

---

---

**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*



**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

© ISO 2005

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 General requirements</b> .....	<b>6</b>
<b>Annex A (normative) Lighting, marking, signalling and retro-reflective devices — Data sheets</b> .....	<b>9</b>
<b>Annex B (normative) Colorimetric characteristics of illuminating and signalling lights</b> .....	<b>28</b>
<b>Annex C (normative) Forward visibility of red lights and rearward visibility of white lights</b> .....	<b>30</b>
<b>Annex D (normative) Lamp surfaces, reference axis, centre of reference and angles of geometric visibility</b> .....	<b>32</b>
<b>Annex E (informative) Other requirements for lighting and marking devices</b> .....	<b>34</b>
<b>Annex F (informative) Technical specifications of lighting and marking devices covered by other standards</b> .....	<b>38</b>
<b>Bibliography</b> .....	<b>39</b>

## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16154 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 4, *Tractors*.

# 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  $\beta$  correspond to the longitude and the vertical angles  $\alpha$  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  $\beta_1$  corresponding to the outboard and  $\beta_2$  corresponding to the inboard, and the vertical angles shall be  $\alpha_1$  corresponding to up and  $\alpha_2$  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.

.....

## 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**

<b>A.1.1</b>	<b>Colour of the light</b>	White
<b>A.1.2</b>	<b>Number</b>	Two [only one pair shall be illuminated at one time if machine is equipped with additional pair(s)]
<b>A.1.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above ground)	$\leq 4\ 000$
	$H_2$ (minimum height above ground)	$\geq 500$
	$D$ (distance between lamps)	Spaced as widely as practicable
	$E$ (distance from outer edge of vehicle)	No requirements
<b>A.1.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	15°
	$\alpha_2$ (downwards)	10° (5° if front ballast weights requires)
	$\beta_1$ (outwards)	45°
	$\beta_2$ (inwards)	5°
<b>A.1.5</b>	<b>Alignment</b>	Towards the front
<b>A.1.6</b>	<b>Electrical connections</b>	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
<b>A.1.7</b>	<b>Tell-tale indicator</b>	Optional

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

<b>A.2.1</b>	<b>Colour of the light</b>	White
<b>A.2.2</b>	<b>Number</b>	Two or four
<b>A.2.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above ground)	$\leq 4\,000$
	$H_2$ (minimum height above ground)	$\geq 500$
	$D$ (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
<b>A.2.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	$5^\circ$
	$\alpha_2$ (downwards)	$5^\circ$
	$\beta_1$ (outwards)	$5^\circ$
	$\beta_2$ (inwards)	$5^\circ$
<b>A.2.5</b>	<b>Alignment</b>	Towards the front
<b>A.2.6</b>	<b>Electrical connections</b>	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
<b>A.2.7</b>	<b>Tell-tale indicator</b>	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)

<b>A.3.1</b>	<b>Colour of the light</b>	Optional
<b>A.3.2</b>	<b>Number</b>	No requirements
<b>A.3.3</b>	<b>Dimensions</b> (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
<b>A.3.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	No requirements
	$\alpha_2$ (downwards)	No requirements
	$\beta_1$ (outwards):	No requirements
	$\beta_2$ (inwards)	No requirements
<b>A.3.5</b>	<b>Alignment</b>	Any direction, or all around where necessary
<b>A.3.6</b>	<b>Electrical connections</b>	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
<b>A.3.7</b>	<b>Tell-tale indicator</b>	Optional



## A.4 Reversing lamp

<b>A.4.1</b>	<b>Colour of the light</b>	White
<b>A.4.2</b>	<b>Number</b>	One or two
<b>A.4.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	$H_2$ (minimum height above ground)	$\geq 250$
	$D$ (distance between lamps)	No requirements
	$E$ (distance from outer edge of vehicle)	No requirements
<b>A.4.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	15°
	$\alpha_2$ (downwards)	5°
	$\beta_1$ (outwards)	45°
	$\beta_2$ (inwards)	45° (30° if there are two)
<b>A.4.5</b>	<b>Alignment</b>	Rearwards
<b>A.4.6</b>	<b>Electrical connections</b>	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
<b>A.4.7</b>	<b>Tell-tale indicator</b>	Optional

## A.5 Front-position lamp

<b>A.5.1</b>	<b>Colour of the light</b>	White or amber
<b>A.5.2</b>	<b>Number</b>	Two or four
<b>A.5.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	$H_2$ (minimum height above ground)	$\geq 300$
	$D$ (distance between lamps)	As far apart as practicable
	$E$ (distance from outer edge of vehicle)	As far apart as practicable
<b>A.5.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	15°
	$\alpha_2$ (downwards)	15° (5° if height < 750, 10° if body work or front wheels dictates)
	$\beta_1$ (outwards)	80°
	$\beta_2$ (inwards)	10° (5° if bodywork dictates)
<b>A.5.5</b>	<b>Alignment</b>	Towards the front
<b>A.5.6</b>	<b>Electrical connections</b>	Shall be activated with rear-position lamps and registration-plate lamp, if machine so equipped
<b>A.5.7</b>	<b>Tell-tale indicator</b>	Mandatory — may be instrument panel lighting or any position lamp visible to the operator

## A.6 Rear-position lamp

<b>A.6.1</b>	<b>Colour of the light</b>	Red
<b>A.6.2</b>	<b>Number</b>	Two (may be only one if machine width < 1 200 mm)
<b>A.6.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	$H_2$ (minimum height above ground)	$\geq 300$
	$D$ (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)
<b>A.6.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	15°
	$\alpha_2$ (downwards)	15° (5° if height < 750)
	$\beta_1$ (outwards)	80°
	$\beta_2$ (inwards)	45°
<b>A.6.5</b>	<b>Alignment</b>	Towards the rear
<b>A.6.6</b>	<b>Electrical connections</b>	Shall be activated with front-position lamps and registration-plate lamp, if machine so equipped
<b>A.6.7</b>	<b>Tell-tale indicator</b>	Mandatory — may be instrument panel lighting or any position lamp visible to the operator

