
**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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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
Web www.iso.org

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Foreword

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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*.

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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*

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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

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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

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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

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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 (standards.iteh.ai)

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 [ISO 16154:2005](https://standards.iteh.ai/catalog/standards/sist/3d58acf8-3267-4109-b82b-013f537a62da/iso-16154-2005)
- A.9 Front direction indicator lamp <https://standards.iteh.ai/catalog/standards/sist/3d58acf8-3267-4109-b82b-013f537a62da/iso-16154-2005>
- A.10 Rear direction indicator lamp
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Special purpose lighting

- A.13 Rear registration-plate lamp
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Retro-reflective/marketing devices

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