



Legal regulations

for cars and trailers based on ECE regulation 48



Survey of lighting regulations

Legal provisions must be complied with when equipping or retrofitting parts to a vehicle. The following pages present the legal regulations concerning the installation of front, side or rear lighting, as stipulated by ECE regulation 48.

The overview is split into two areas:

- Regulations for vehicle classes (passenger cars, offroad vehicles, motorhomes, buses, trucks, municipal vehicles and vehicles with special bodywork).
- Regulations for vehicle classes (12 V trailers, caravans and 24 V trailers).

Which lamps are mandatory by law and which are optional are clearly stated. The fitting regulations for the individual lamps are also explained in detail.

HELLA shall assume no liability for potential deviations from the equipment requirements documented here, as experience shows that legal regulations are modified at irregular intervals.

Last updated: late 2013 (ECE-R48 series 06 revision 9, supp. 3)

Vehicle classes:	
M₁	Cars up to 3.5 t and up to 9 passengers
M₂	Cars up to 5 t and up to 9 passengers
M₃	Cars up to 5 t and over 9 passengers
N₁	Vehicles for transporting freight up to 3.5 t
N₂	Vehicles for transporting freight over 3.5 t up to 12 t
N₃	Vehicles for transporting freight over 12 t
N_{3G}	Offroad vehicles

Vehicle classes:	
O₁	Trailers up to 0.75 t
O₂	Trailers over 0.75 t to 3.5 t
O₃	Trailers over 3.5 t to 10 t
O₄	Trailers over 10 t



Passenger cars



Offroad vehicles



Motorhomes



Buses



Trucks



Municipal vehicles and vehicles with special bodywork



12 V trailers



Caravans



24 V trailers

These pictograms indicate to which regulations apply to which classes.

Legal regulations based on ECE regulation 48

Car classes

(passenger cars, offroad vehicles, motorhomes, buses, trucks, municipal vehicles and vehicles with special bodywork)



3 Rear lighting
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1 Front lighting
Pages 6–11

2 Side lighting
Pages 12–17

Legal regulations for lamps and headlamps

Due to the scope of the legal regulations, only the most important are explained here. The following regulations contain all the relevant information on signal lamps and headlamps, their properties and uses.

Passenger cars, offroad vehicles, motorhomes, buses, trucks, municipal vehicles and vehicles with special bodywork

Vehicle classes:

M₁ Cars up to 3.5 t and up to 9 passengers

M₂ Cars up to 5 t and up to 9 passengers

M₃ Cars up to 5 t and over 9 passengers

N₁ Vehicles for transporting freight up to 3.5 t

N₂ Vehicles for transporting freight over 3.5 t up to 12 t

N₃ Vehicles for transporting freight over 12 t

N_{3G} Offroad vehicles

- **ECE-R3**
Reflex reflector
- **ECE-R4**
Registration plate lamp
- **ECE-R6**
Direction indicator front, rear and side
- **ECE-R7**
Position lamp, tail lamp, stop lamp and clearance lamps
- **ECE-R19**
Fog lamp
- **ECE-R23**
Reversing lamp
- **ECE-R38**
Rear fog lamp
- **ECE-R48**
For installation and use
- **ECE-R77**
Parking lamps front and rear
- **ECE-R87**
Daytime running lamps
- **ECE-R91**
Side marker lamps
- **ECE-R98**
Xenon headlamp
- **ECE-R104**
Contour markings
- **ECE-R112**
Halogen headlamp
- **ECE-R119**
Cornering lamp
- **ECE-R123**
Adaptive frontlighting system (AFS)

Vehicle categories

12 V trailers, caravans and 24 V trailers



6 Rear lighting
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4 Front lighting
Pages 28–31

5 Side lighting
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Legal regulations for lamps

Due to the scope of the legal regulations, only the most important are explained here. The following regulations contain all the relevant information about signal lamps, their properties and uses.

Trailer/caravan classes

Vehicle classes:	
O ₁	Trailers up to 0.75 t
O ₂	Trailers over 0.75 t to 3.5 t
O ₃	Trailers over 3.5 t to 10 t
O ₄	Trailers over 10 t

- **ECE-R3**
Reflex reflector
- **ECE-R4**
Registration plate lamp
- **ECE-R6**
Direction indicator rear and side
- **ECE-R7**
Position lamp, tail lamp, stop lamp and clearance lamps
- **ECE-R23**
Reversing lamp
- **ECE-R38**
Rear fog lamp
- **ECE-R48**
For installation and use
- **ECE-R77**
Parking lamps front and rear
- **ECE-R91**
Side marker lamps
- **ECE-R104**
Contour markings

1

Front lighting – motor vehicle





Headlamps for low beam

ECE-R48 section 6.2, ECE-R98 und ECE-R112 (ECE-R123 contains further special conditions)

Presence ECE-R48 § 6.2.1	Mandatory for all passenger car classes.
Number ECE-R48 § 6.2.2	2 units
Color ECE-R48 § 5.15	White
Position in width ECE-R48 § 6.2.4.1	Max. 400 mm from the extreme outer edge of the vehicle. Min. 600 mm between the two low beam headlamps. Min. 400 mm, if the total vehicle width is < 1,300 mm (not applicable to M ₁ - and N ₁ vehicles.).
Position in height ECE-R48 § 6.2.4.2	Min. 500 mm, max. 1,200 mm, max. 1,500 mm on N ₂ G vehicles.
Visibility ECE-R48 § 6.2.5	Horizontal 10° inwards and 45° outwards. Vertical 15° upwards and 10° downwards.
Electrical connections ECE-R48 § 6.2.7	The low beam may remain on when the high beam is switched on.
Tell-tale ECE-R48 § 6.2.8	Optional
Other regulations ECE-R48 § 6.2.9	Automatic leveling must be installed with LED headlamps. If the headlamps are equipped with light sources > 2,000 lumen (usually xenon), automatic leveling and a headlamp cleaning system need to be installed, 2 additional cornering lamps are optional.