## A.7 End-outline marker lamp

<b>A.7.1</b>	<b>Colour of the light</b>	White or amber front, red rear
<b>A.7.2</b>	<b>Number</b>	Two front, two rear
<b>A.7.3</b>	<b>Dimensions</b> (in millimetres)	
	<i>H</i> (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
	<i>D</i> (distance between lamps)	As far apart as practicable
	<i>E</i> (distance from outer edge of vehicle)	As close as practicable
<b>A.7.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	5°
	$\alpha_2$ (downwards)	20°
	$\beta_1$ (outwards)	80°
	$\beta_2$ (inwards)	0°
<b>A.7.5</b>	<b>Alignment</b>	Towards the front/rear
<b>A.7.6</b>	<b>Electrical connections</b>	Shall be activated with position lamps and registration-plate lamp, if machine so equipped
<b>A.7.7</b>	<b>Tell-tale indicator</b>	Optional (if fitted shall be the same as for the position lamps)

## A.8 Stop lamp

<b>A.8.1</b>	<b>Colour of the light</b>	Red
<b>A.8.2</b>	<b>Number</b>	Two (may be only one if machine width < 1 200 mm)
<b>A.8.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	$H_2$ (minimum height above ground)	$\geq 300$
	$D$ (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)
<b>A.8.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	15°
	$\alpha_2$ (downwards)	15° (5° if height < 750)
	$\beta_1$ (outwards)	45°
	$\beta_2$ (inwards)	45°
<b>A.8.5</b>	<b>Alignment</b>	Towards the rear
<b>A.8.6</b>	<b>Electrical connections</b>	Shall be activated when the service brake is applied
<b>A.8.7</b>	<b>Tell-tale indicator</b>	Optional. If fitted, it shall be a non-flashing light which comes on in the event of a malfunctioning of the stop lamp(s)

## A.9 Front direction indicator lamp

<b>A.9.1</b>	<b>Colour of the light</b>	Amber
<b>A.9.2</b>	<b>Number</b>	An even number
<b>A.9.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	$H_2$ (minimum height above ground)	$\geq 300$
	$D$ (distance between lamps)	As far apart as practicable
	$E$ (distance from outer edge of vehicle)	As close as practicable
<b>A.9.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	15°
	$\alpha_2$ (downwards)	15° (5° if height < 750, 10° if body work or front wheels dictates)
	$\beta_1$ (outwards)	80°
	$\beta_2$ (inwards)	10° (5° if bodywork dictates)
<b>A.9.5</b>	<b>Alignment</b>	Towards the front
<b>A.9.6</b>	<b>Electrical connections</b>	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 $90 \pm 35$ times per minute
<b>A.9.7</b>	<b>Tell-tale indicator</b>	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

<b>A.10.1</b>	<b>Colour of the light</b>	Amber
<b>A.10.2</b>	<b>Number</b>	An even number
<b>A.10.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	$H_2$ (minimum height above ground)	$\geq 300$
	$D$ (distance between lamps)	As far apart as practicable
	$E$ (distance from outer edge of vehicle)	As close as practicable
<b>A.10.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	15°
	$\alpha_2$ (downwards)	15° (5° if height < 750)
	$\beta_1$ (outwards)	80°
	$\beta_2$ (inwards)	45°
<b>A.10.5</b>	<b>Alignment</b>	Towards the rear
<b>A.10.6</b>	<b>Electrical connections</b>	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 $90 \pm 35$ times per minute
<b>A.10.7</b>	<b>Tell-tale indicator</b>	Mandatory for each direction. It shall be optical (green flashing) (may be same tell-tale indicator as for front turn indicator)

### A.11 Hazard warning signal

<b>A.11.1</b>	<b>Colour of the light</b>	Amber
<b>A.11.2</b>	<b>Number</b>	An even number of forward facing and an even number of rearward facing
<b>A.11.3</b>	<b>Dimensions</b>	See data sheets for front and rear direction indicator lamps
<b>A.11.4</b>	<b>Minimum angles of geometric visibility</b>	See data sheets for front and rear direction indicator lamps
<b>A.11.5</b>	<b>Alignment</b>	Towards the front and rear
<b>A.11.6</b>	<b>Electrical connections</b>	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
<b>A.11.7</b>	<b>Tell-tale indicator</b>	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)

<b>A.12.1</b>	<b>Colour of the light</b>	Amber or yellow
<b>A.12.2</b>	<b>Number</b>	One or more to meet visibility requirements
<b>A.12.3</b>	<b>Dimensions (in millimetres)</b>	
	$H_1$ (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
<b>A.12.4</b>	<b>Minimum angles of geometric visibility (in degrees)</b>	
	$\alpha_1$ (upwards)	8°
	$\alpha_2$ (downwards)	Shall light up the ground 50 m from the periphery of the machine
	$\beta_1$ (outwards)	360°
	$\beta_2$ (inwards)	Not applicable
<b>A.12.5</b>	<b>Alignment</b>	All around
<b>A.12.6</b>	<b>Electrical connections</b>	Lamp(s) shall switch on independently of the other lamps
<b>A.12.7</b>	<b>Tell-tale indicator</b>	Optional

## A.13 Rear registration-plate lamp

<b>A.13.1</b>	<b>Colour of the light</b>	White
<b>A.13.2</b>	<b>Number</b>	As required to illuminate the space for the rear registration plate
<b>A.13.3</b>	<b>Dimensions</b> (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
<b>A.13.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	Lamp assembly(ies) shall not obstruct geometric visibility requirements of plate
	$\alpha_2$ (downwards)	Lamp assembly(ies) shall not obstruct geometric visibility requirements of plate
	$\beta_1$ (outwards)	Lamp assembly(ies) shall not obstruct geometric visibility requirements of plate
	$\beta_2$ (inwards)	Lamp assembly(ies) shall not obstruct geometric visibility requirements of plate
<b>A.13.5</b>	<b>Alignment</b>	Light source shall not be directly visible to another driver coming from the rear
<b>A.13.6</b>	<b>Electrical connections</b>	Shall light up only at the same time as the rear-position lamps
<b>A.13.7</b>	<b>Tell-tale indicator</b>	Optional. If present, function should be performed by tell-tale for front and rear-position lamps



## A.14 Front fog lamp

<b>A.14.1</b>	<b>Colour of the light</b>	White
<b>A.14.2</b>	<b>Number</b>	Two
<b>A.14.3</b>	<b>Dimensions</b> (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)	$\geq 250$
	$D$ (distance between lamps)	No requirements
	$E$ (distance from outer edge of vehicle)	No requirements
<b>A.14.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	5°
	$\alpha_2$ (downwards)	5°
	$\beta_1$ (outwards)	45°
	$\beta_2$ (inwards)	5°
<b>A.14.5</b>	<b>Alignment</b>	<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>
<b>A.14.6</b>	<b>Electrical connections</b>	<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>
<b>A.14.7</b>	<b>Tell-tale indicator</b>	Optional

