
**Tractors and machinery for agriculture
and forestry — Installation of lighting,
light signalling and marking devices for
travel on public roadways**

*Tracteurs et matériels agricoles et forestiers — Installation des
dispositifs d'éclairage, de signalisation lumineuse et d'identification pour
circulation sur route*

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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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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Tractors and machinery for agriculture and forestry — Installation of lighting, light signalling and marking devices for travel on public roadways

1 Scope

This International Standard specifies the characteristics and installation of lighting and marking devices on agricultural and forestry tractors, self-propelled agricultural machines, agricultural trailers and trailed machines when operated on public roads. It is not applicable to purpose-built forestry machines as defined in ISO 6814 or to motor vehicles such as automobiles, buses, trucks and their trailers.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 303, *Road vehicles — Installation of lighting and light signalling devices for motor vehicles and their trailers*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 303 and the following apply.

3.1

angles of geometric visibility

angles which determine the field of the minimum solid angle in which the apparent surface of the lamp must be visible

NOTE 1 The field of the solid angle is determined by the segments of the sphere of which the centre coincides with the centre of reference of the lamp and the equator is parallel with the ground. These segments are determined in relation to the reference axis. The horizontal angles β correspond to the longitude and the vertical angles α to the latitude. There must be no obstacle on the inside of the angles of geometric visibility to the propagation of light from any part of the apparent surface of the lamp observed from infinity.

NOTE 2 If measurements are taken closer to the lamp, the direction of observation must be shifted parallel to achieve the same accuracy.

NOTE 3 On the inside of the angles of geometric visibility, no account is taken of obstacles already present when the lamp was type-approved.

NOTE 4 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 furnished that the part of the lamp not hidden by obstacles still conforms to the photometric values prescribed for the approval of the device as an optical unit (see Annex C). Nevertheless, when the vertical angle of geometric visibility below the horizontal may be reduced to 5° (lamp at less than 750 mm above the ground) the photometric field of measurements of the installed optical unit may be reduced to 5° below the horizontal.

3.2

reference axis

characteristic axis of the lamp determined by the manufacturer (of the lamp) for use as the direction of reference ($H = 0^\circ$, $V = 0^\circ$) for angles of field for photometric measurements and for installing the lamp on the vehicle

NOTE See Annex D.

3.3

centre of reference

intersection of the reference axis with the exterior light-emitting surface

NOTE 1 It is specified by the manufacturer of the lamp.

NOTE 2 See Annex D.

3.4

closed-circuit tell-tale

light (or equivalent device) showing that a device has been switched on but not showing whether or not it is operating correctly

3.5

dipped-beam headlamp

lower-beam headlamp

dipped-beam headlight

lamp used to illuminate the road or the ground ahead of the tractor or self-propelled machine without causing undue dazzle or discomfort to oncoming drivers and other road users

3.6

end-outline marker lamp

lamp used to indicate the overall width of the tractor, self-propelled machine, trailer or trailed machine and to complement the machine's front- and rear-position lamps by drawing particular attention to its bulk

3.7

extreme outer edge

plane on either side of the vehicle, parallel to the vehicle's median longitudinal plane and touching its lateral outer edge, but disregarding the projection of tyres near the point of contact with the ground, connections for tire-pressure gauges, rear-view mirrors, end-outline marker lamps, front- and rear-position lamps, and retro-reflectors

3.8

front direction indicator lamp

lamp used to indicate to other road users that the operator intends to change direction to the right or left

3.9

front fog lamp

lamp used to improve the illumination of the road or the ground ahead of the tractor or self-propelled machine under conditions of fog or other conditions which adversely affect visibility

3.10

front implement connector

device used to transmit electrical power and/or signals from an agricultural tractor or self-propelled machine to a front-mounted implement

3.11

front-position lamp

lamp used to indicate the presence and width of the tractor, self-propelled machine, trailer or trailed machine when viewed from the front

3.12**front retro-reflector**

device used to improve the visible detectability of a wide tractor, self-propelled machine, trailer or trailed machine when viewed from the front

3.13**ground**

surface on which the vehicle stands and which normally is substantially horizontal

3.14**hazard warning signal**

simultaneous operation of all direction-indicator lamps of tractor, self-propelled machine, trailer or trailed machine to show that the vehicle temporarily constitutes a special danger to other road users

3.15**illuminating surface**

⟨lighting device⟩ orthogonal projection of the full aperture of the reflector, or in the case of headlamps with an ellipsoidal reflector of the "projection lens", on a transverse plane

NOTE 1 If the lighting device has no reflector, the definition of the illuminating surface of a light signalling device (see 3.16) applies. If the light-emitting surface of the lamp extends over part only of the full aperture of the reflector, then the projection of that part only is taken into account.

NOTE 2 In the case of a dipped-beam headlamp, the illuminating surface is limited by the apparent trace of the cut-off on to the lens. If the reflector and lens are adjustable relative to one another, the mean adjustment is preferred.

NOTE 3 Adapted from ISO 7227:1987.

NOTE 4 See Annex D.

3.16**illuminating surface**

⟨light signalling device other than a retro-reflector⟩ orthogonal projection of the lamp in a plane perpendicular to its reference axis and in contact with the exterior light-emitting surface of the lamp, this projection being bounded by the edges of screens situated in this plane, each allowing only 98 % of the total luminous intensity of the light to persist in the reference axis direction

NOTE 1 Adapted from ISO 7227:1987.