Headlamps for high beam

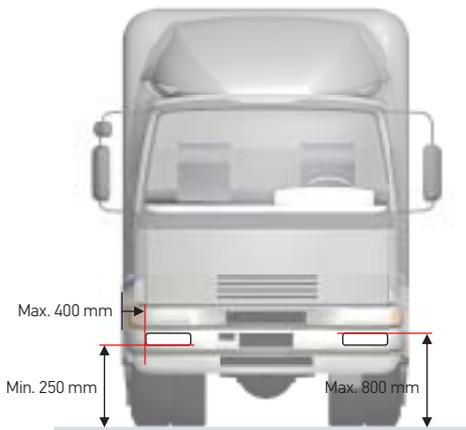
ECE-R48 section 6.1, ECE-R98 und ECE-R112 (ECE-R123 contains further special conditions)

Presence ECE-R48 § 6.1.1	Mandatory for all passenger car classes.
Number ECE-R48 § 6.1.2	2 or 4 units, for N ₂ vehicles max. 6 units
Color ECE-R48 § 5.15	White
Position in width ECE-R48 § 6.1.4.1	No specific regulations, but installed so that the driver is not dazzled by reflections.
Position in height ECE-R48 § 6.1.4.2	No specific regulations.
Visibility ECE-R48 § 6.1.5	5° in all directions.
Electrical connections ECE-R48 § 6.1.7	The high beam headlamps may only be switched on either at the same time or in pairs. If two additional high beam headlamps are installed, then no more than two pairs may be lit at the same time. During the transition from low beam to high beam, at least 1 pair needs to be switched on for high beam. During the low beam function, all high beam lamps need to switch off at the same time.
Tell-tale ECE-R48 § 6.1.8	Mandatory
Other regulations ECE-R48 § 6.1.9	The luminous intensity of all the switchable high beam lamps must not exceed 430,000 cd. The sum of the reference numbers must not be greater than 100.



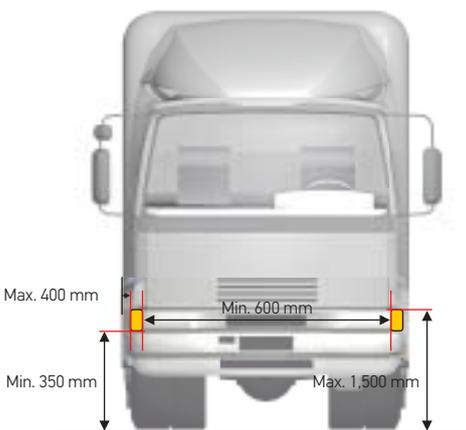
Fog lamp
ECE-R48 section 6.3 and ECE-R19

Presence ECE-R48 § 6.3.1	Optional for all passenger car classes.
Number ECE-R48 § 6.3.2	2 units
Color ECE-R48 § 5.15	White or light amber
Position in width ECE-R48 § 6.3.4.1	Max. 400 mm from the extreme outer edge of the vehicle.
Position in height ECE-R48 § 6.3.4.2	Not higher than the low beam headlamps. Min. 250 mm above the ground. For M ₁ vehicles and N ₁ vehicles, max. 800 mm above the ground. For all other vehicle classes, max. 1,200 mm, only for N ₃ G up to 1,500 mm allowed.
Visibility ECE-R48 § 6.3.5	Horizontal 10° inwards and 45° outwards. Vertical ± 5°.
Electrical connections ECE-R48 § 6.3.7	It must be possible to switch them on and off independently of the high or low beam lamps.
Tell-tale ECE-R48 § 6.3.8	Mandatory. An independent non-flashing warning lamp.
Other regulations ECE-R48 § 6.3.6.2.2	Special regulation in connection with the headlamps of the R123 (AFS)



Front direction indicator (indicator)
ECE-R48 section 6.5 and ECE-R6

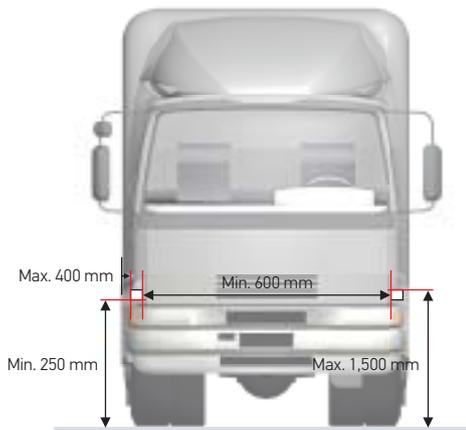
Presence ECE-R48 § 6.5.1	Mandatory for all passenger car classes. Category 1, 1a or 1b.
Number ECE-R48 § 6.5.2	2 units
Color ECE-R48 § 5.15	Amber
Position in width ECE-R48 § 6.5.4.1	Max. 400 mm from the extreme outer edge of the vehicle. Min. 600 mm between the two indicators, but min. 400 mm for vehicle widths < 1,300 mm.
Position in height ECE-R48 § 6.5.4.2	Min. 350 mm, max. 1,500 mm (exception: 2,100 mm)*.
Visibility ECE-R48 § 6.5.5	Horizontal 45° inwards to 80° outwards, vertical ± 15°, but for a position in height of < 750 mm also 5° downwards (and 20° inwards for M ₁ and N ₁ vehicles.)
Electrical connections ECE-R48 § 6.5.7	It must switch on independently of the other lamps (except other indicators). All indicators need to be switched on and off on the same side of the vehicle by the same activation device. They must flash synchronously.
Tell-tale ECE-R48 § 6.5.8	Mandatory
Other regulations ECE-R48 § 6.5.9	A malfunction of the direction indicators must be signaled in the vehicle.



* An exception is only possible if the vehicle geometry does not make standard installation possible.

ECE-R6 § 6.1

Category 1 = distance to low beam/fog lamp > 40 mm, luminous intensity min. 175 cd, single lamp max. 1,000 cd, type "D" lamp max. 500 cd
 Category 1a = distance to low beam/fog lamp > 20 mm, ≤ 40 mm, luminous intensity min. 250 cd, single lamp max. 1,200 cd, type "D" lamp max. 600 cd
 Category 1b = distance to low beam/fog lamp ≤ 20 mm, luminous intensity min. 400 cd, single lamp max. 1,200 cd, type "D" lamp max. 600 cd

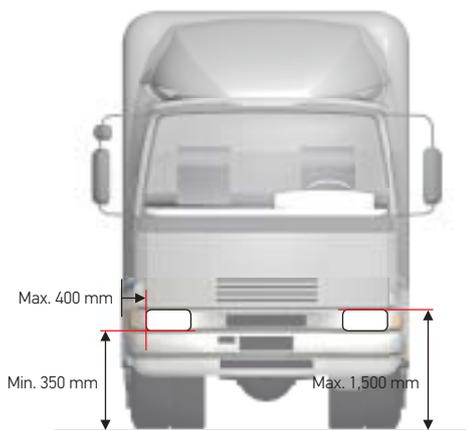


Position lamp

ECE-R48 section 6.9 and ECE-R7

Presence ECE-R48 § 6.9.1	Mandatory for all passenger car classes.
Number ECE-R48 § 6.9.2	2 units
Color ECE-R48 § 5.15	White
Position in width ECE-R48 § 6.9.4.1	Max. 400 mm from the extreme outer edge of the vehicle. The clearance between the position lamps for M ₁ and N ₁ vehicles is not defined. For all other vehicle classes, min. 600 mm between both position lamps, but min. 400 mm for vehicle widths < 1,300 mm.
Position in height ECE-R48 § 6.9.4.2	Min. 250 mm, max. 1,500 mm (exception: 2,100 mm)*.
Visibility ECE-R48 § 6.9.5	Horizontal 45° inwards to 80° outwards, vertical ± 15°, but for a position in height of < 750 mm also 5° downwards. Restriction possible for M ₁ and N ₁ vehicles (see ECE-R48 section 6.9.5.2).
Electrical connections ECE-R48 § 6.9.7	Must be designed so that the position lamp, tail lamp, side marker lamp and registration plate lamp can only be switched on and off simultaneously. May be switched off while the indicator is on.
Tell-tale ECE-R48 § 6.9.8	Mandatory. The tell-tale may not flash. Not necessary if the lighting equipment in the dashboard can only be switched on at the same time as the position lamps.