## A.15 Rear fog lamp

<b>A.15.1</b>	<b>Colour of the light</b>	Red
<b>A.15.2</b>	<b>Number</b>	One or two
<b>A.15.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if bodywork dictates
	$H_2$ (minimum height above ground)	$\geq 300$
	$D$ (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
<b>A.15.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	$5^\circ$
	$\alpha_2$ (downwards)	$5^\circ$
	$\beta_1$ (outwards)	$25^\circ$
	$\beta_2$ (inwards)	$25^\circ$
<b>A.15.5</b>	<b>Alignment</b>	Towards the rear
<b>A.15.6</b>	<b>Electrical connections</b>	Such that lamp(s) can only be illuminated when the main-beam or dipped-beam headlamps or front fog lamps are illuminated
<b>A.15.7</b>	<b>Tell-tale indicator</b>	Mandatory — an independent, fixed-intensity warning light

## A.16 Rear retro-reflector

<b>A.16.1</b>	<b>Colour of the reflector</b>	Red
<b>A.16.2</b>	<b>Number</b>	Two or more to meet spacing, position and/or visibility requirements
<b>A.16.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above ground)	$\leq 2\,300$ preferred, 2 600 if body work dictates
	$H_2$ (minimum height above ground)	$\geq 400$
	$D$ (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 ( $\leq 400$ for machines $\geq 3$ m wide)
<b>A.16.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	15°
	$\alpha_2$ (downwards)	15°
	$\beta_1$ (outwards)	30°
	$\beta_2$ (inwards)	30°
<b>A.16.5</b>	<b>Alignment</b>	Towards the rear, as in line as practicable
<b>A.16.6</b>	<b>Electrical connections</b>	Not applicable
<b>A.16.7</b>	<b>Tell-tale indicator</b>	Not applicable

## A.17 Rear fluorescent marking

<b>A.17.1</b>	<b>Colour of the marking</b>	Red-orange
<b>A.17.2</b>	<b>Number</b>	Two or more to meet spacing, position and/or visibility requirements
<b>A.17.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above ground)	$\leq 2\ 100$
	$H_2$ (minimum height above ground)	$\geq 400$
	$D$ (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)	$\leq 635$
<b>A.17.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	$15^\circ$
	$\alpha_2$ (downwards)	$15^\circ$
	$\beta_1$ (outwards)	$30^\circ$
	$\beta_2$ (inwards)	$30^\circ$
<b>A.17.5</b>	<b>Alignment</b>	Towards the rear, as in line as practicable
<b>A.17.6</b>	<b>Electrical connections</b>	Not applicable
<b>A.17.7</b>	<b>Tell-tale indicator</b>	Not applicable

## A.18 Front retro-reflector

<b>A.18.1</b>	<b>Colour of the reflector</b>	Yellow or white
<b>A.18.2</b>	<b>Number</b>	Two minimum
<b>A.18.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above ground)	$\leq 2\ 100$ preferred, 2 600 if bodywork dictates
	$H_2$ (minimum height above ground)	$\geq 400$
	$D$ (distance between lamps)	No requirements
	$E$ (distance from outer edge of vehicle)	$\leq 400$
<b>A.18.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	$15^\circ$
	$\alpha_2$ (downwards)	$15^\circ$
	$\beta_1$ (outwards)	$30^\circ$
	$\beta_2$ (inwards)	$30^\circ$
<b>A.18.5</b>	<b>Alignment</b>	Towards the front
<b>A.18.6</b>	<b>Electrical connections</b>	Not applicable
<b>A.18.7</b>	<b>Tell-tale indicator</b>	Not applicable

### A.19 Side retro-reflector

<b>A.19.1</b>	<b>Colour of the reflector</b>	Yellow or amber
<b>A.19.2</b>	<b>Number</b>	As required to meet spacing requirements
<b>A.19.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above ground)	$\leq 2\,100$ preferred, 2 600 if bodywork dictates
	$H_2$ (minimum height above ground)	$\geq 400$
	$D$ (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)
<b>A.19.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	15°
	$\alpha_2$ (downwards)	15°
	$\beta_1$ (outwards)	45°
	$\beta_2$ (inwards)	45°
<b>A.19.5</b>	<b>Alignment</b>	Towards each side, as in line as practicable
<b>A.19.6</b>	<b>Electrical connections</b>	Not applicable
<b>A.19.7</b>	<b>Tell-tale indicator</b>	Not applicable

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

<b>A.20.1</b>	<b>Colour of the emblem</b>	Red-orange fluorescent/red retro-reflective
<b>A.20.2</b>	<b>Number</b>	One
<b>A.20.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above ground)	$\leq 3\,000$ preferred
	$H_2$ (minimum height above ground)	$\geq 600$
<b>A.20.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	5°
	$\alpha_2$ (downwards)	5°
	$\beta_1$ (outwards)	25° both sides
	$\beta_2$ (inwards)	Not applicable
<b>A.20.5</b>	<b>Alignment</b>	Perpendicular to direction of travel, within $\pm 20^\circ$ of vertical and as near to the machine centreline as practicable
<b>A.20.6</b>	<b>Electrical connections</b>	Not applicable
<b>A.20.7</b>	<b>Tell-tale indicator</b>	Not applicable

## A.21 Signalling panel

<b>A.21.1</b>	<b>Colour of the panel</b>	White and red
<b>A.21.2</b>	<b>Number</b>	Two on the front and two on the rear
<b>A.21.3</b>	<b>Dimensions</b> (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)	$\leq 250$
<b>A.21.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	5°
	$\alpha_2$ (downwards)	5°
	$\beta_1$ (outwards)	25°
	$\beta_2$ (inwards)	25°
<b>A.21.5</b>	<b>Alignment</b>	Towards the front and towards the rear
<b>A.21.6</b>	<b>Electrical connections</b>	Not applicable
<b>A.21.7</b>	<b>Tell-tale indicator</b>	Not applicable