NOTE 2 To determine the lower, upper and lateral limits of the illuminating surface, only screens with horizontal or vertical edges are used to verify the distance to the extreme outer edges (3.7) of the vehicle and the height above the ground. For other applications of the illuminating surface, e.g. distance between two lamps or functions, the shape of the periphery of this illuminating surface is used. The screens remain parallel, but other orientations are permitted.

NOTE 3 In the case of a light signalling device whose illuminating surface encloses either totally or partially the illuminating surface of another function or encloses a non-lighted surface, the illuminating surface can be considered to be the light-emitting surface itself.

NOTE 4 See Annex D.

3.17**illuminating surface**

⟨retro-reflector⟩ orthogonal projection of the retro-reflector (as declared by the applicant during the component approval procedure) in a plane perpendicular to its reference axis and delimited by planes contiguous to the declared outermost parts of its optical system and parallel to that axis

NOTE For the purposes of determining the lower, upper and lateral edges of the device, only horizontal and vertical planes are considered.

3.18

main beam headlamp
upper beam headlamp
driving light

lamp used to illuminate the road or the ground over a long distance ahead of the tractor or self-propelled machine

3.19

median longitudinal plane

vertical plane passing through the longitudinal centreline of the vehicle

3.20

operational tell-tale

light or auditory device (or equivalent device) showing whether a device that has been actuated is operating correctly or not

3.21

overall width

distance between the two extreme outer edges

3.22

rear direction indicator lamp

lamp used to indicate to other road users that the operator intends to change direction to the right or left

3.23

rear fluorescent marking

device used to improve the daytime visible detectability of a wide tractor, self-propelled machine, trailer or trailed machine when viewed from the rear

3.24

rear fog lamp

lamp used to render the tractor, self-propelled machine, trailer or trailed machine more readily visible from the rear in conditions of fog or other conditions which adversely affect visibility

3.25

rear implement connector

device used to transmit electrical power and/or signals from an agricultural tractor or self-propelled agricultural machine to a rear-mounted implement, agricultural trailer or trailed machine

3.26

rear-position lamp

lamp used to indicate the presence and the width of tractor, self-propelled machine, trailer or trailed machine when viewed from the rear

3.27

rear registration-plate lamp

lamp used to illuminate the space intended to accommodate the rear registration plate

3.28

rear retro-reflector

device used to improve the visible detectability of a tractor, self-propelled machine, trailer or trailed machine when viewed from the rear

3.29

reversing lamp

lamp actuated when the operator has moved the control to select the reverse direction, provided to illuminate the area to the rear of the machine

3.30**self-propelled machine**

vehicle fitted with wheels or endless tracks and having at least two axles, primarily designed for use in agriculture or forestry and which, according to its design and the permanently mounted devices on the vehicle, is suitable and intended to perform work

NOTE Additionally, there may be transport facilities which are suitable and intended to carry instruments and auxiliaries required for the performance of work as well as materials resulting from and necessary for the work for intermediate storage.

3.31**side retro-reflector**

device used to improve the visible detectability of a tractor, self-propelled machine, trailer or trailed machine when viewed from the side

3.32**signalling panel**

device used to indicate to other road users the presence of a wide tractor, self-propelled machine, trailer or trailed machine when viewed from the front and rear

3.33**slow-moving vehicle identification emblem****SMV emblem**

device used to indicate the presence of a slow-moving tractor, self-propelled machine, trailer or trailed machine when viewed from the rear

3.34**special warning lamp****beacon**

light used to draw the attention of other road users to the presence of an extra-wide tractor or self-propelled machine

3.35**stop lamp**

lamp used to indicate to road users to the rear of the tractor, self-propelled machine, trailer or trailed machine that the operator has actuated the service brake control or another primary control used to slow the machine

3.36**tractor**

vehicle fitted with wheels or endless tracks and having at least two axles, the main function of which lies in its tractive power and which is especially designed to tow, push, carry and/or power certain tools, machinery or trailers intended by the manufacturer for agricultural or forestry use or similar application

3.37**trailed machine**

trailed vehicle for agricultural or forestry use fitted with wheels or endless tracks which, by design and its permanently mounted devices, is intended to perform work

NOTE 1 Additionally, there may be transport facilities which are suitable and intended to carry instruments and auxiliaries required for the performance of work as well as materials resulting from, and necessary for, the work for intermediate storage.

NOTE 2 If the transport facilities are not designed for the treatment (e.g. stirring) of auxiliaries and materials when travelling on the road, or if the ratio of permissible gross weight to empty weight is larger than 3, the trailed machine is classified as a trailer.

3.38**trailer**

trailed vehicle for agricultural or forestry use fitted with wheels or endless tracks, intended mainly to carry loads and designed to be towed by a tractor or self-propelled machine

3.39

transverse plane

vertical plane perpendicular to the median longitudinal plane of the vehicle

3.40

vehicle

agricultural or forestry tractor, self-propelled agricultural machine, agricultural trailer or trailed agricultural machine

3.41

work lamp

working light

lamp used for illuminating the working areas to the front, rear or side

4 General requirements

4.1 Horizontal and vertical angles

For the purposes of this International Standard, the horizontal angles shall be β_1 corresponding to the outboard and β_2 corresponding to the inboard, and the vertical angles shall be α_1 corresponding to up and α_2 corresponding to down (see data sheets in Annex A)

4.2 Mounting of devices

4.2.1 General

The lighting, signalling and marking lights and retro-reflective devices shall be so fitted that under normal circumstances 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 Annex A. In particular, it shall not be possible for the adjustment of the lamps to be inadvertently disturbed.

4.2.2 Trailed machines

The lighting and signalling devices of trailed machines may be removable, provided they can be fixed rigidly to the vehicle.