* An exception is only possible if the vehicle geometry does not make standard installation possible.



Parking lamps, front

ECE-R48 section 6.12 and ECE-R7

Presence ECE-R48 § 6.12.1	Optional for vehicles ≤ 6 m length and ≤ 2 m wide. Prohibited for all other vehicles.
Number ECE-R48 § 6.12.2	2 lamps at the front and 2 lamps at the back or 1 lamp on each side.
Color ECE-R48 § 5.15	White
Position in width ECE-R48 § 6.12.4.1	Max. 400 mm from the extreme outer edge of the vehicle. If only two lamps are installed on the entire vehicle, installation is on the vehicle sides.
Position in height ECE-R48 § 6.12.4.2	No specific regulations for M ₁ and N ₁ vehicles. For all other vehicle classes: min. 350 mm, max. 1,500 mm (exception: 2,100 mm)*.
Visibility ECE-R48 § 6.12.5	Horizontal ± 45°, vertical ± 15°, but for a position in height of < 750 mm also 5° downwards.
Electrical connections ECE-R48 § 6.12.7	It must be possible to switch on the parking lamps independently of all other functions.
Tell-tale ECE-R48 § 6.12.8	Optional. If one is available, it must not be confused with the tell-tale for the position lamps and tail lamps.
Other regulations ECE-R48 § 6.12.9	Optional. If there is a tell-tale, it must not be confused with the tell-tale for the position lamps and tail lamps.

* An exception is only possible if the vehicle geometry does not make standard installation possible.



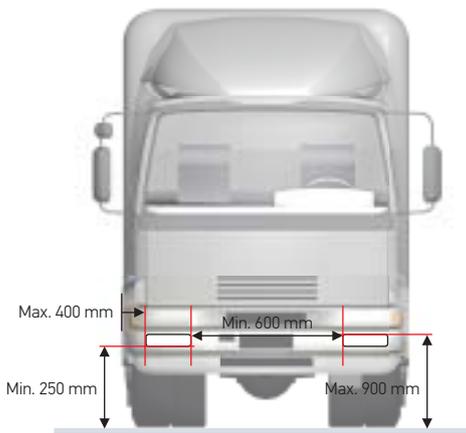
Front clearance lamp
ECE-R48 section 6.13 and ECE-R7

Presence ECE-R48 § 6.13.1	Mandatory for vehicles > 2.1 m wide. Optional for vehicles > 1.8 m ≤ 2.1 m width. Category A or AM.
Number ECE-R48 § 6.13.2	2 units, further 2 optionally possible
Color ECE-R48 § 5.15	White
Position in width ECE-R48 § 6.13.4.1	As close as possible to the extreme outer edge, max. 400 mm from the extreme outer edge of the vehicle.
Position in height ECE-R48 § 6.13.4.2	Above the transparent area of the windshield.
Visibility ECE-R48 § 6.13.5	Horizontal 80° outwards. Vertical 5° over and 20° below the horizontal.
Electrical connections ECE-R48 § 6.13.7	Must be designed so that the position lamp, tail lamp, clearance lamp, side marker lamps and registration plate lamps can only be switched on and off simultaneously.
Tell-tale ECE-R48 § 6.13.8	Optional. If there is a tell-tale, its function must be satisfied by the mandatory tell-tale for the position lamps and tail lamps.
Other regulations ECE-R48 § 6.13.9	The front white and rear contour lamps may be combined in one lamp as long as the installation instructions and visibility values are satisfied. Distance to position lamp min. 200 mm.

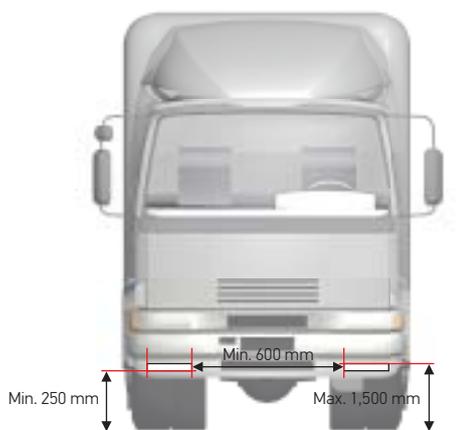


Front reflector
ECE-R48 section 6.16 and ECE-R3

Presence ECE-R48 § 6.16.1	Mandatory for vehicles with retractable headlamps/lamps. Optional on all other vehicles.
Number ECE-R48 § 6.16.2	Min. 2 devices
Color ECE-R48 § 5.15	White/colorless
Shape ECE-R48 § 6.16	Not triangular
Position in width ECE-R48 § 6.16.4.1	Max. 400 mm from the extreme outer edge of the vehicle. The clearance between the reflectors for M ₁ and N ₁ vehicles is not defined. For all other vehicle classes, min. 600 mm between both reflectors, but min. 400 mm for vehicle widths < 1,300 mm.
Position in height ECE-R48 § 6.16.4.2	Min. 250 mm, max. 900 mm (exception: 1,500 mm)*.
Visibility ECE-R48 § 6.16.5	Horizontal ± 30°. Vertical ± 10°, but for a position in height of < 750 mm 5° downwards.



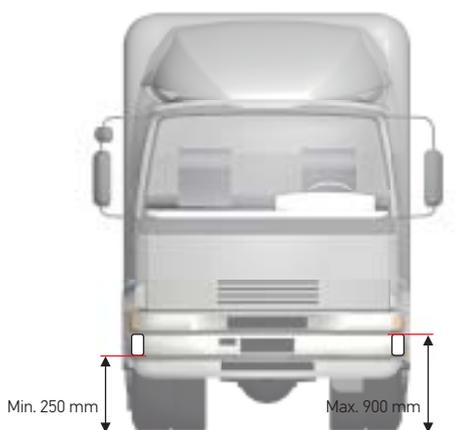
* An exception is only possible if the vehicle geometry does not make standard installation possible.