## A.22 Rear implement connector

<b>A.22.1</b>	<b>Colour of the light</b>	Not applicable
<b>A.22.2</b>	<b>Number</b>	One or two
<b>A.22.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_3$ (maximum height above hitch point)	$\leq 1200$
	$H_4$ (minimum height above hitch point)	$\geq 200$
	$H_5$ (maximum distance in front of hitch point):	$\leq 1200$
	$H_6$ (minimum distance in front of hitch point)	$\geq 200$
	$H_7$ (maximum lateral distance from hitch point)	$\leq 300$
<b>A.22.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	Not applicable
	$\alpha_2$ (downwards)	Not applicable
	$\beta_1$ (outwards)	Not applicable
	$\beta_2$ (inwards)	Not applicable
<b>A.22.5</b>	<b>Alignment</b>	Rear facing
<b>A.22.6</b>	<b>Electrical connections</b>	Not applicable
<b>A.22.7</b>	<b>Tell-tale indicator</b>	Not applicable

## A.23 Front implement connector

<b>A.23.1</b>	<b>Colour of the light</b>	Not applicable
<b>A.23.2</b>	<b>Number</b>	One or two
<b>A.23.3</b>	<b>Dimensions</b> (in millimetres)	
	$H_1$ (maximum height above hitch point)	$\leq 1200$
	$H_2$ (minimum height above hitch point)	$\geq 200$
	$H_3$ (maximum distance in front of hitch point):	$\leq 1200$
	$H_4$ (minimum distance in front of hitch point)	$\geq 200$
	$H_5$ (maximum lateral distance from hitch point)	$\leq 300$
<b>A.23.4</b>	<b>Minimum angles of geometric visibility</b> (in degrees)	
	$\alpha_1$ (upwards)	Not applicable
	$\alpha_2$ (downwards)	Not applicable
	$\beta_1$ (outwards)	Not applicable
	$\beta_2$ (inwards)	Not applicable
<b>A.23.5</b>	<b>Alignment</b>	Front facing
<b>A.23.6</b>	<b>Electrical connections</b>	Not applicable
<b>A.23.7</b>	<b>Tell-tale indicator</b>	Not applicable

## Annex B (normative)

### Colorimetric characteristics of illuminating and signalling lights

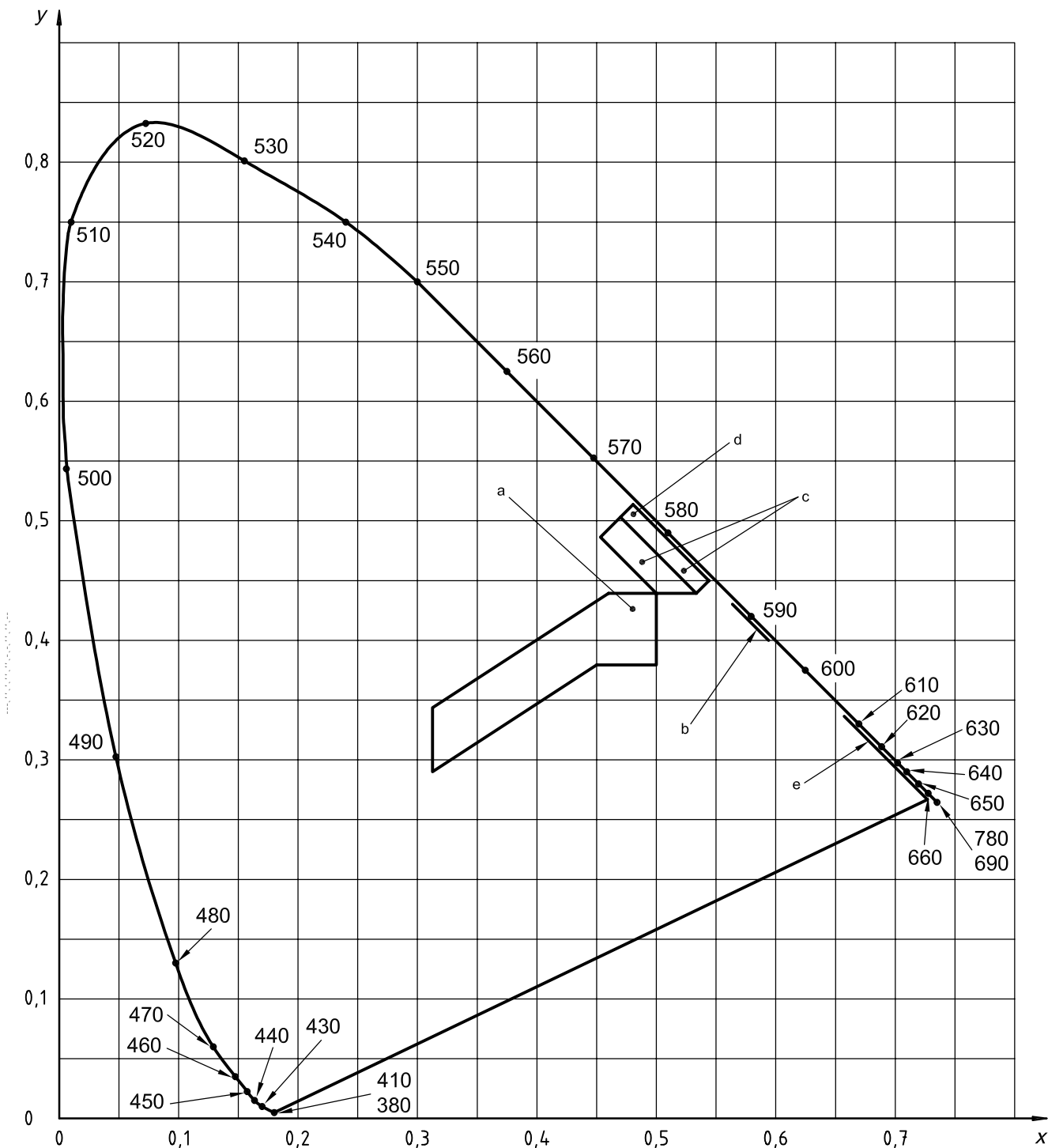
The trichromatic coordinates shall be in accordance with Table B.1. See Figure B.1 for the colorimetric zones corresponding to recommended limits.

