International Standard 303

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Road vehicles — Installation of lighting and light signalling devices for motor vehicles and their trailers

Véhicules routiers — Installation des feux d'éclairage et de signalisation pour les véhicules à moteur et leurs remorques

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 303 was prepared by Technical Committee ISO/TC 22, *Road vehicles*.

It cancels and replaces ISO Recommendation R 303-1963, of which it constitutes a technical revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Road vehicles — Installation of lighting and light signalling devices for motor vehicles and their trailers

1 Scope and field of application

This International Standard defines the essential characteristics for the installation of lighting and light signalling devices on motor vehicles[1] and their trailers intended for use on the road with the exception of vehicles which run on rails, agricultural or forestry tractors and machinery, and public works vehicles.

Attention is drawn to the fact that some of these requirements may be modified or up-dated to take account of technical and regulatory[2] development.

2 References

ISO 612, *Road vehicles — Dimensions of motor vehicles and towed vehicles — Terms and definitions.*

ISO 1176, *Road vehicles — Weights — Vocabulary.*

ISO 3833, *Road vehicles — Types — Terms and definitions.*

ISO 4082, *Road vehicles — Motor vehicles — Flasher units.*

ISO 4182, *Road vehicles — Motor vehicles — Measurement of variation of passing beam inclination as a function of load.*

ISO 7227, *Road vehicles — Lighting and light signalling devices — Vocabulary.*[3]

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 3833 and the following definitions apply.

3.1 longitudinal median plane: See ISO 612.

3.2 transverse plane: Vertical plane perpendicular to the median longitudinal plane of the vehicle.

3.3 ground: Plane surface on which the vehicle stands and which should be substantially horizontal.

3.4 unladen vehicle: Mass of the complete vehicle in running order as defined in ISO 1176 (subclause 4.6).

3.5 overall width: See ISO 612.

3.6 lamp: See ISO 7227.

For the purposes of this International Standard, rear registration-plate lamps and reflex-reflectors shall similarly be regarded as lamps.

3.7 reflex-reflector: See ISO 7227.

For the purposes of this International Standard, a reflex-reflector is a reflex-reflecting device. The following are not considered as retro-reflecting or reflex-reflecting devices:

— retro-reflecting registration-plates;

— other plates and retro-reflecting signs which are used to comply with national or international specifications for use on certain categories of vehicles, certain conditions of utilization or certain modes of operation.

3.8 equivalent lamps: See ISO 7227.

Equivalent lamps may be installed on condition that they meet the requirements of this International Standard.

3.9 reciprocally incorporated lamps: See ISO 7227.

For the purposes of this International Standard, the lenses shall be considered as common only if they are common from an optical point of view, i.e. if the separate light sources are designed in such a way that they shine through the same lens or part of a lens.

1) Concerning motor vehicles, this International Standard applies at the present stage only to motor vehicles having at least four wheels. However work will be initiated in ISO/TC 22 to define the installation of lighting and light signalling devices for vehicles having two and/or three wheels (motorcycles and mopeds).

2) For information, the regulatory side of the various devices in different countries is the subject of an annually up-dated document within TC 22.

3) At present at the stage of draft.

3.10 illuminating surface of a lighting device (other than a reflex-reflector): See ISO 7227. (See figure 3 for graphical interpretation.)

3.11 illuminating surface of a signalling lamp: See ISO 7227. (See figure 3 for graphical interpretation.)

3.12 reference axis: See ISO 7227.

The reference axis shall be determined by the manufacturer. (See figure 3 for graphical interpretation.)

3.13 reference centre of a lamp: See ISO 7227. (See figure 3 for graphical interpretation.)

3.14 angles of geometric visibility of a lamp: See ISO 7227.

For the purposes of this International Standard, the horizontal angles shall be β_1 corresponding to the longitude outboard, and β_2 corresponding to the longitude inboard, and the vertical angles shall be α_1 corresponding to the up latitude and α_2 corresponding to the down latitude. (See the data sheet diagrams in annex B.)

3.15 light-emitting surface: See ISO 7227. (See figures 1, 2 and 3 for graphical interpretation.)

3.16 apparent surface: See ISO 7227. (See figure 3 for graphical interpretation.)

3.17 direction of observation: Direction from which the lamp is observed or tested. (In the latter case, the test is mainly conducted in the angles of geometric visibility or the angles of visibility of red light to the front and of white light to the rear.) (See figures 1, 2 and 3 for graphical interpretation.)

3.18 single lamp: See ISO 7227.