Daytime running lamps

ECE-R48 section 6.19 and ECE-R87

Presence ECE-R48 § 6.19.1	Mandatory for all passenger car classes.
Number ECE-R48 § 6.19.2	2 units
Color ECE-R48 § 5.15	White
Position in width ECE-R48 § 6.19.4.1	Min. 600 mm between the two daytime running lamps, but min. 400 mm for vehicle widths < 1,300 mm.
Position in height ECE-R48 § 6.19.4.2	Min. 250 mm, max. 1,500 mm.
Visibility ECE-R48 § 6.19.5	Horizontal $\pm 20^\circ$. Vertical $\pm 10^\circ$.
Electrical connections ECE-R48 § 6.19.7	Automatic activation when the engine is started. The daytime running lamps must switch off automatically if the headlamps or fog lamps are switched on.
Tell-tale ECE-R48 § 6.19.8	Optional

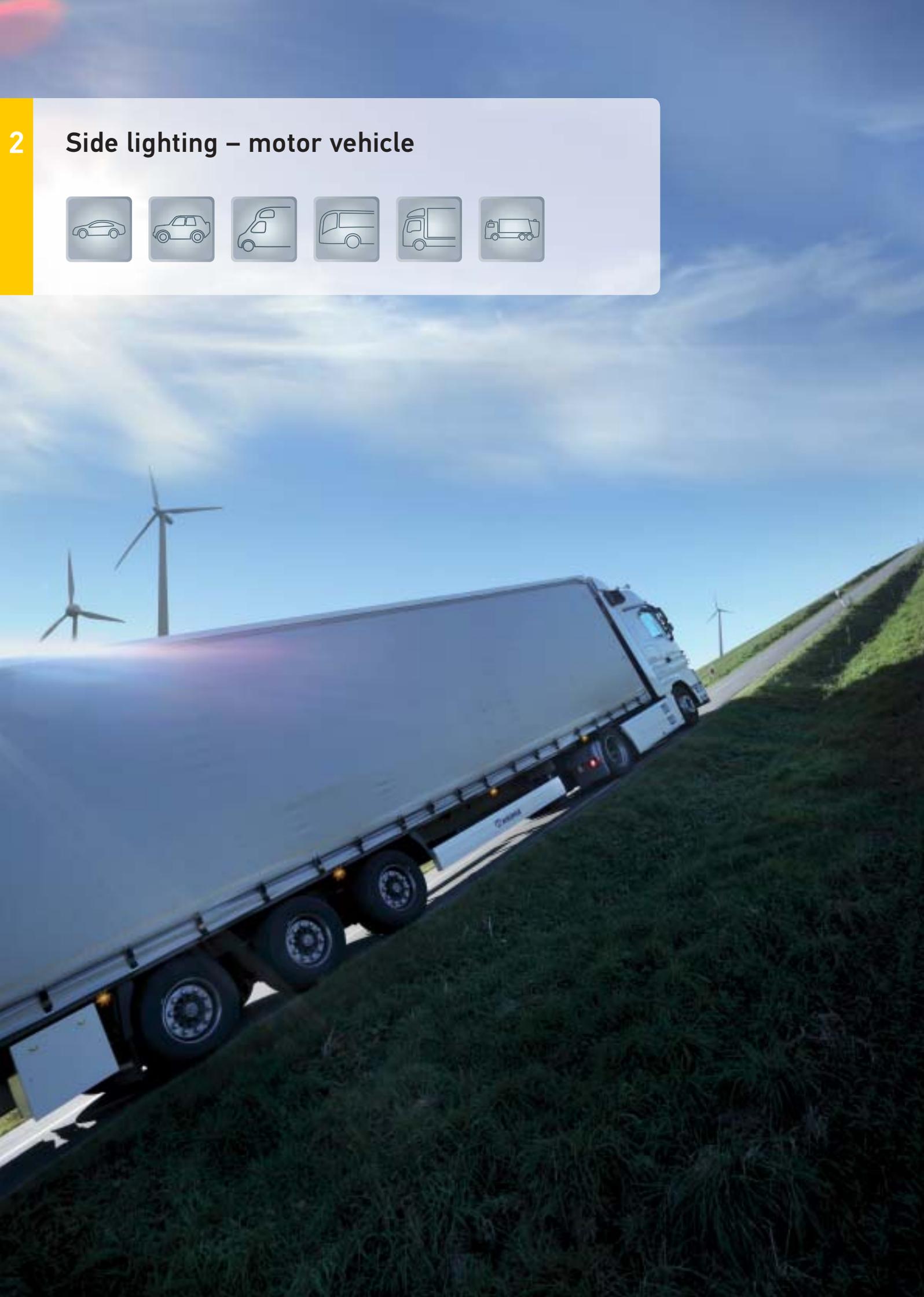
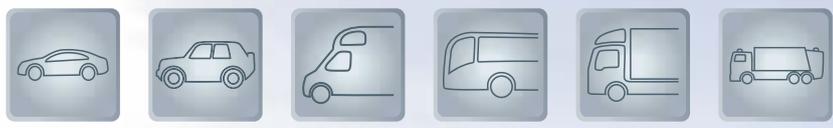


Cornering lamp

ECE-R48 section 6.20 and ECE-R119

Presence ECE-R48 § 6.20.1	Optional for all passenger car classes.
Number ECE-R48 § 6.20.2	2 units
Color ECE-R48 § 5.15	White
Position in height ECE-R48 § 6.20.4.3	Min. 250 mm, max. 900 mm, but not higher than the low beam lamp.
Position in length ECE-R48 § 6.20.4.2	Max. 1,000 mm away from the foremost point of the vehicle.
Visibility ECE-R48 § 6.20.5	Vertical $\pm 10^\circ$. Horizontal 30° to 60° outwards.
Electrical connections ECE-R48 § 6.20.7	Switched so that they can only be switched on when the high beam or low beam lamps are switched on. Only switched on when the direction indicator is switched on on the same side of the vehicle and/or when the steer angle changes from the straight-ahead position. Automatic switch-off when the direction indicator is canceled and/or when the steering returns to the straight-ahead position. The cornering lamp may also be switched on while the reversing lamp is on. The cornering lamp must also be switched off when the reversing lamp is off.
Tell-tale ECE-R48 § 6.20.8	None
Other regulations ECE-R48 § 6.20.9	The cornering lamps are not to be switched on at speeds of > 40 km/h.