**Table B.1 — Trichromatic coordinates**

<b>Red</b>	Limit towards:	yellow	$y \leq 0,335$
		purple <sup>a</sup>	$z \leq 0,008$
<b>White</b>	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	$y \geq 0,382$
<b>Amber</b>	Limit towards:	yellow <sup>a</sup>	$y \leq 0,429$
		red <sup>a</sup>	$y \geq 0,398$
		white <sup>a</sup>	$z = 0,007$
<b>Selective yellow</b>	Limit towards:	red <sup>a</sup>	$y \geq 0,138 + 0,580x$
		green <sup>a</sup>	$y \leq 1,29x - 0,100$
		white <sup>a</sup>	$y \geq -x + 0,966$
		spectral value <sup>a</sup>	$y \geq -x + 0,992$
<b>Enlarged selective yellow</b>	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	$y \leq -x + 0,992$

<sup>a</sup> 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.

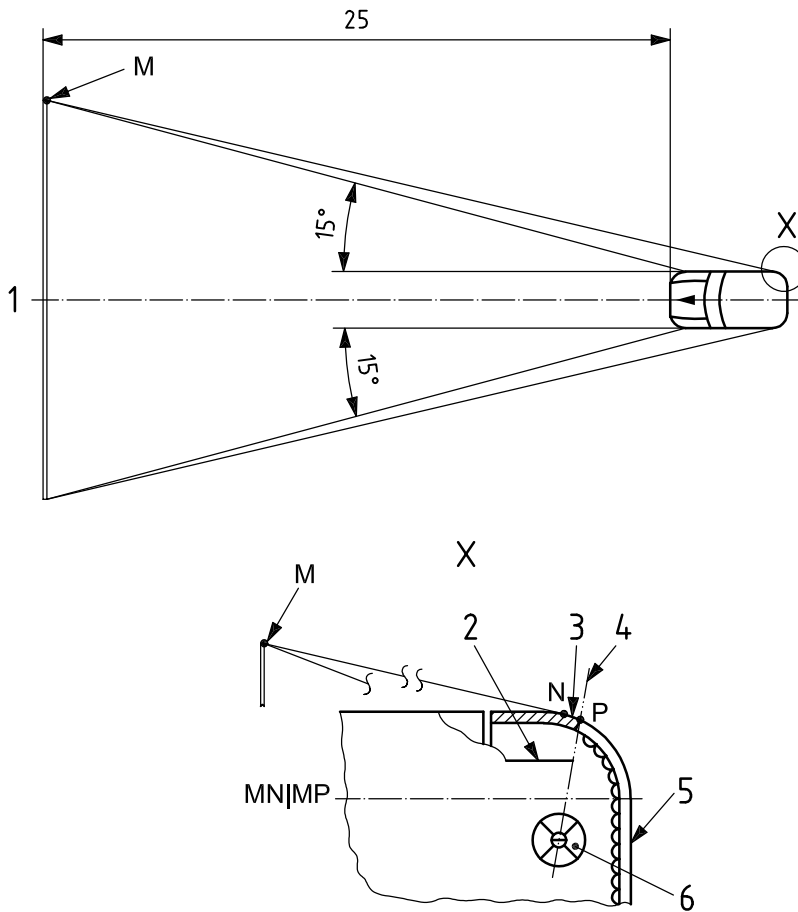
**Figure B.1 — Colorimetric zones corresponding to recommended limits**