For the purposes of this International Standard, a single lamp also means any assembly of two or more lamps, whether identical or not, having the same function and emitting light of the same colour, if it comprises devices, the projection of aggregate illuminating surfaces of which in a given transverse plane occupies 60 % or more of the area of the smallest rectangle enclosing the projection of those illuminating surfaces, provided that the assembly complies with the specification for such a lamp. This possible assembly does not apply to main-beam headlamps, dipped-beam headlamps and front fog lamps.

3.19 two lamps or an even number of lamps: Single light-emitting surface in the shape of a band if placed symmetrically in relation to the median longitudinal plane of the vehicle and extending on both sides to within not less than 400 mm of the extreme outer edges of the vehicle, and being not less than 800 mm long.

The illumination of such a surface shall be provided by not less than two light sources placed as close as possible to its ends. The light-emitting surface may consist of a number of juxtaposed elements on condition that the projections of the several individual light-emitting surfaces on the same transverse plane occupy not less than 60 % of the area or the smallest rectangle enclosing the projections of those individual light-emitting surfaces.

3.20 distance between two lamps (facing in the same direction): Shortest distance between the orthogonal projections in a plane perpendicular to the axes of reference of the outlines of the two illuminating surfaces as defined according to the case cited in ISO 7227[1]. Where the distance is clearly in excess of the minimum requirements of this International Standard, the distance between two lamps may, however, be measured without determining the outlines of the illuminating surfaces exactly.

4 General specification

4.1 Mounting of devices

The lighting and light-signalling devices shall be so fitted that under normal conditions of use, and notwithstanding any vibration to which they may be subjected, they retain the characteristics laid down in, and enable the vehicle to comply with the requirements of, this International Standard. In particular, it shall not be possible for the adjustment of the lamps to be inadvertently disturbed.

4.2 Adjustment of setting

The main-beam, dipped-beam and front fog lamps shall be capable of being easily adjusted to permit them to be correctly oriented.

4.3 Angles of geometric visibility

There shall be no obstacle within the angles of geometric visibility to the spread of light from any part of the apparent surface of the lamp observed from infinity.

If measurements are taken closer to the lamp, the direction of observation must be moved in parallel to achieve the same accuracy.

1) Except for identification lamps where this distance is the distance measured between the reference axes.

On the inside of the angles of geometric visibility, no account is taken of obstacles if they were already present when the lamp was tested.

If, when the lamp is installed, any part of the apparent surface of the lamp is hidden by any further parts of the vehicle, proof shall be provided that the part of the lamp not hidden by obstacles still conforms to the photometric values set for the device.

4.4 Axis of reference

For all light-signalling devices, including those mounted on the side panels, the reference axis of the lamp when fitted to the vehicle shall be parallel with the ground. In addition, it shall be perpendicular to the median plane of the vehicle in the case of side reflex-reflectors and side marker lamps and parallel to that plane in the case of all other signalling devices. In each direction a tolerance of ± 3° is allowed.

Any specific fitting instructions laid down by the manufacturer shall be met.

4.5 Check of alignment and height

In the absence of specific requirements, the height and alignment of the lamps shall be checked with the unladen vehicle on the ground.

4.6 Lamps constituting a pair

In the absence of specific requirements, lamps constituting a pair shall

a) be fitted to the vehicle symmetrically in relation to the median longitudinal plane (this estimate shall be based on the exterior geometrical form of the lamp and not on the edge of its illuminating surface referred to in ISO 7227);

b) be symmetrical to one another in relation to the median longitudinal plane (not applicable to the interior structure of the lamp);

c) satisfy the same colorimetric characteristics;

d) have substantially identical photometric characteristics.

4.7 Vehicles with asymmetrical external shape

On vehicles the external shape of which is asymmetrical, the requirements in 4.6 shall be met as far as possible.

4.8 Maximum and minimum heights

(See diagrams in annex B.)

The maximum height (H_1) above ground shall be measured from the highest point and minimum height (H_2) from the lowest point of the illuminating surface.

When height requirements are substantially met, it is sufficient to refer to the actual lamp edges.

In the case of dipped headlamps, the minimum height in relation to the ground shall be measured from the lowest edge of the reflector.

4.9 Width position

The width position shall be determined from the edge of the illuminating surface which is furthest from the median longitudinal plane of the vehicle when referred to the overall width, and from the inner edges of the illuminating surfaces when referred to the distance between the lamps.

When width requirements are substantially met, it is sufficient to refer to the actual lamp edges.

4.10 Flashing lamps

In the absence of specific requirements, no lamps other than direction indicator lamps and the hazard warning signal may emit a flashing light.

