Manufacturers Association, New Delhi
Shri K.N.D. Nambudiripad	Automotive Components Manufacturers Association of India, New Delhi

Member Secretary
Mrs. Rashmi Urdhwareshe
Sr. Deputy Director
The Automotive Research Association of India, Pune

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