## 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

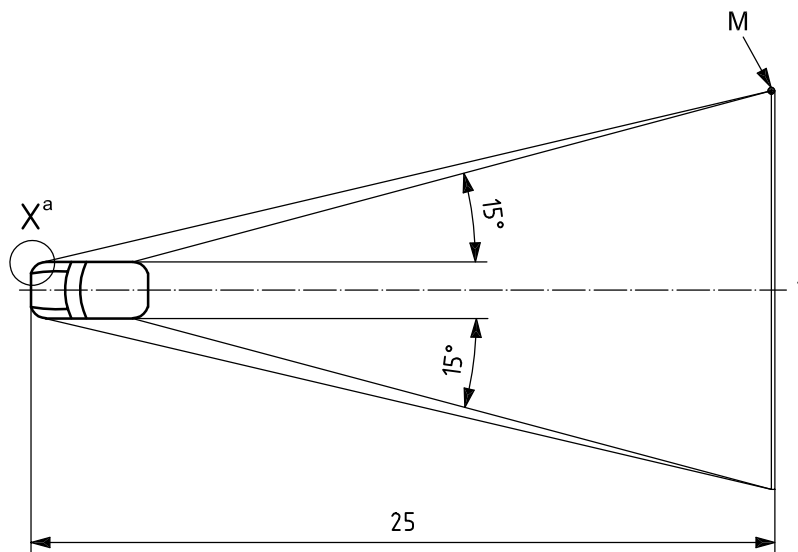


**Key**

- 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

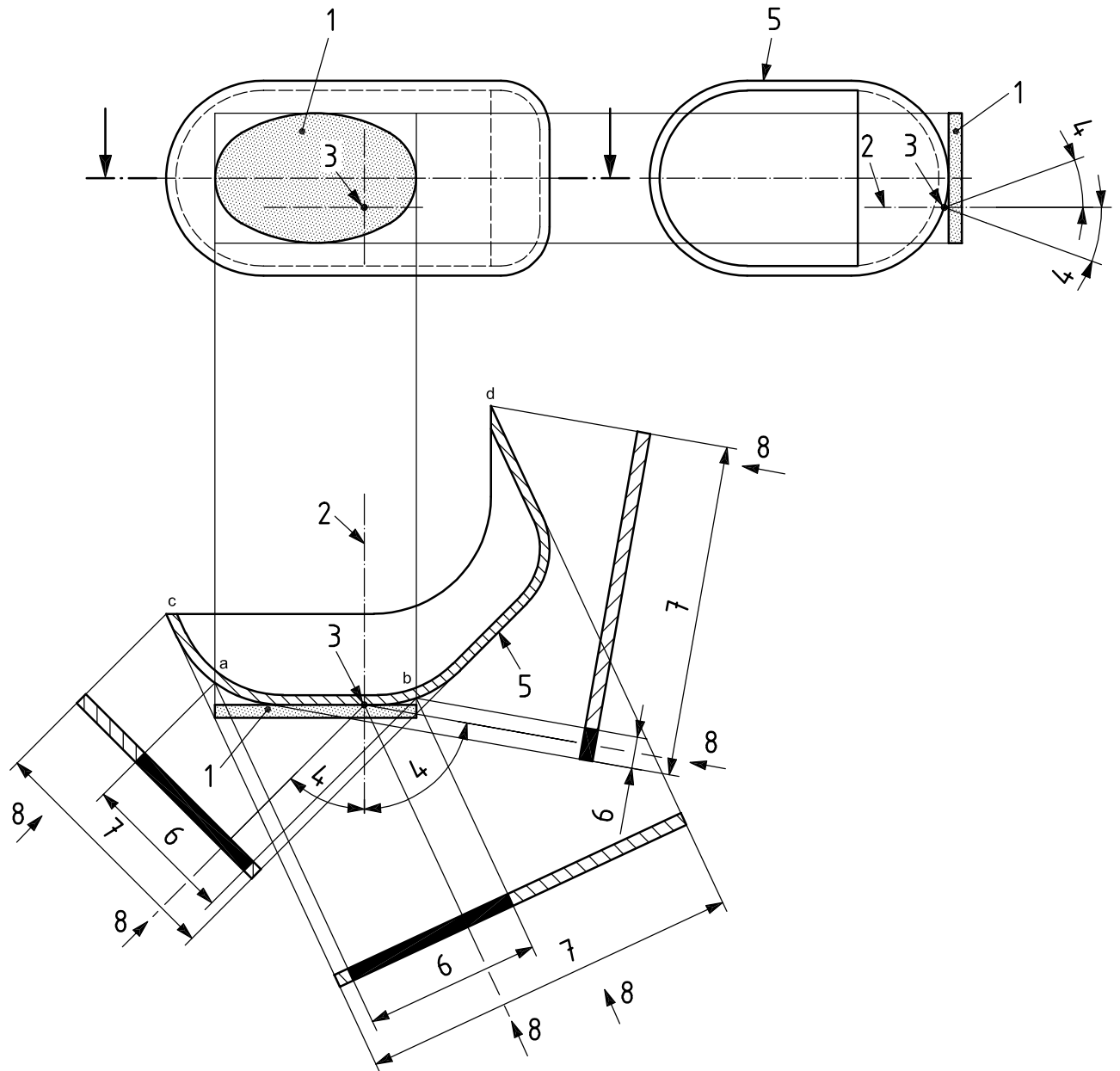
<sup>a</sup> Symmetric design of detail of Figure C.1.

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

**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.



**Key**

- |   |                                 |   |  |
|---|---------------------------------|---|--|
| 1 | illuminating surface            | 5 | light-emitting surface                           |
| 2 | reference axis                  | 6 | apparent surface based on illuminating surface   |
| 3 | centre of reference             | 7 | apparent surface based on light-emitting surface |
| 4 | angle of geometric visibility   | 8 | direction of visibility                          |
| a | Edge of illuminating surface.   |   |  |
| b | Edge of illuminating surface.   |   |  |
| c | Edge of light-emitting surface. |   |  |
| d | Edge of light-emitting surface. |   |  |

**Figure D.1 — Lamp surfaces, reference axis, centre of reference and angles of geometric visibility**

**Annex E**  
(informative)

**Other requirements for lighting and marking devices**

Requirements for the presence of lighting and marking devices are the subject of various regional standards and/or regulations. For information, these are summarised as follows for the EEC and North America.

EEC requirements			
Device	Tractor	Self-propelled machine	Trailer, trailed or mounted implement
Dipped-beam headlamp	R	R	NP
Main-beam headlamp	O	O	NP
Work lamp	O	O	O
Reversing lamp	O	O	O
Front-position lamp	R <sup>a b</sup>	R <sup>a b</sup>	R <sup>a b c</sup>
Rear-position lamp	R <sup>b</sup>	R <sup>b</sup>	R <sup>b d</sup>
End-outline marker lamp	NP/O <sup>a e</sup>	NP/O <sup>a e</sup>	NP/O <sup>a e</sup>
Stop lamp	R <sup>o</sup>	R <sup>o</sup>	R <sup>o</sup>
Front direction indicator lamp	R <sup>q</sup>	R <sup>q</sup>	O
Rear direction indicator lamp	R <sup>q f</sup>	R <sup>q f</sup>	R
Hazard warning signal	R <sup>g</sup>	R <sup>g</sup>	R
Special warning lamp	O/R <sup>h</sup>	O/R <sup>h</sup>	O/R <sup>h</sup>
Rear registration-plate lamp	R	R	R
Front fog lamp	O	O	O
Rear fog lamp	O	O	O
Rear retro-reflectors	R <sup>b i</sup>	R <sup>b i</sup>	R <sup>b i</sup>
Rear fluorescent marking	NR	NR	NR
Front retro-reflector	NR	NR	R <sup>a</sup>
Side retro-reflector	R <sup>j k l</sup>	R <sup>j k l</sup>	R <sup>j k l</sup>
Slow-moving vehicle emblem	O/R <sup>h</sup>	O/R <sup>h</sup>	O/R <sup>h</sup>
Signalling panel	R <sup>h m</sup>	R <sup>h m</sup>	R <sup>h m</sup>
Implement connector	O <sup>n</sup>	O <sup>n</sup>	O <sup>n</sup>
R Required O Optional NP Not permitted NR No requirement			

- a Colour shall be white for front facing devices.
- b Distance from outer edge shall be no greater than 400 mm.
- c Required if the distance between the outer edge of the towed vehicle and the outer edge of the position lamp of the towing vehicle exceeds 400 mm.
- d One required if width  $\leq 1,20$  m; two required if width  $> 1,20$  m.
- e Not permitted if width  $\leq 2,10$  m; optional if width  $> 2,10$  m.
- f Tractors and self-propelled machines designed to tow trailers shall have turn indicator tell-tale(s) to indicate trailer turn indicator operation.
- g Tell-tale for hazard warning shall be red.
- h Dependant on national regulations.
- i Shall have two not higher than 1 200 mm above ground.
- j Colour shall be amber.
- k Required if vehicle length exceeds 6 000 mm.
- l May be fitted on centre of wheel(s).
- m Required on vehicles  $> 2,55$  m. wide.
- n Required only if the self-propelled machine is designed to tow a trailer or trailed implement.
- o Not less than 500 mm apart. This distance may be reduced to 400 mm if the overall width is less than 1 400 mm.
- q Arrangement (see Directive 78/933/EEC, Appendix 3).