4.3 Check of alignment and height

The height and alignment of the lamps shall be verified with the unladen machine on a flat, horizontal surface.

4.4 Lamps constituting a pair

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

- a) be fitted to the machine symmetrically in relation to the median longitudinal plane and at the same height above the ground, except on machines with unsymmetrical shape,
- b) satisfy the same colorimetric characteristics (see Annex E), and
- c) have substantially identical photometric characteristics (see Annex E).

4.5 Maximum and minimum heights

The maximum height above ground shall be measured from the highest point and the minimum height above ground from the lowest point of the illuminating surface. When the height requirements are substantially met, it is sufficient to refer to actual lamp edges (see ISO 303).

4.6 Width position

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

4.7 Light causing confusion

4.7.1 No red light that could lead to confusion shall be visible from the front; no white light that could cause confusion shall be visible from the rear, apart from the light emitted by the reversing lamp, rear registration-plate lamp or the work lamps. The compliance with these requirements shall be tested in accordance with Annex C. During the test, the machine shall be located on a horizontal plane, and, in the case of articulated frame steering, in a straight position.

4.7.2 There shall be no direct visibility of a red light if viewed by an observer moving within Zone 1 in a transverse plane situated 25 m in front of the machine. See Figure C.1.

4.7.3 There shall be no direct visibility of a white light if viewed by an observer moving within Zone 2 in a transverse plane situated 25 m behind the machine. See Figure C.2.

4.8 Assembly of lamps

Lamps may be grouped, combined or reciprocally incorporated with one another provided that all requirements regarding colour, position, orientation, geometric visibility, electrical connections and other requirements, if any, for each lamp are fulfilled.

4.9 Electrical connections

4.9.1 Front- and rear-position (side) lamps, rear registration-plate lamp

The electrical connections shall be such that the front- and rear-position (side) lamps, and the rear registration-plate lamp if it exists, can only be switched on and off simultaneously.

4.9.2 Main-beam and dipped-beam headlamps, front and rear fog lamps

The electrical connections shall be such that the main-beam and dipped-beam headlamps, and the front and rear fog lamps if they exist, cannot be switched on unless the lamps referred to in 4.9.1 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 illumination at short intervals of the main-beam and dipped-beam headlamps.

4.10 Concealable lamps

4.10.1 The concealment of lamps is prohibited excepting, and only when not in use, the

- main-beam headlamp,
- dipped-beam headlamp, and
- front fog lamp.

4.10.2 When all three of these lamps are concealed, the fitting of front retro-reflectors is recommended.

4.10.3 When concealable lamps are in use, they shall always be in their correct operating position, irrespective of any failure of the mechanism used for concealment.

4.11 Variable position lamps

The position of the direction indicator lamps, the front- and rear-position (side) lamps and the stop lamps may be varied, provided these lamps

- a) remain visible even when their position is altered, and
- b) may be locked in the position required by traffic conditions and that locking is automatic.

4.12 Number of lamps

The number of lighting, marking, signalling and retro-reflective devices fitted to the vehicle according to Annex E shall be equal to the number specified for each lighting device in Annex F.

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Annex A (normative)

Lighting, marking, signalling and retro-reflective devices — Data sheets

A.0 Index to data sheets

Lighting

- A.1 Dipped/lower-beam headlamp (dipped-beam light)
- A.2 Main/upper-beam headlamp (driving light)
- A.3 Work lamp (working light)
- A.4 Reversing lamp

Marking/warning lights

- A.5 Front-position lamp
- A.6 Rear-position lamp
- A.7 End-outline marker lamp
- A.8 Stop lamp
- A.9 Front direction indicator lamp
- A.10 Rear direction indicator lamp
- A.11 Hazard warning signal
- A.12 Special warning lamp (beacon)

Special purpose lighting

- A.13 Rear registration-plate lamp
- A.14 Front fog lamp
- A.15 Rear fog lamp

Retro-reflective/marketing devices

- A.16 Rear retro-reflector
- A.17 Rear fluorescent marking
- A.18 Front retro-reflector
- A.19 Side retro-reflector
- A.20 Slow-moving vehicle identification emblem (SMV emblem)
- A.21 Signalling panel

Implement/trailer connectors

A.22 Rear implement connector

A.23 Front implement connector

A.1 Dipped-beam headlamp

A.1.1	Colour of the light	White
A.1.2	Number	Two [only one pair shall be illuminated at one time if machine is equipped with additional pair(s)]
A.1.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 4\ 000$
	H_2 (minimum height above ground)	≥ 500
	D (distance between lamps)	Spaced as widely as practicable
	E (distance from outer edge of vehicle)	No requirements
A.1.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	15°
	α_2 (downwards)	10° (5° if front ballast weights requires)
	β_1 (outwards)	45°
	β_2 (inwards)	5°
A.1.5	Alignment	Towards the front
A.1.6	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
A.1.7	Tell-tale indicator	Optional

A.2 Main/upper beam headlamp (driving light)

A.2.1	Colour of the light	White
A.2.2	Number	Two or four
A.2.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 4\ 000$
	H_2 (minimum height above ground)	≥ 500
	D (distance between lamps)	No requirements
	E (distance from outer edge of vehicle)	The outer edges of the illuminating surfaces shall in no case be closer to the extreme outer edge of the machine than the outer edges of the illuminating surfaces of the dipped/lower beam headlamp
A.2.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	5°
	α_2 (downwards)	5°
	β_1 (outwards)	5°
	β_2 (inwards)	5°
A.2.5	Alignment	Towards the front
A.2.6	Electrical connections	The main-beam headlamps may be switched on either simultaneously or in pairs. For changing over from the dipped to the main beam at least one pair of main beams must be switched on. 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
A.2.7	Tell-tale indicator	Mandatory — a blue warning light shall be visible in the operator's field of view when the main-beam headlamps are switched on