4.11 Light causing confusion

Apart from the light emitted by the red side marker lamps, no red light that could lead to confusion emitted by a lamp cited in 4.13 shall be visible from the front; apart from the light emitted by the reversing lamp, no white light that could lead to confusion emitted by a lamp cited in 4.13 shall be visible from the rear. Lamps used to illuminate the vehicle interior shall not be taken into consideration in this respect.

This condition is considered to have been met if

a) for the visibility of a red light from the front, there is no direct visibility of a light-emitting surface of a red lamp, as determined by the graphical procedure in detail A of figure 1, within zone 1 in a transverse plane situated 25 m in front of the vehicle;

b) for the visibility of a white light from the rear, there is no direct visibility of a light-emitting surface, as determined by the graphical procedure in detail B of figure 2, of a white lamp within zone 2 in a transverse plane situated 25 m behind the vehicle;

c) zones 1 and 2 are limited in their respective planes as follows:

1) as regards height, by two horizontal planes which are 1 and 2,20 m respectively above the ground;

2) as regards width, by two vertical planes forming an angle of 15° towards the front and rear respectively, and outside the vehicle by reference to the median plane of the vehicle passing through the point (or points) of contact of vertical planes which are parallel with the median longitudinal plane of the vehicle, and limiting the overall width of the vehicle (if there are several points of contact, that which is furthest forward shall correspond to the front plane and that furthest rearward shall correspond to the rear plane).

4.12 Electrical connections

4.12.1 The electrical connections shall be such that the front and rear position lamps, end-outline marker lamps, side marker lamps, front and rear identification lamps if they exist, and rear registration-plate lamp can only be switched on and off simultaneously. This does not apply when using front and rear position lamps as parking lamps.

4.12.2 The electrical connections shall be such that the main-beam and dipped-beam headlamps, and the front and rear fog lamps cannot be switched on unless the lamps referred to in 4.12.1 are also switched on. This requirement shall not apply, however, to main-beam or dipped-beam headlamps when luminous warnings are given by the intermittent illuminating at short intervals of the dipped-beam headlamps or the intermittent illuminating at short intervals of the main-beam headlamps or the alternate illuminating at short intervals of the main-beam and dipped-beam headlamps.

4.13 Lamp colours

The colours of the light emitted by the lamps or reflectors are as follows (see annex A):

Main-beam headlamp:	white or selective yellow
Dipped-beam headlamp:	white or selective yellow
Front fog lamp:	white or enlarged selective yellow
Reversing lamp:	white
Direction indicator lamp:	amber
Hazard warning signal:	amber
Stop lamp:	red
Rear registration-plate lamp:	white
Front position lamp:	white (selective yellow or a mixture of white and selective yellow are permitted if the front position lamp is incorporated in a selective yellow headlamp)
Rear position lamp:	red
Rear fog lamp:	red
Parking lamp:	white in front, red at the rear, amber if incorporated in the side direction indicator lamps
End-outline marker lamp:	white in front, red at the rear
Rear reflex-reflector, non-triangular:	red
Rear reflex-reflector, triangular:	red
Front reflex-reflector, non-triangular:	identical to incident light
Front and intermediate side reflex-reflector, non-triangular:	amber
Rear side reflex-reflector:	red or amber
Front side marker lamp:	amber
Intermediate side marker lamp:	amber
Rear side marker lamp:	red or amber
Front identification lamp:	amber
Rear identification lamp:	red
Identification plate:	(colour to be agreed pending decision by regulatory bodies).

4.14 Circuit-closed tell-tales

See ISO 7227.

4.15 Concealable lamps

4.15.1 The concealment of lamps shall be prohibited, with the exception of the main-beam headlamp, the dipped-beam headlamp and the front fog lamp which may be concealed when not in use.

4.15.2 An illuminating device in the position of use shall remain in that position if the malfunction referred to in a) occurs alone or in conjunction with one of the malfunctions described in b):

a) the absence of power for manipulating the lamp;

b) a break, impedance, or short circuit to earth in the electrical circuit, defects in the hydraulic or pneumatic lines, flexible cables, solenoids or other components controlling or transmitting the energy intended to activate the concealment device.

4.15.3 In the event of a defect in the concealment control or other defects referred to in 4.15.2 a) and b), a concealed lighting device shall be capable of being moved into the position of use without the aid of tools.