North American requirements			
Device	Tractor	Self-propelled machine	Trailer, trailed or mounted implement
Dipped-beam headlamp	R	R	NP
Main-beam headlamp	O	O	NP
Work lamp	O	O	O
Reversing lamp	O	O	O
Front-position lamp	O	O	O
Rear-position (tail) lamp	R	R	R <sup>a</sup>
End-outline marker lamp	O	O	O
Stop lamp	O	O	O
Front direction indicator lamp	R <sup>l m</sup>	R <sup>l m</sup>	R <sup>b l m</sup>
Rear direction indicator lamp	R <sup>l j m</sup>	R <sup>l j m</sup>	R <sup>b l j m</sup>
Hazard warning signal	R <sup>h</sup>	R <sup>h</sup>	R <sup>b c h</sup>
Special warning lamp	O	O	O
Rear registration-plate lamp	O	O	O
Front fog lamp	O	O	O
Rear fog lamp	O	O	O
Rear retro-reflectors	R	R	R <sup>d</sup>
Rear fluorescent marking	R if W > 3,7 m	R if W > 3,7 m	R if W > 3,7 m
Front retro-reflector	R if W > 3,7 m	R if W > 3,7 m	R if W > 3,7 m
Side retro-reflector	O	O	R if L > 5 m
Slow-moving vehicle emblem	R	R	R <sup>e</sup>
Signalling panel	O	O	O
Implement connector	R <sup>f</sup>	R <sup>f</sup>	R <sup>g</sup>
R Required O Optional NP Not permitted			

© ISO 2005 – All rights reserved



- a Required if the rear position (tail) lamp on the propelling machine is obscured.
- b Required if the corresponding lamp on the propelling machine is obscured.
- c Required if the width of trailer, trailed or mounted equipment is greater than 3,70 m in road transport configuration, or if the equipment extends more than 7,60 m to the rear of the hitch point, or if the equipment extends more than 1,80 m to the left or right of the centreline and beyond the left or right extremity of the propelling machine.
- d Required if the trailer, trailed or mounted equipment extends more than 1,20 m to the rear of the hitch point of the propelling machine, or if the equipment (including front mounted equipment) extends more than 1,20 m to the right or left of the centreline of the propelling machine. No retro-reflectors are required on the rear of front mounted equipment for a horizontal distance of 1,20 m on either side of the centreline of the propelling machine.
- e Required if the trailer, trailed or mounted equipment extends more than 5 m to the rear of the hitch point of the propelling machine, or if the slow moving vehicle emblem on the propelling machine is obscured.
- f Tractors and self-propelled equipment not primarily used with agricultural trailers, trailed or mounted equipment are excluded from this requirement.
- g The connector location and cable length shall be compatible with the location of the receptacle on the tractor or self-propelled machine.
- h Lamps shall flash in unison at a rate at least 20 flashes per minute less than the turn indication flash rate.
- i When a turn is signalled, the direction indicator lamps opposite the direction of the turn shall become steady burning and the direction indicator lamps in the direction of the turn shall flash at a rate of 85 to 110 flashes per minute. Turn indication shall over-ride the operation of the hazard warning signal.
- j Additional rear facing red or amber lamps conforming to SAE J2261, mounted according to the requirements for rear-position lamps shall operate in conjunction with the turn indicator lamps. The additional lamp on the side in the direction of the turn shall flash in unison with the direction indicator lamps. The additional lamp on the side opposite the direction of turn may remain off, or on, or become brighter but shall not flash. These lamps may be reciprocally incorporated with the rear-position lamps. They shall not flash as part of the hazard warning signal.
- k Required if width of equipment is greater than 3,70 m in road transport configuration.
- l Required if the equipment extends more than 5 m to the rear of the hitch point of the propelling machine in road transport configuration
- m Distance from outer edge shall not be greater than 400 mm when road transport width is greater than 3,70 m.

## Annex F (informative)

### Technical specifications of lighting and marking devices covered by other standards

The technical specifications of the various lighting and marking devices specified in this International Standard are also subject to regional standards and/or regulations, given as follows, for information. See Bibliography.

Device	EEC	North America	UNECE Reg. (Ref.)
Dipped-beam headlamp	76/761/EEC	SAE J975	1, 5, 8, 20, 31, 112
Main-beam headlamp	76/761/EEC	a	1, 5, 8, 20, 31, 112
Work lamp	—	b	—
Reversing lamp	77/539/EEC	SAE J593	23
Front-position lamp	76/758/EEC	SAE J222	7
Rear-position lamp	76/758/EEC	SAE J2040	7
End-outline marker lamp	76/758/EEC	—	7
Stop lamp	76/758/EEC	SAE J2261	7
Front direction indicator lamp	76/759/EEC	SAE J2261	6
Rear direction indicator lamp	76/759/EEC	SAE J2261	6
Special warning lamp	ECE Reg. No. 65	SAE J1318 or SAE J845	65
Rear registration-plate lamp	76/760/EEC	c	4
Front fog lamp	76/762/EEC	SAE J583	19
Rear fog lamp	77/538/EEC	SAE J1319	38
Rear retro-reflectors	76/757/EEC	ASAE S279.11	3 <sup>d</sup>
Rear fluorescent marking	—	ASAE S279.11	—
Front retro-reflectors	76/757/EEC	ASAE S279.11	3 <sup>d</sup>
Side retro-reflectors	76/757/EEC	ASAE S279.11	3 <sup>d</sup>
Slow-moving vehicle emblem	ECE Reg. No. 69	ASAE S276.5	69
Signalling panel	DIN 11030	—	—
Implement connector	ISO 1724, ISO 1185, ISO 11783-2	SAE J560	—

<sup>a</sup> If equipped with main beam headlamps, applicable sections of SAE J1383 should be used

<sup>b</sup> SAE J2121 may be used as a guide to qualify work lamp performance.

<sup>c</sup> If registration plates are required, SAE J587 should be used.

<sup>d</sup> Reg. 104 may also be relevant and should be considered, dependent upon heavy and long vehicle type category.