A.3 Work lamp (working light)

A.3.1	Colour of the light	Optional
A.3.2	Number	No requirements
A.3.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	No requirements
	H_2 (minimum height above ground)	No requirements
	D (distance between lamps)	No requirements
	E (distance from outer edge of vehicle)	No requirements
A.3.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	No requirements
	α_2 (downwards)	No requirements
	β_1 (outwards):	No requirements
	β_2 (inwards)	No requirements
A.3.5	Alignment	Any direction, or all around where necessary
A.3.6	Electrical connections	Lamp(s) shall work independent of other lamps
		If illuminated during road travel, shall be aimed downward to avoid blinding or confusing drivers of other vehicles
A.3.7	Tell-tale indicator	Optional

A.4 Reversing lamp

A.4.1	Colour of the light	White
A.4.2	Number	One or two
A.4.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	H_2 (minimum height above ground)	≥ 250
	D (distance between lamps)	No requirements
	E (distance from outer edge of vehicle)	No requirements
A.4.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	15°
	α_2 (downwards)	5°
	β_1 (outwards)	45°
	β_2 (inwards)	45° (30° if there are two)
A.4.5	Alignment	Rearwards
A.4.6	Electrical connections	Shall only light up if reverse gear is engaged and the engine starting/stopping device is in the position that operation of the engine is possible
A.4.7	Tell-tale indicator	Optional

A.5 Front-position lamp

A.5.1	Colour of the light	White or amber
A.5.2	Number	Two or four
A.5.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	H_2 (minimum height above ground)	≥ 300
	D (distance between lamps)	As far apart as practicable
	E (distance from outer edge of vehicle)	As far apart as practicable
A.5.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	15°
	α_2 (downwards)	15° (5° if height < 750, 10° if body work or front wheels dictates)
	β_1 (outwards)	80°
	β_2 (inwards)	10° (5° if bodywork dictates)
A.5.5	Alignment	Towards the front
A.5.6	Electrical connections	Shall be activated with rear-position lamps and registration-plate lamp, if machine so equipped
A.5.7	Tell-tale indicator	Mandatory — may be instrument panel lighting or any position lamp visible to the operator

A.6 Rear-position lamp

A.6.1	Colour of the light	Red
A.6.2	Number	Two (may be only one if machine width < 1 200 mm)
A.6.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	H_2 (minimum height above ground)	≥ 300
	D (distance between lamps)	As far apart as practicable, maximum 3 000 (as close to centre as practicable if only one)
	E (distance from outer edge of vehicle)	As close as practicable (as close to centre as practicable if only one)
A.6.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	15°
	α_2 (downwards)	15° (5° if height < 750)
	β_1 (outwards)	80°
	β_2 (inwards)	45°
A.6.5	Alignment	Towards the rear
A.6.6	Electrical connections	Shall be activated with front-position lamps and registration-plate lamp, if machine so equipped
A.6.7	Tell-tale indicator	Mandatory — may be instrument panel lighting or any position lamp visible to the operator

A.7 End-outline marker lamp

A.7.1	Colour of the light	White or amber front, red rear
A.7.2	Number	Two front, two rear
A.7.3	Dimensions (in millimetres)	
	H (height above ground)	At the maximum height compatible with the requirements relating to the position as regards width and to the symmetry of the lamps
	D (distance between lamps)	As far apart as practicable
	E (distance from outer edge of vehicle)	As close as practicable
A.7.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	5°
	α_2 (downwards)	20°
	β_1 (outwards)	80°
	β_2 (inwards)	0°
A.7.5	Alignment	Towards the front/rear
A.7.6	Electrical connections	Shall be activated with position lamps and registration-plate lamp, if machine so equipped
A.7.7	Tell-tale indicator	Optional (if fitted shall be the same as for the position lamps)

A.8 Stop lamp

A.8.1	Colour of the light	Red
A.8.2	Number	Two (may be only one if machine width < 1 200 mm)
A.8.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	H_2 (minimum height above ground)	≥ 300
	D (distance between lamps)	As far apart as practicable, maximum 3 000 (as close to centre as practicable if only one)
	E (distance from outer edge of vehicle)	As close as practicable (as close to centre as practicable if only one)
A.8.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	15°
	α_2 (downwards)	15° (5° if height < 750)
	β_1 (outwards)	45°
	β_2 (inwards)	45°
A.8.5	Alignment	Towards the rear
A.8.6	Electrical connections	Shall be activated when the service brake is applied
A.8.7	Tell-tale indicator	Optional. If fitted, it shall be a non-flashing light which comes on in the event of a malfunctioning of the stop lamp(s)

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A.9 Front direction indicator lamp

A.9.1	Colour of the light	Amber
A.9.2	Number	An even number
A.9.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	H_2 (minimum height above ground)	≥ 300
	D (distance between lamps)	As far apart as practicable
	E (distance from outer edge of vehicle)	As close as practicable
A.9.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	15°
	α_2 (downwards)	15° (5° if height < 750, 10° if body work or front wheels dictates)
	β_1 (outwards)	80°
	β_2 (inwards)	10° (5° if bodywork dictates)
A.9.5	Alignment	Towards the front
A.9.6	Electrical connections	Direction indicator lamps shall switch on independently of the other lamps. All direction indicator lamps on one side of a vehicle or combination of vehicles shall be switched on and off by means of one control and shall flash in phase, flashing 90 ± 35 times per minute
A.9.7	Tell-tale indicator	Mandatory for each direction. It shall be optical (green flashing) (may be same tell-tale indicator as for rear direction indicator)