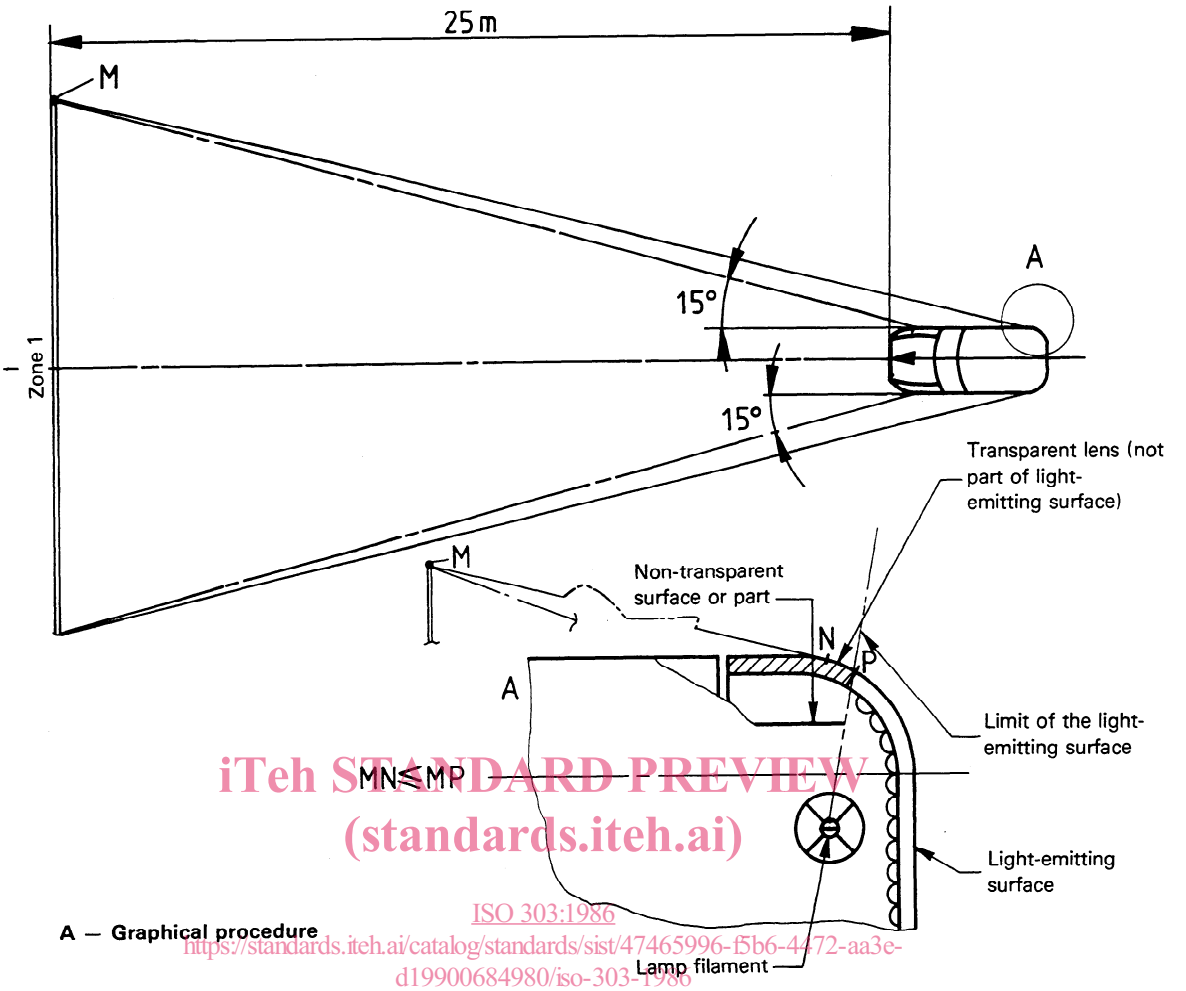
4.15.4 It shall be possible to move illuminating devices into the position of use and to switch them on by means of a single control, while allowing the possibility of moving them into the position of use without switching them on. However in the case of grouped main-beam and dipped-beam headlamps, the control referred to above is required only to activate the dipped-beam headlamps.

4.15.5 It shall not be possible, from the driver's seat, deliberately to stop the movement of illuminated headlamps before they reach the position of use. If there is a danger of dazzling other road users by the movement of headlamps, they may illuminate only when they have reached their final position.

4.15.6 Within the temperature range −30 to +50 °C, the concealment device shall allow the headlamp to be fully exposed within 3 s of initial operation of the control.

4.16 Number of lamps

The number of lamps fitted to the vehicle shall be equal to the number(s) specified in the data sheets on lamps (see annex B).