## Bibliography

- [1] ISO 1185, *Road vehicles — Connectors for the electrical connection of towing and towed vehicles — 7-pole connector type 24 N (normal) for vehicles with 24 V nominal supply voltage*
- [2] ISO 1724, *Road vehicles — Connectors for the electrical connection of towing and towed vehicles — 7-pole connector type 12 N (normal) for vehicles with 12 V nominal supply voltage*
- [3] ISO 6814:2000, *Machinery for forestry — Mobile and self-propelled machinery — Terms, definitions and classification*
- [4] ISO 11783-2:2002, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 2: Physical layer*
- [5] ISO 7227:1987, *Road vehicles — Lighting and light signalling devices — Vocabulary*
- [6] ASAE S276.5, *Slow-Moving Identification Emblem*
- [7] ASAE S279.11, *Lighting and Marking of Agricultural Equipment on Highways*
- [8] DIN 11030, *Landmaschinen und Traktoren — Kenntlichmachung von Anbaugeräten und angehängten Arbeitsgeräten — Warntafel und Warnfolie*
- [9] ECE Regulation No. 1, *Uniform provisions concerning the approval of motor vehicle headlamps emitting an asymmetrical passing beam and/or a driving beam and equipped with filament lamps of category R2*
- [10] ECE Regulation No. 3, *Uniform provisions concerning the approval of retro-reflecting devices for power-driven vehicles and their trailers*
- [11] ECE Regulation No. 4, *Uniform provisions for the approval of devices for the illumination of rear-registration plates of motor vehicles (except motor cycles) and their trailers*
- [12] ECE Regulation No. 5, *Uniform provisions for the approval of motor vehicle "Sealed Beam" headlamps (SB) emitting a European asymmetrical passing beam or a driving beam or both*
- [13] ECE Regulation No. 6, *Uniform provisions concerning the approval of direction indicators for motor vehicles and their trailers*
- [14] ECE Regulation No. 7, *Uniform provisions concerning the approval of front and rear position (side) lamps, stop-lamps and end-outline marker lamps for motor vehicles (except motor cycles) and their trailers*
- [15] ECE Regulation No. 8, *Uniform provisions concerning the approval of motor vehicles headlamps emitting an asymmetrical passing beam or a driving beam or both and equipped with halogen filament lamps (H1, H2, H3, HB3, HB4, H7, H8, H9, HIR1, HIR2 and/or H11)*
- [16] ECE Regulation No. 19, *Uniform provisions concerning the approval of motor vehicle front fog lamps*
- [17] ECE Regulation No. 20, *Uniform provisions concerning the approval of motor vehicle headlamps emitting an asymmetrical passing beam or a driving beam or both and equipped with halogen filament lamps (H4)*
- [18] ECE Regulation No. 31, *Uniform provisions concerning the approval of halogen sealed-beam unit (HSB unit) motor vehicle headlamps emitting an asymmetrical passing beam or a driving beam or both*

- [19] ECE Regulation No. 38, *Uniform provisions concerning the approval of rear fog lamps for power-driven vehicles and their trailers*
- [20] ECE Regulation No. 65, *Uniform provisions concerning the approval of special warning lights for motor vehicles*
- [21] ECE Regulation No. 69, *Uniform provisions concerning the approval of rear marking plates for slow-moving vehicles (by construction) and their trailers*
- [22] ECE Regulation No. 104, *Uniform provisions concerning the approval of retro-reflective markings for heavy and long vehicles and their trailers*
- [23] ECE Regulation No. 112, *Uniform provisions concerning the approval of motor vehicle headlamps emitting an asymmetrical passing beam or a driving beam or both and equipped with filament lamps*
- [24] SAE J222, *Parking Lamps (Front position lamps)*
- [25] SAE J560, *Primary and Auxiliary Seven Conductor Electrical Connector for Truck-Trailer Jumper Cable*
- [26] SAE J583, *Front Fog Lamp*
- [27] SAE J587, *License Plate Illumination Devices (Rear Registration Plate Illumination Devices)*
- [28] SAE J593, *Backup Lamps (Reversing Lamps)*
- [29] SAE J845, *Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles*
- [30] SAE J975, *Headlamps for Agricultural Equipment*
- [31] SAE J1318, *Gaseous Discharge Warning Lamp for Authorized Emergency, Maintenance, and Service Vehicles*
- [32] SAE J1319, *Fog Tail Lamp (Rear Fog Light) Systems*
- [33] SAE J1383, *Performance Requirements for Motor Vehicle Headlamps*
- [34] SAE J2040, *Tail Lamps (Rear-position lamps) for Use on Vehicles 2032 mm or More in Overall Width*
- [35] SAE J2121, *Requirements for Composite Lighting Assemblies used on Construction and Industrial Machinery*
- [36] SAE J2261, *Stop Lamps and Front- and Rear-Turn Signal Lamps for Use on Motor Vehicles 2032 mm or More in Overall Width*
- [37] 76/757/EEC, *Council Directive 76/757/EEC of 27 July 1976 on the approximation of the laws of the Member States relating to reflex reflectors for motor vehicles and their trailers*
- [38] 76/758/EEC, *Council Directive 76/758/EEC of 27 July 1976 on the approximation of the laws of the Member States relating to end-outline marker lamps, front position (side) lamps, rear position (side) lamps and stop lamps for motor vehicles and their trailers*
- [39] 76/759/EEC, *Council Directive 76/759/EEC of 27 July 1976 on the approximation of the laws of the Member States relating to direction indicator lamps for motor vehicles and their trailers*
- [40] 76/760/EEC, *Council Directive 76/760/EEC of 27 July 1976 on the approximation of the laws of the Member States relating to the rear registration plate lamps for motor vehicles and their trailers*

- [41] *76/761/EEC, Council Directive 76/761/EEC of 27 July 1976 on the approximation of the laws of the Member States relating to motor-vehicle headlamps which function as main-beam and/or dipped-beam headlamps and to incandescent electric filament lamps for such headlamps*
- [42] *76/762/EEC, Council Directive 76/762/EEC of 27 July 1976 on the approximation of the laws of the Member States relating to front fog lamps for motor vehicles and filament lamps for such lamps*
- [43] *77/538/EEC, Council Directive 77/538/EEC of 28 June 1977 on the approximation of the laws of the Member States relating to rear fog lamps for motor vehicles and their trailers*
- [44] *78/933/EEC, Council Directive of 17 October 1978 on the approximation of the laws of the Member States relating to the installation of lighting and light signalling devices on wheeled agricultural and forestry tractors*

---

---

**ICS 43.040.30; 65.060.10**

Price based on 41 pages