A.10 Rear direction indicator lamp

A.10.1	Colour of the light	Amber
A.10.2	Number	An even number
A.10.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	H_2 (minimum height above ground)	≥ 300
	D (distance between lamps)	As far apart as practicable
	E (distance from outer edge of vehicle)	As close as practicable
A.10.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	15°
	α_2 (downwards)	15° (5° if height < 750)
	β_1 (outwards)	80°
	β_2 (inwards)	45°
A.10.5	Alignment	Towards the rear
A.10.6	Electrical connections	Direction indicator lamps shall switch on independently of the other lamps. All direction indicator lamps on one side of a vehicle or combination of vehicles shall be switched on and off by means of one control and shall flash in phase, flashing 90 ± 35 times per minute
A.10.7	Tell-tale indicator	Mandatory for each direction. It shall be optical (green flashing) (may be same tell-tale indicator as for front turn indicator)

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A.11 Hazard warning signal

A.11.1	Colour of the light	Amber
A.11.2	Number	An even number of forward facing and an even number of rearward facing
A.11.3	Dimensions	See data sheets for front and rear direction indicator lamps
A.11.4	Minimum angles of geometric visibility	See data sheets for front and rear direction indicator lamps
A.11.5	Alignment	Towards the front and rear
A.11.6	Electrical connections	The hazard warning signal shall be operated by a separate control. All direction indicator lamps shall function simultaneously The hazard warning signal shall be able to function even though the "on-off" device of the engine is in a position in which it is impossible to run the engine
A.11.7	Tell-tale indicator	Mandatory. Tell-tale light shall be flashing and may be the simultaneous operation of the tell-tale(s) of the direction indicator lamps

A.12 Special warning lamp (beacon)

A.12.1	Colour of the light	Amber or yellow
A.12.2	Number	One or more to meet visibility requirements
A.12.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	As required to meet geometric visibility requirements
	H_2 (minimum height above ground)	As required to meet geometric visibility requirements
	D (distance between lamps)	As required to meet geometric visibility requirements
	E (distance from outer edge of vehicle)	As required to meet geometric visibility requirements
A.12.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	8°
	α_2 (downwards)	Shall light up the ground 50 m from the periphery of the machine
	β_1 (outwards)	360°
	β_2 (inwards)	Not applicable
A.12.5	Alignment	All around
A.12.6	Electrical connections	Lamp(s) shall switch on independently of the other lamps
A.12.7	Tell-tale indicator	Optional

A.13 Rear registration-plate lamp

A.13.1	Colour of the light	White
A.13.2	Number	As required to illuminate the space for the rear registration plate
A.13.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	As required to illuminate space for rear registration plate
	H_2 (minimum height above ground)	As required to illuminate space for rear registration plate
	D (distance between lamps)	As required to illuminate space for rear registration plate
	E (distance from outer edge of vehicle)	As required to illuminate space for rear registration plate
A.13.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	Lamp assembly(ies) shall not obstruct geometric visibility requirements of plate
	α_2 (downwards)	Lamp assembly(ies) shall not obstruct geometric visibility requirements of plate
	β_1 (outwards)	Lamp assembly(ies) shall not obstruct geometric visibility requirements of plate
	β_2 (inwards)	Lamp assembly(ies) shall not obstruct geometric visibility requirements of plate
A.13.5	Alignment	Light source shall not be directly visible to another driver coming from the rear
A.13.6	Electrical connections	Shall light up only at the same time as the rear-position lamps
A.13.7	Tell-tale indicator	Optional. If present, function should be performed by tell-tale for front and rear-position lamps

A.14 Front fog lamp

A.14.1	Colour of the light	White
A.14.2	Number	Two
A.14.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	No point on the illuminating surface shall be higher than the highest point of the illuminating surface of the dipped-beam headlamps
	H_2 (minimum height above ground)	≥ 250
	D (distance between lamps)	No requirements
	E (distance from outer edge of vehicle)	No requirements
A.14.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	5°
	α_2 (downwards)	5°
	β_1 (outwards)	45°
	β_2 (inwards)	5°
A.14.5	Alignment	<p>Shall be directed forwards without causing undue dazzle or discomfort to oncoming drivers and other road users</p> <p>Shall not vary according to the angle of the steering</p> <p>The light emitted shall not in any circumstances cause discomfort to the driver either directly or indirectly through the rear-view mirrors and/or other reflecting surfaces of the vehicle</p>
A.14.6	Electrical connections	<p>Shall not be possible to illuminate unless position lamps are illuminated</p> <p>Shall be possible to switch on and off independently of the main-beam or dipped-beam headlamps and vice versa</p>
A.14.7	Tell-tale indicator	Optional

A.15 Rear fog lamp

A.15.1	Colour of the light	Red
A.15.2	Number	One or two
A.15.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	H_2 (minimum height above ground)	≥ 300
	D (distance between lamps)	If only one, it shall be on the opposite side of the median longitudinal plane of the vehicle to the direction of traffic prescribed in the country of registration. Distance between the rear fog lamp and the stop lamp shall be > 100 mm
	E (distance from outer edge of vehicle)	as close as practicable
A.15.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	5°
	α_2 (downwards)	5°
	β_1 (outwards)	25°
	β_2 (inwards)	25°
A.15.5	Alignment	Towards the rear
A.15.6	Electrical connections	Such that lamp(s) can only be illuminated when the main-beam or dipped-beam headlamps or front fog lamps are illuminated
A.15.7	Tell-tale indicator	Mandatory — an independent, fixed-intensity warning light