A — Graphical procedure

Figure 1 — Visibility of red light to the front

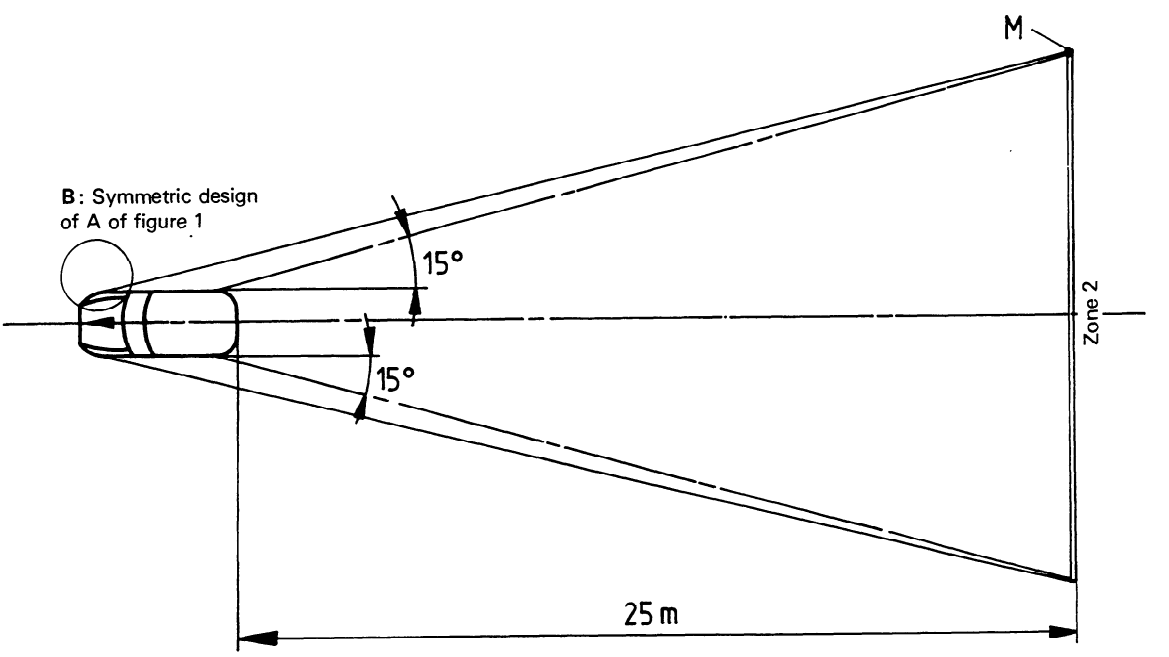
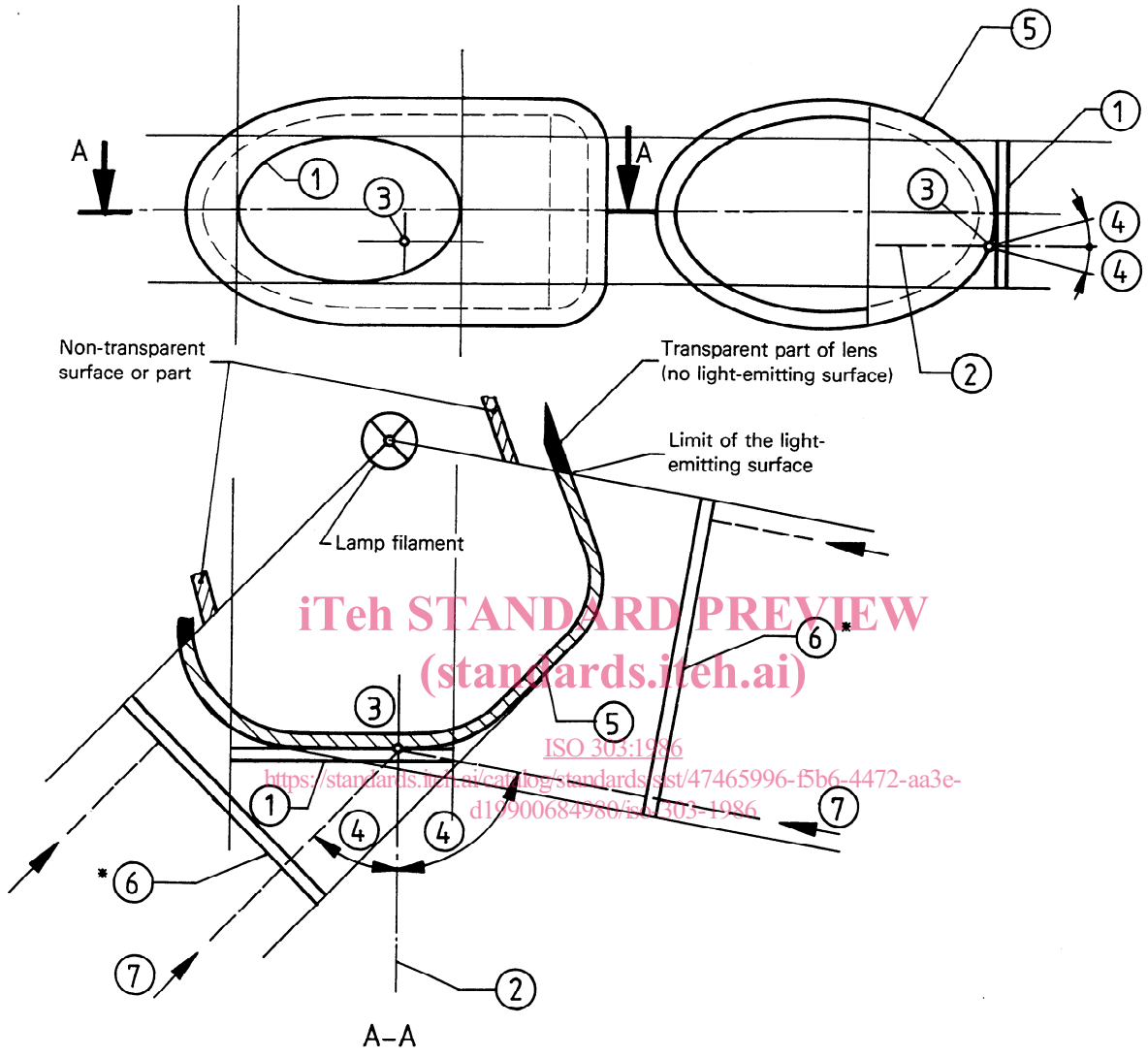