Side lighting – motor vehicle





Side direction indicator (indicator)

ECE-R48 section 6.5 and ECE-R6

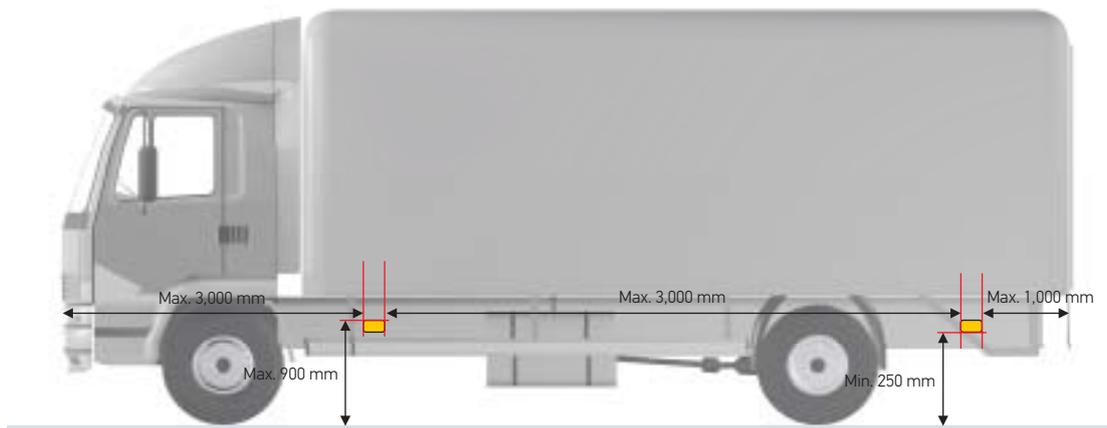
Presence ECE-R48 § 6.5.1	Category 5: mandatory for M ₁ vehicles and N ₁ , M ₂ , M ₃ vehicles of ≤ 6 m length. Category 6: mandatory for N ₂ , N ₃ vehicles and N ₁ , M ₂ , M ₃ vehicles of > 6 m length.
Number ECE-R48 § 6.5.2	1 on each side of the vehicle
Color ECE-R48 § 5.15	Amber
Position in height ECE-R48 § 6.5.4.2	Min. 350 mm for M ₁ and N ₁ vehicles, min. 500 mm for all other vehicle classes. Max. 1,500 mm (exception: 2,300 mm)*.
Position in length ECE-R48 § 6.5.4.3	Max. 1,800 mm from the front, measured from the outermost point. 2,500 mm for all M ₁ and N ₁ vehicles and whenever the vehicle geometry does not allow for any installations of < 1,800 mm.
Visibility ECE-R48 § 6.5.5	Horizontal min. 5° to 60° rear. Vertical ± 15° for category 5, but for position in heights of < 750 mm also 5° downwards. For category 6, however, 30° over and 5° below the horizontal.
Electrical connections ECE-R48 § 6.5.7	Mandatory. Must switch on with the direction indicators on the same side of the vehicle together and independently of the other lamps. They need to be switched on and off on the same side of the vehicle by the same activation device. They must flash synchronously.
Tell-tale ECE-R48 § 6.5.8	None
Other regulations ECE-R48 § 6.5.9	Side direction indicators in category 5 may always be replaced with category 6. For M ₂ , M ₃ , N ₂ and N ₃ vehicles of > 9 m length = max. 3 additional category 5 or 1 additional category 6 possible.

* An exception is only possible if the vehicle geometry does not make standard installation possible.

ECE-R6 § 6.1

Category 5 = luminous intensity min. 0.6 cd, single lamp max. 280 cd, type "D" lamp max. 140 cd

Category 6 = luminous intensity min. 50 cd, single lamp max. 280 cd, type "D" lamp max. 140 cd



Side reflector

ECE-R48 section 6.17 and ECE-R3

Presence ECE-R48 § 6.17.1	Mandatory for all vehicles > 6 m. Optional for all vehicles ≤ 6 m.
Number ECE-R48 § 6.17.2	See position in length
Color ECE-R48 § 5.15	Front amber, rear amber (in combination with the combination rear lamp, red is also possible)
Shape ECE-R48 § 6.17	Not triangular
Position in height ECE-R48 § 6.17.4.2	Min. 250 mm, max. 900 mm (exception: 1,500 mm)*. Max. 1,200 mm, if it is installed with another lighting function.
Position in length ECE-R48 § 6.17.4.3	The reflex reflector installed at the most foremost point must not be further than max. 3 m from the front of the vehicle. Max. 3 m between the individual reflex reflector. This does not apply to M ₁ and N ₁ vehicles (exception: 4 m). Max. clearance from rear 1 m, min. 1 reflex reflector in the middle third. For vehicle lengths of < 6 m, one in the first third and/or one in the last third is sufficient. M ₁ vehicles > 6 m but < 7 m, one reflex reflector within 3 m from front and one in the last third of the vehicle length.
Visibility ECE-R48 § 6.17.5	Horizontal ± 45°. Vertical ± 10°, but for a position in height of < 750 mm 5° downwards.
Other regulations ECE-R48 § 6.17.9	The illuminating surface of the reflector may be integrated in any other position lamp.

* An exception is only possible if the vehicle geometry does not make standard installation possible.

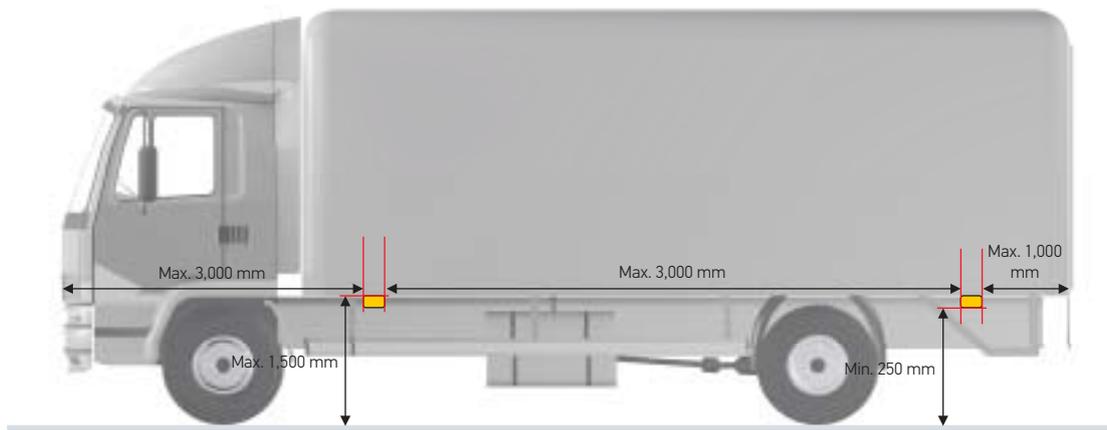


Parking lamps, side

ECE-R48 section 6.12 and ECE-R77 or ECE-R7

Presence ECE-R48 § 6.12.1	Optional for vehicles ≤ 6 m long and ≤ 2 m wide. Prohibited for all other vehicles.
Number ECE-R48 § 6.12.2	1 lamp on each side (or 2 lamps at the front and 2 lamps at the rear; see parking lamps front/rear)
Color ECE-R48 § 5.15	Amber
Position in height ECE-R48 § 6.12.4.2	No specific regulations for M ₁ and N ₁ vehicles. For all other vehicle classes: min. 350 mm, max. 1,500 mm (exception: 2,100 mm)*.
Visibility ECE-R48 § 6.12.5	Horizontal 45° to the front and rear. Vertical $\pm 15^\circ$, but for a position in height of < 750 mm 5° downwards.
Electrical connections ECE-R48 § 6.12.7	It must be possible to switch on the parking lamps independently of all other functions. Automatic switching-off is forbidden after time x.
Tell-tale ECE-R48 § 6.12.8	Optional. If one is available, it must not be confused with the tell-tale for the position lamps and tail lamps.
Other regulations ECE-R48 § 6.12.9	Optional. If there is a tell-tale, it must not be confused with the tell-tale for the position lamps and tail lamps.