A.16 Rear retro-reflector

A.16.1	Colour of the reflector	Red
A.16.2	Number	Two or more to meet spacing, position and/or visibility requirements
A.16.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if body work dictates
	H_2 (minimum height above ground)	≥ 400
	D (distance between lamps)	$\leq 2\,000$ (the SMV emblem, if fitted, may be considered as a rear retro-reflector for the purposes of meeting this requirement)
	E (distance from outer edge of vehicle)	As close to edge as practicable (≤ 400 for machines ≥ 3 m wide)
A.16.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	15°
	α_2 (downwards)	15°
	β_1 (outwards)	30°
	β_2 (inwards)	30°
A.16.5	Alignment	Towards the rear, as in line as practicable
A.16.6	Electrical connections	Not applicable
A.16.7	Tell-tale indicator	Not applicable

A.17 Rear fluorescent marking

A.17.1	Colour of the marking	Red-orange
A.17.2	Number	Two or more to meet spacing, position and/or visibility requirements
A.17.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 2\ 100$
	H_2 (minimum height above ground)	≥ 400
	D (distance between lamps)	$\leq 2\ 000$ (the SMV emblem, if fitted, may be considered as a rear retro-reflector for the purposes of meeting this requirement)
	E (distance from outer edge of vehicle)	≤ 635
A.17.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	15°
	α_2 (downwards)	15°
	β_1 (outwards)	30°
	β_2 (inwards)	30°
A.17.5	Alignment	Towards the rear, as in line as practicable
A.17.6	Electrical connections	Not applicable
A.17.7	Tell-tale indicator	Not applicable

A.18 Front retro-reflector

A.18.1	Colour of the reflector	Yellow or white
A.18.2	Number	Two minimum
A.18.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 2\ 100$ preferred, 2 600 if bodywork dictates
	H_2 (minimum height above ground)	≥ 400
	D (distance between lamps)	No requirements
	E (distance from outer edge of vehicle)	≤ 400
A.18.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	15°
	α_2 (downwards)	15°
	β_1 (outwards)	30°
	β_2 (inwards)	30°
A.18.5	Alignment	Towards the front
A.18.6	Electrical connections	Not applicable
A.18.7	Tell-tale indicator	Not applicable

A.19 Side retro-reflector

A.19.1	Colour of the reflector	Yellow or amber
A.19.2	Number	As required to meet spacing requirements
A.19.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 2\ 100$ preferred, 2 600 if bodywork dictates
	H_2 (minimum height above ground)	≥ 400
	D (distance between lamps)	$\leq 3\ 000$
	L_1 (distance from front of vehicle)	$\leq 3\ 000$
	L_2 (distance from rear of vehicle)	$\leq 1\ 000$ preferred (as near as practicable as dictated by bodywork)
A.19.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	15°
	α_2 (downwards)	15°
	β_1 (outwards)	45°
	β_2 (inwards)	45°
A.19.5	Alignment	Towards each side, as in line as practicable
A.19.6	Electrical connections	Not applicable
A.19.7	Tell-tale indicator	Not applicable

A.20 Slow-moving vehicle identification emblem (SMV emblem)

A.20.1	Colour of the emblem	Red-orange fluorescent/red retro-reflective
A.20.2	Number	One
A.20.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 3\ 000$ preferred
	H_2 (minimum height above ground)	≥ 600
A.20.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	5°
	α_2 (downwards)	5°
	β_1 (outwards)	25° both sides
	β_2 (inwards)	Not applicable
A.20.5	Alignment	Perpendicular to direction of travel, within $\pm 20^\circ$ of vertical and as near to the machine centreline as practicable
A.20.6	Electrical connections	Not applicable
A.20.7	Tell-tale indicator	Not applicable

A.21 Signalling panel

A.21.1	Colour of the panel	White and red
A.21.2	Number	Two on the front and two on the rear
A.21.3	Dimensions (in millimetres)	
	H_1 (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	H_2 (minimum height above ground)	No requirements
	D (distance between lamps)	No requirements
	E (distance from outer edge of vehicle)	≤ 250
A.21.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	5°
	α_2 (downwards)	5°
	β_1 (outwards)	25°
	β_2 (inwards)	25°
A.21.5	Alignment	Towards the front and towards the rear
A.21.6	Electrical connections	Not applicable
A.21.7	Tell-tale indicator	Not applicable

A.22 Rear implement connector

A.22.1	Colour of the light	Not applicable
A.22.2	Number	One or two
A.22.3	Dimensions (in millimetres)	
	H_3 (maximum height above hitch point)	≤ 1200
	H_4 (minimum height above hitch point)	≥ 200
	H_5 (maximum distance in front of hitch point):	≤ 1200
	H_6 (minimum distance in front of hitch point)	≥ 200
	H_7 (maximum lateral distance from hitch point)	≤ 300
A.22.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	Not applicable
	α_2 (downwards)	Not applicable
	β_1 (outwards)	Not applicable
	β_2 (inwards)	Not applicable
A.22.5	Alignment	Rear facing
A.22.6	Electrical connections	Not applicable
A.22.7	Tell-tale indicator	Not applicable