Figure 2 — Visibility of white light to the rear



* This surface shall be considered tangent to the light-emitting surface

(1) Illuminating surface
(2) Reference axis
(3) Reference centre
(4) Angle of geometric visibility
(5) Light-emitting surface
(6) Apparent surface
(7) Direction of observation

Figure 3 — Light signalling devices

Annex A

Colorimetric characteristics of illuminating and signalling lights

A.1 Introduction

The colorimetric characteristics of illuminating and signalling lights for automobiles and trailers have been determined by the International Commission on Illumination (CIE), which thought it desirable in certain cases [designated by an asterisk (*)] to adopt different limits from those which had been recommended by Technical Committee CIE/TC 13.3, *Colour of light signals*. In fact, the voltages applied at lamp terminals are subject to extensive variation and it is important to avoid any confusion arising from too low or too high a voltage. In other cases, the colours specified below have not been considered by the CIE.

A.2 Trichromatic co-ordinates

Red	limit towards yellow limit towards purple*	$y \leqslant 0{,}335$ $z \leqslant 0{,}008$
White	limit towards blue limit towards yellow limit towards green limit towards green limit towards purple limit towards red	$x \geqslant 0{,}310$ $x \leqslant 0{,}500$ $y \leqslant 0{,}150 + 0{,}640\ x$ $y \leqslant 0{,}440$ $y \geqslant 0{,}050 + 0{,}750\ x$ $y \geqslant 0{,}382$
Amber	limit towards yellow* limit towards red* limit towards white*	$y \leqslant 0{,}429$ $y \geqslant 0{,}398$ $z \leqslant 0{,}007$
Selective yellow	limit towards red* limit towards green* limit towards white* limit towards spectral value*	$y \geqslant 0{,}138 + 0{,}580\ x$ $y \leqslant 1{,}29\ x - 0{,}100$ $y \geqslant -\ x + 0{,}966$ $y \leqslant -\ x + 0{,}992$
Enlarged selective yellow	limit towards red limit towards green limit towards white limit towards spectral value	$y \geqslant 0{,}138 + 0{,}580\ x$ $y \leqslant 1{,}29\ x - 0{,}100$ $\begin{cases} y \geqslant -\ x + 0{,}940 \\ y \geqslant 0{,}440 \end{cases}$ $y \leqslant -\ x + 0{,}992$

* See clause A.1.