* An exception is only possible if the vehicle geometry does not make standard installation possible.

**Side marker lamp**

ECE-R48 section 6.18 and ECE-R91

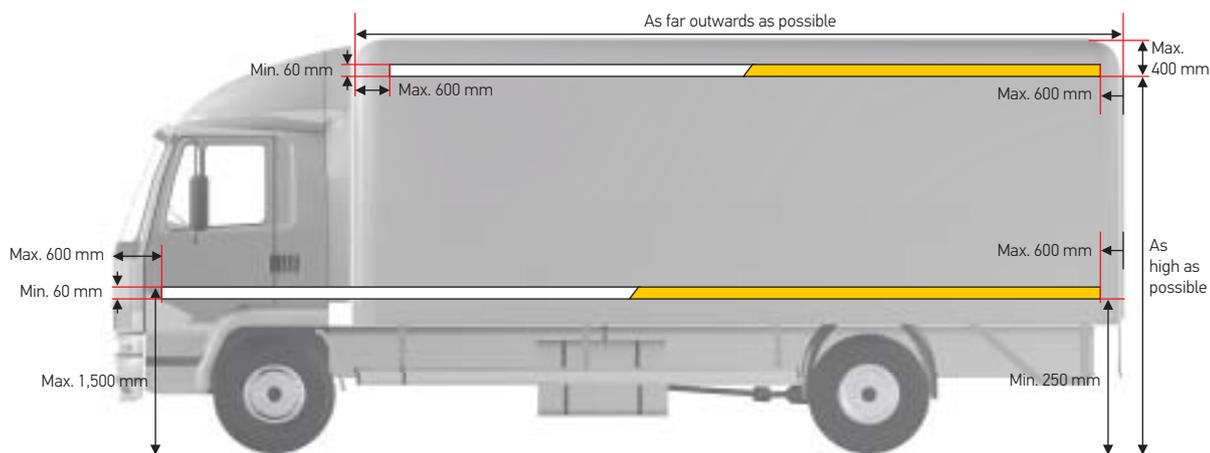
Presence ECE-R48 § 6.18.1	Mandatory for all vehicles > 6 m except for chassis with cab. Optional for all other motor vehicles. Mandatory for M ₁ vehicles and N ₁ vehicles with vehicle lengths ≤ 6 m, if the geometric visibility of the position lamps and tail lamps needs to be compensated.
Number ECE-R48 § 6.18.2	See position in length
Color ECE-R48 § 5.15	Amber (in combination with the combination rear lamp, red is also possible)
Position in height ECE-R48 § 6.18.4.2	Min. 250 mm, max. 1,500 mm (exception: 2,100 mm)*.
Position in length ECE-R48 § 6.18.4.3	Foremost max. 3 m from the front, rearmost max. 1 m from rear, max. 3 m between the individual side marker lamps (exception: 4 m). Min. 1 in the front and/or rear third. For vehicle lengths of ≤ 6 m, alternatively min. one in the middle third. M ₁ vehicles > 6 m but < 7 m, one side marker lamp within 3 m from front and one in the last third of the vehicle length.
Visibility ECE-R48 § 6.18.5	Horizontal ± 45°. For vehicles in which the installation is optional, however, ± 30°. Vertical ± 10°, but for a position in height of < 750 mm 5° downwards.
Electrical connections ECE-R48 § 6.18.7	For M ₁ vehicles and N ₁ vehicles that are < 6 m long, side marker lamps may also act as indicators. They must flash at the same frequency as the direction indicators and on the same side.
Tell-tale ECE-R48 § 6.18.8	Optional. If there is a tell-tale, its function must be met by the mandatory tell-tale for the position lamps and tail lamps.
Other regulations ECE-R48 § 6.18.9	The illuminating surface of the reflector may be integrated into the side indicator lamp. The max. position in height of the reflex reflector needs to be observed here. The rear side marker lamps must be amber if they flash together with the rear direction indicator.

* An exception is only possible if the vehicle geometry does not make standard installation possible.

ECE-R91 § 7.1

Category SM1 (use in all vehicle classes) = luminous intensity min. 4 cd, max. 25 cd

Category SM2 (use only in M₁ classes) = luminous intensity min 0.6 cd, max. 25 cd



Conspicuity markings

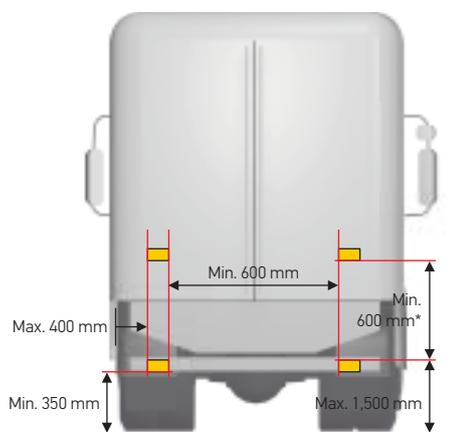
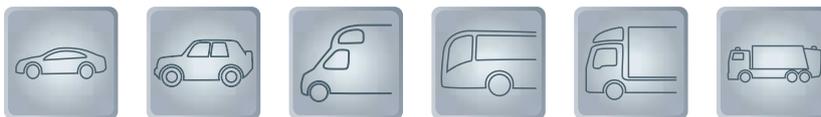
ECE-R48 section 6.21 and ECE-R104