A.23 Front implement connector

A.23.1	Colour of the light	Not applicable
A.23.2	Number	One or two
A.23.3	Dimensions (in millimetres)	
	H_1 (maximum height above hitch point)	≤ 1200
	H_2 (minimum height above hitch point)	≥ 200
	H_3 (maximum distance in front of hitch point):	≤ 1200
	H_4 (minimum distance in front of hitch point)	≥ 200
	H_5 (maximum lateral distance from hitch point)	≤ 300
A.23.4	Minimum angles of geometric visibility (in degrees)	
	α_1 (upwards)	Not applicable
	α_2 (downwards)	Not applicable
	β_1 (outwards)	Not applicable
	β_2 (inwards)	Not applicable
A.23.5	Alignment	Front facing
A.23.6	Electrical connections	Not applicable
A.23.7	Tell-tale indicator	Not applicable

Annex B
(normative)

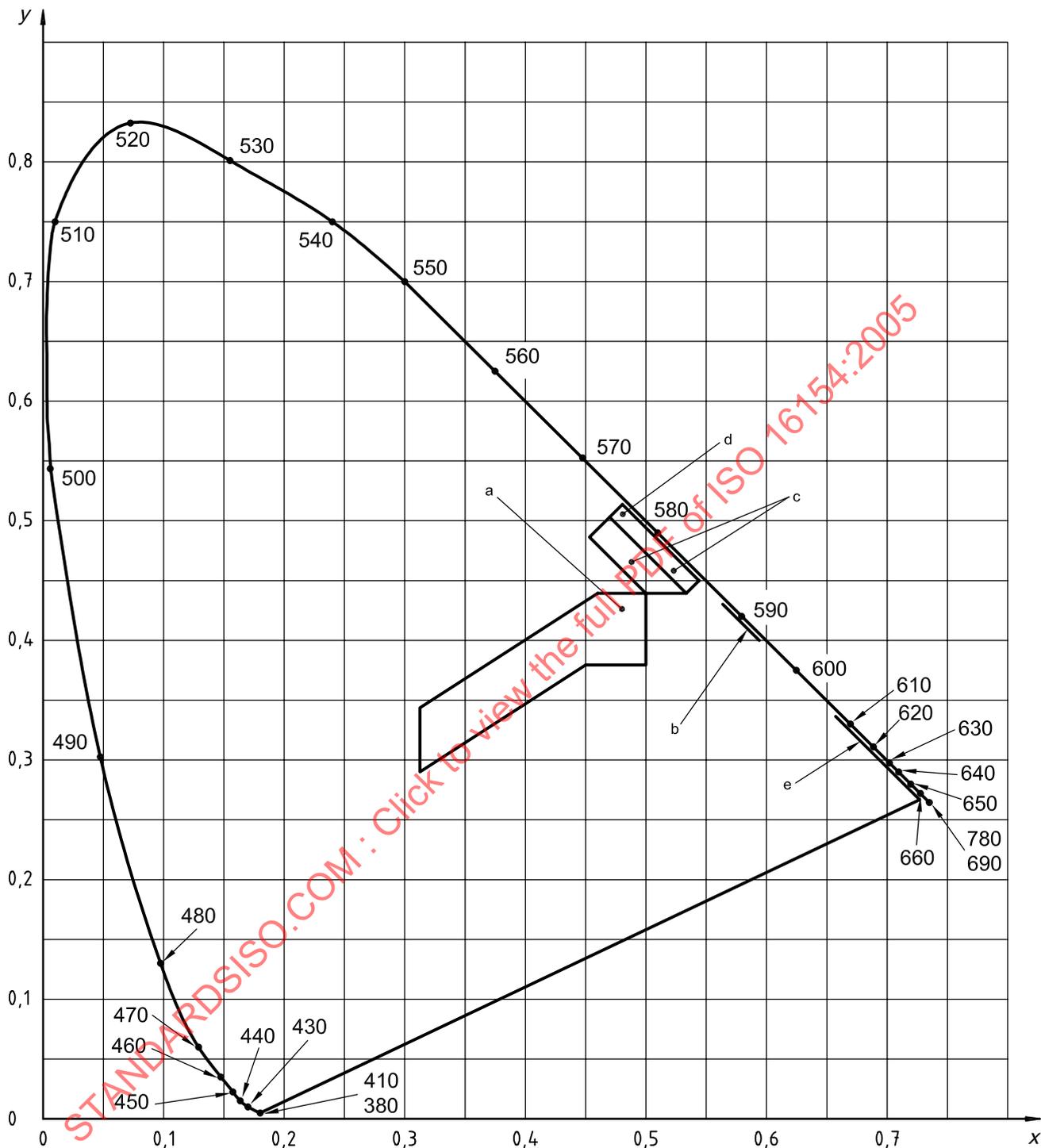
Colorimetric characteristics of illuminating and signalling lights

The trichromatic coordinates shall be in accordance with Table B.1. See Figure B.1 for the colorimetric zones corresponding to recommended limits.

Table B.1 — Trichromatic coordinates

Red	Limit towards:	yellow	$y \leq 0,335$
		purple ^a	$z \leq 0,008$
White	Limit towards:	blue	$x \geq 0,310$
		yellow	$x \leq 0,500$
		green	$y \leq 0,150 + 0,640x$
		green	$y \leq 0,440$
		purple	$y \geq 0,050 + 0,750x$
		red	$y \geq 0,382$
Amber	Limit towards:	yellow ^a	$y \leq 0,429$
		red ^a	$y \geq 0,398$
		white ^a	$z = 0,007$
Selective yellow	Limit towards:	red ^a	$y \geq 0,138 + 0,580x$
		green ^a	$y \leq 1,29x - 0,100$
		white ^a	$y \geq -x + 0,966$
		spectral value ^a	$y \geq -x + 0,992$
Enlarged selective yellow	Limit towards:	red	$y \geq 0,138 + 0,580x$
		green	$y \leq 1,290x - 0,100$
		white	$y \geq -x + 0,940$
			$y \geq 0,440$
	spectral value	$y \leq -x + 0,992$	

^a The colorimetric characteristics of illuminating and signalling lights for road vehicles have been determined by the International Commission on Illumination (CIE), which thought it desirable in this case to adopt a different limit from that 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 have not been considered by the CIE (see ISO 303:2002, Annex A).