A.3 Colorimetric zones corresponding to the recommended limits

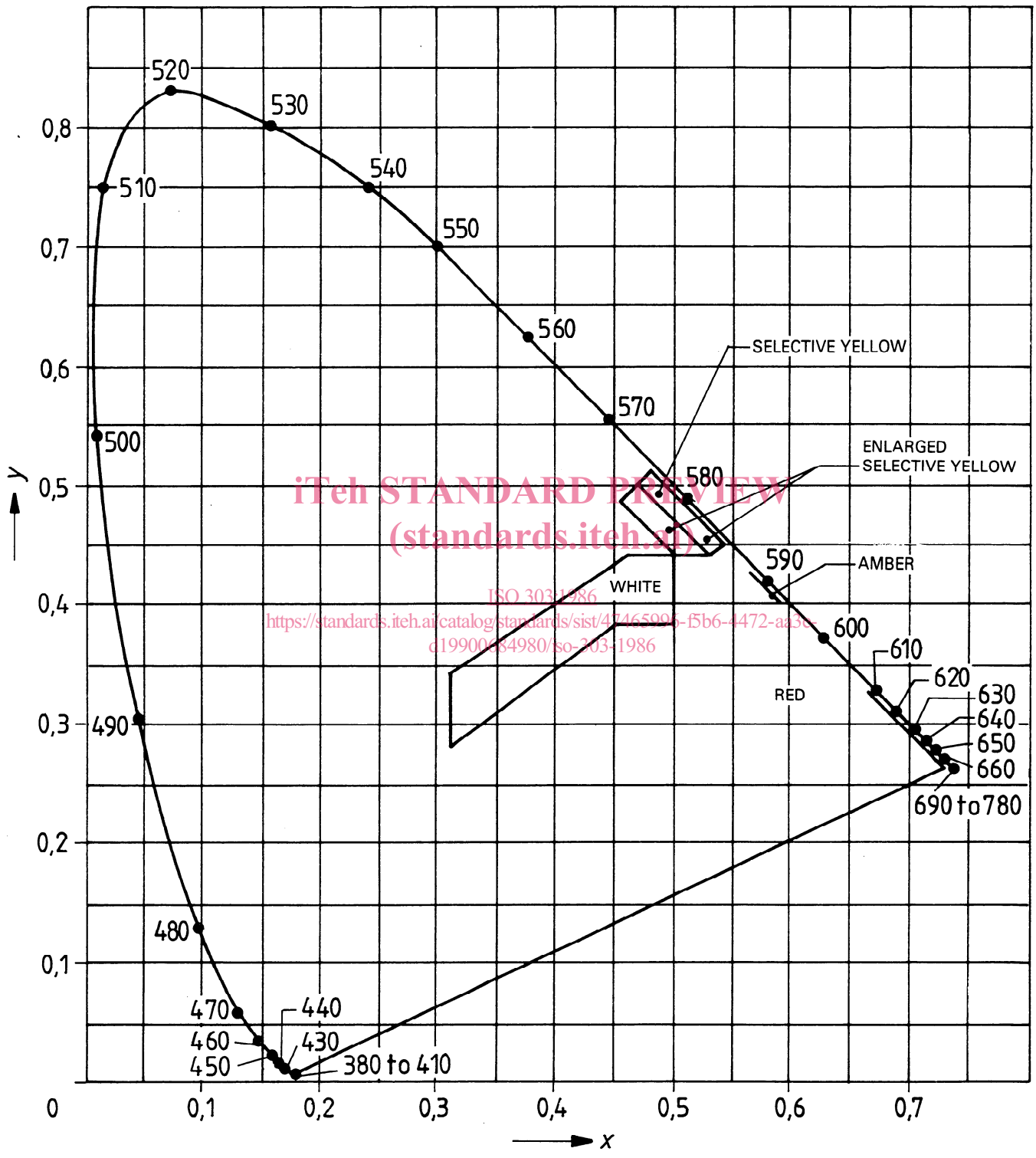


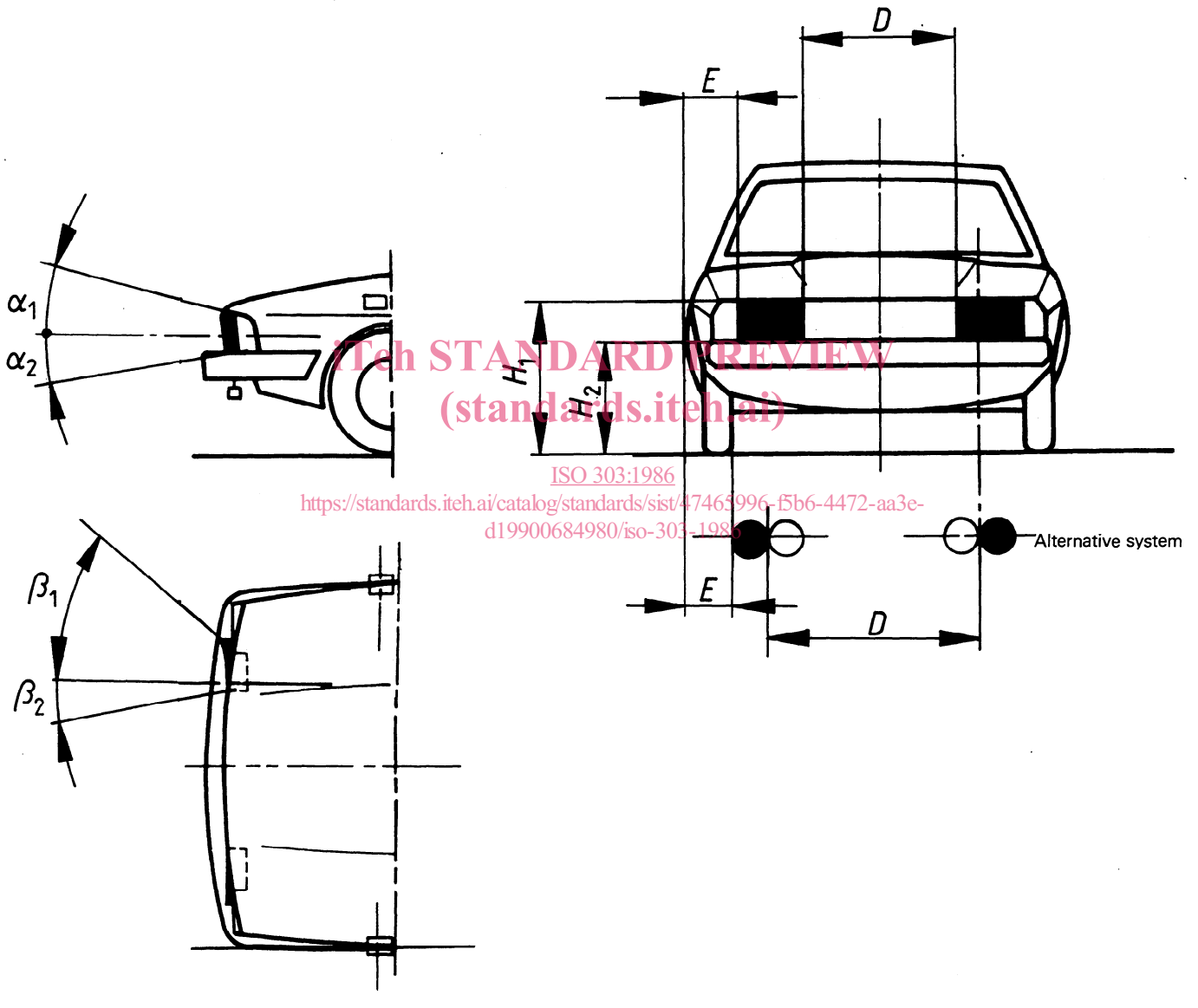
Figure 4 — Diagram representing the zones of the CIE colour triangle, corresponding to the limits given in the table in A.2

Annex B

Lighting devices data sheets

NOTE — The layout drawings are examples and are not restrictive.

1 Dipped-beam headlamp



a) Application

For motor vehicles only.

b) Number

2

c) Dimensions (in millimetres)

$H_1 \leqslant 1\,200$

$H_2 \geqslant 500$

$E \leqslant 400$ and $\leqslant E$ of main beam of same vehicle

$D \geqslant 600$, or 400 if overall width is less than 1 300

d) Configuration

May be grouped with the main-beam headlamp and the other front lamps.

May not be combined with any other lamp.

May be reciprocally incorporated

— with the main-beam headlamp, unless the latter swivels with the steering;

— with the other front lamps.

e) Minimum angles of geometric visibility

α_1: 15°

α_2: 10°

β_1: 45°

β_2: 10°

f) Adjustment of dipped beam

The vertical inclination of the dipped beam shall be measured under static conditions and all the loading conditions defined in ISO 4182. In the unladen vehicle state, with one person in the driving seat, the initial vertical downwards inclination shall be between 1 % and 1,5 %.

The initial adjustment for each type of vehicle shall be expressly laid down by the manufacturer.

The vertical inclination shall remain between 0,5 % and 2,5 % under all loading conditions defined in ISO 4182.

g) Electrical connections

The control for changing over to the dipped-beam shall switch off all main-beam headlamps simultaneously.

The dipped beams may remain switched on at the same time as the main beams.