Presence ECE-R48 § 6.21.1	Partial contour marking mandatory on vehicles in the following classes with a length of > 6,000 mm: N ₂ > 7.5 t and N ₃ (exception: chassis with cab, incomplete vehicles and semitrailer tractors). However, if it is not possible to install the mandatory contour marking, line markings may be installed. Optional on vehicles in all other classes except M ₁ vehicles. A full contour marking may be used in place of a partial contour marking. Partial or full contour marking is permissible in place of line marking.
Arrangement ECE-R48 § 6.21.3	Horizontal and vertical if compatible with the shape, structure and design of the vehicle.
Color ECE-R48 § 5.15	White or amber
Position in length ECE-R48 § 6.21.4.2	Continuous until as close as practicable to the ends of the vehicle, within max. 600 mm of each end of the vehicle. → For vehicles, at each end of the vehicle. → For semitrailer tractors at each end of the driver's cab. The total length of the horizontal markings must be min. 70 % of the value of the following dimensions: → For vehicles: length of vehicle (without driver's cab). → For semitrailer tractors: length of the driver's cab. If this is not technically feasible, this value can be reduced to 60%/40%.
Position in height ECE-R48 § 6.21.4.3	Lower marking: as low as possible, but min. 250 mm above the ground, max. 1,500 mm above the ground (exception: to 2,500 mm). Upper marking: as high as possible, max. 400 mm from the upper edge of the vehicle.
Visibility ECE-R48 § 6.21.5	Min. 70% of the marking must be visible to an onlooker.
Position on side ECE-R48 § 6.21.6.1	As close as practicable to being parallel to the median longitudinal plane of the vehicle.
Other regulations ECE-R48 § 6.21.7	1. Conspicuity markings are deemed continuous if the clearances between parts arranged next to each other are as small as possible and no more than 50% of the shortest length of one of these parts. (If this is not possible, a value > 50% but < 1 m is allowed.) 2. In the case of a partial contour marking, each upper corner must be clearly marked by two lines at angles of 90°; each line must be min. 250 mm long. 3. The locations of the vehicle where the conspicuity markings are to be installed must be big enough to bear markings that are min. 60 mm wide.

Note: due to the multitude of restrictions and modifications for conspicuity markings in ECE-R48, we strongly recommend using the unshortened original version in your planning processes.

Rear lighting – motor vehicle





* Above the mandatory indicators

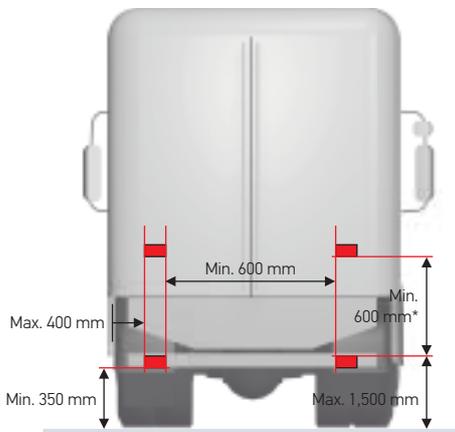
Rear direction indicator (indicator)

ECE-R48 section 6.5 and ECE-R6

Presence ECE-R48 § 6.5.1	Mandatory for all passenger car classes. Category 2a or 2b.
Number ECE-R48 § 6.5.3	2 units, further 2 optionally possible for M ₂ , M ₃ , N ₂ and N ₃ vehicles.
Color ECE-R48 § 5.15	Amber
Position in width ECE-R48 § 6.5.4.1	Max. 400 mm from the extreme outer edge of the vehicle. This does not apply to the additional indicators. Min. 600 mm between the two indicators, but min. 400 mm for vehicle widths < 1,300 mm.
Position in height ECE-R48 § 6.5.4.2	Min. 350 mm, max. 1,500 mm (exception: 2,100 mm, only if the vehicle geometry does not allow for an installation of less than 1,500 mm and if no additional indicators are installed). Position in height of the additional indicators: min. 600 mm above the mandatory indicators.
Visibility ECE-R48 § 6.5.5	Horizontal 45° inwards to 80° outwards. 45° outside for M ₁ and N ₁ vehicles if the side marker lamp also flashes. Vertical ± 15°, but for a position in height of < 750 mm also 5° downwards. Optional indicators with a position in height of 2,100 mm also 5° downwards.
Electrical connections ECE-R48 § 6.5.7	Must switch on independently of the other lamps (except other indicators). All indicators need to be switched on and off on the same side of the vehicle by the same activation device. They must flash synchronously.
Tell-tale ECE-R48 § 6.5.8	Mandatory
Other regulations ECE-R48 § 6.5.9	Installation of 2 additional indicators on all vehicles of classes M ₂ , M ₃ , N ₂ and N ₃ is optional.

ECE-R6 § 6.1

Category 2a (fixed) = luminous intensity min. 50 cd, single lamp max. 500 cd, type "D" lamp max. 250 cd
Category 2b (variable) = luminous intensity min. 50 cd, single lamp max. 1,000 cd, type "D" lamp max. 500 cd



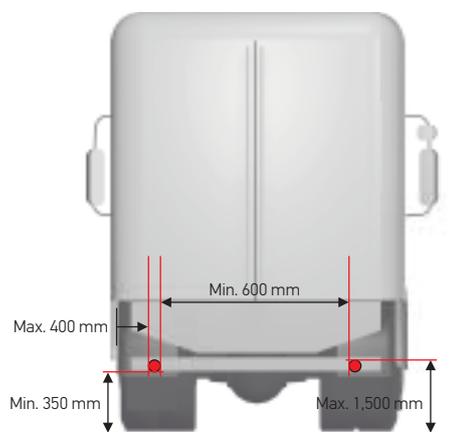
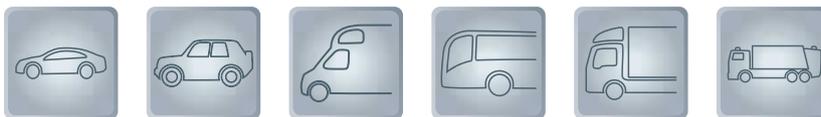
* Above the mandatory indicators

Tail lamp
ECE-R48 section 6.10 and ECE-R7

Presence ECE-R48 § 6.10.1	Mandatory for all passenger car classes. Categories R, R1 or R2.
Number ECE-R48 § 6.10.2	2 units, further 2 optionally possible for M ₂ , M ₃ , N ₂ and N ₃ vehicles (if clearance lamps are not installed).
Color ECE-R48 § 5.15	Red
Position in width ECE-R48 § 6.10.4.1	Max. 400 mm from the extreme outer edge of the vehicle. This does not apply to the additional tail lamps. The clearance between the tail lamps for M ₁ and N ₁ vehicles is not defined. For all other vehicle classes min. 600 mm between both tail lamps, but min. 400 mm for vehicle widths < 1,300 mm.
Position in height ECE-R48 § 6.10.4.2	Min. 350 mm, max. 1,500 mm (exception: 2,100 mm, only if the vehicle geometry does not allow for an installation of less than 1,500 mm and no additional tail lamps are installed). Position in height of the additional indicators: min. 600 mm above the mandatory tail lamps.
Visibility ECE-R48 § 6.10.5	Horizontal 45° inwards to 80° outwards. 45° for M ₁ and N ₁ vehicles if a side marker lamp is installed. Vertical ± 15°, but for a position in height of < 750 mm also 5° downwards. For additional tail lamps with a position in height of 2,100 mm, also 5° upwards.
Electrical connections ECE-R48 § 6.10.7	Must be designed so that the position lamp, tail lamp, side marker lamps and registration plate lamps can only be switched on and off simultaneously.
Tell-tale ECE-R48 § 6.10.8	Mandatory. It must be combined with the tell-tale for the front position lamps.