This diagram represents the zones of the CIE colour triangle, corresponding to the limits in Table B.1.

- a White.
- b Amber.
- c Enlarged selective yellow.
- d Selective yellow.
- e Red.

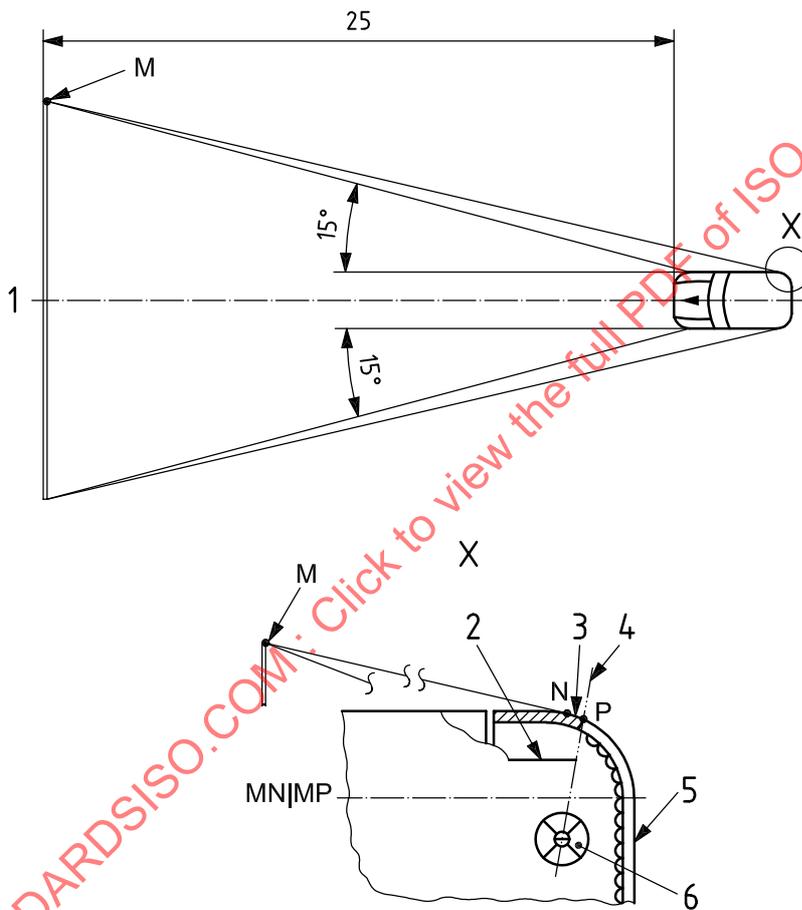
Figure B.1 — Colorimetric zones corresponding to recommended limits

Annex C (normative)

Forward visibility of red lights and rearward visibility of white lights

The visibility required of a red lamp to the front of the vehicle and a white lamp to the rear shall be in accordance with Figures C.1 and C.2, respectively.

Dimensions in metres

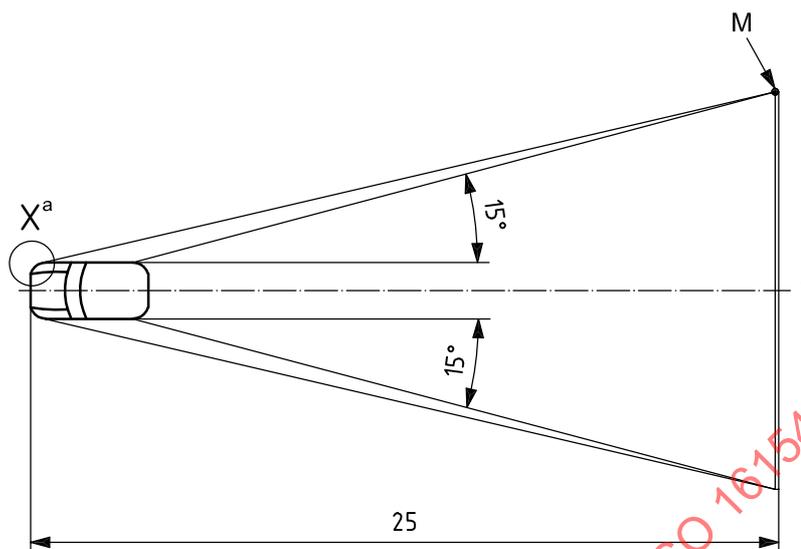


Key

- M limit point of zone 1
- 1 zone 1
- 2 non-transparent surface or part
- 3 transparent lens (not part of light-emitting surface)
- 4 limit of the light-emitting surface
- 5 light-emitting surface
- 6 lamp filament

Figure C.1 — Visibility of red light to the front (see 4.7)

Dimensions in metres



Key

M limit point of zone 2

1 zone 2

^a Symmetric design of detail of Figure C.1.

Figure C.2 — Visibility of white light to the rear (see 4.7)

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Annex D
(normative)

**Lamp surfaces, reference axis, centre of reference and
angles of geometric visibility**

The lamp surfaces, reference axis, centre of reference and the angles of geometric visibility shall be in accordance with Figure D.1.

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