ECE-R7 § 6.1

Category R, R1 (fixed) = luminous intensity min. 4 cd, single lamp max. 17 cd, type "D" lamp max. 8.5 cd
 Category R2 (variable) = luminous intensity min. 4 cd, single lamp max. 42 cd, type "D" lamp max. 21 cd

**Stop lamp**

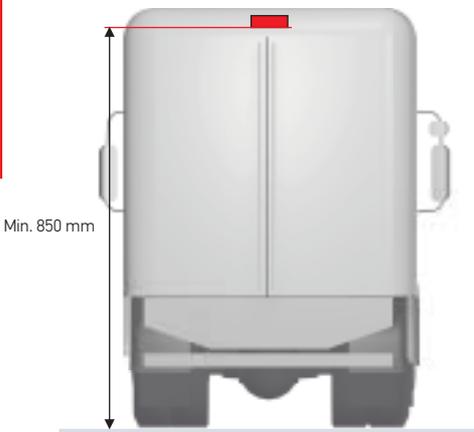
ECE-R48 section 6.7 and ECE-R7

Presence ECE-R48 § 6.7.1	Mandatory for all passenger car classes. Category S1 or S2.
Number ECE-R48 § 6.7.2	2 units Except when stop lamps in category S3 or S4 are installed (center high mounted stop lamps), two additional stop lamps in category S1 or S2 can be installed on vehicle classes M ₂ , M ₃ , N ₂ and N ₃ .
Color ECE-R48 § 5.15	Red
Position in width ECE-R48 § 6.7.4.1	For M ₁ and N ₁ vehicles, max. 400 mm from the extreme outer edge of the vehicle. No regulations regarding the clearance between the stop lamps. For all other vehicle classes min. 600 mm between both stop lamps, but min. 400 mm for vehicle widths < 1,300 mm.
Position in height ECE-R48 § 6.7.4.2	Min. 350 mm, max. 1,500 mm (exception: 2,100 mm, only if the vehicle geometry does not allow for an installation of less than 1,500 mm and 2 additional stop lamps are not installed). Position in height of the additional stop lamps: min. 600 mm above the mandatory stop lamps.
Visibility ECE-R48 § 6.7.5	Horizontal ± 45°. Vertical ± 15°, but for a position in height of < 750 mm also 5° downwards. The vertical angle above the horizontal can be reduced to 5° if the position in height of the additional stop lamps is 2,100 mm.
Electrical connections ECE-R48 § 6.7.7	Must light up when the brake is pressed.
Tell-tale ECE-R48 § 6.7.8	Optional. If there is one, only as an operating tell-tale in the shape of a non-flashing warning lamp that lights up in the event of a fault.
Other regulations ECE-R48 § 6.11.9	The clearance of the stop lamp to the rear fog lamp must be ≥ 100 mm.

ECE-R7 § 6.1

Category S1 (fixed) = luminous intensity min. 60 cd, single lamp max. 260 cd, type "D" lamp max. 130 cd

Category S2 (variable) = luminous intensity min. 60 cd, single lamp max. 730 cd, type "D" lamp max. 365 cd

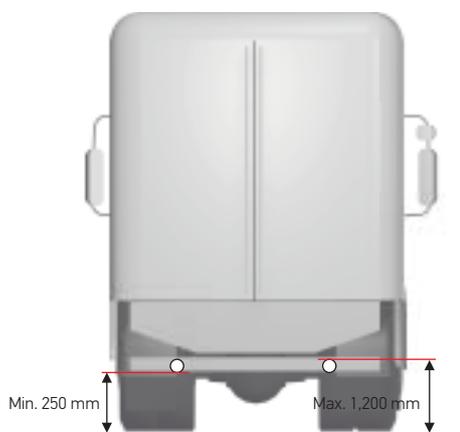
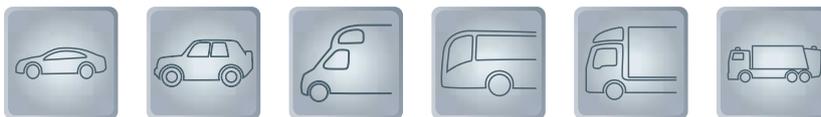


Center high mounted stop lamp
ECE-R48 section 6.7 and ECE-R7

Presence ECE-R48 § 6.7.1	Category S3 or S4. Mandatory for vehicle classes M ₁ and N ₁ . Except chassis with driver's cabs and N ₁ vehicles with an open loading space. Optional for other vehicle classes.
Number ECE-R48 § 6.7.2	1 unit If the median longitudinal plane of the vehicle is not located on a fixed body panel but separates e.g. doors and there is no space for an S3 or S4 stop lamp, two S3 or S4 stop lamps of the type "D" stop lamp or an S3 or S4 stop lamp can be installed to the left or right of the median longitudinal plane of the vehicle.
Color ECE-R48 § 5.15	Red
Presence in width ECE-R48 § 6.7.4.1	The central reference point must lie in the median longitudinal plane of the vehicle. If two S3 or S4 stop lamps are installed, each one needs to be installed as close as possible to the median longitudinal plane. If only one S3 or S4 stop lamp is installed next to the median longitudinal plane, the clearance may not be greater than 150 mm.
Presence in height ECE-R48 § 6.7.4.2	Either max. 150 mm below the rear window or min. 850 mm above the ground. Above the S1 and S2 stop lamps.
Visibility ECE-R48 § 6.7.5	Horizontal ± 10°. Vertical 10° over and 5° below the horizontal.
Electrical connections ECE-R48 § 6.7.7	Must light up when the braking system sends a corresponding signal.
Tell-tale ECE-R48 § 6.7.8	Optional. If there is one, only as an operating tell-tale in the shape of a non-flashing warning lamp that lights up in the event of a fault.
Other regulations ECE-R48 § 6.7.9	The S3 or S4 stop lamp can be installed outside or inside the vehicle. If it is installed inside, it must not dazzle the driver. An S3 or S4 stop lamp may not be built into another lamp.

ECE-R7 § 6.1

Category S3 (fixed) = luminous intensity min. 25 cd, single lamp max. 110 cd, type "D" lamp max. 55 cd
 Category S4 (variable) = luminous intensity min. 25 cd, single lamp max. 160 cd, type "D" lamp max. 80 cd

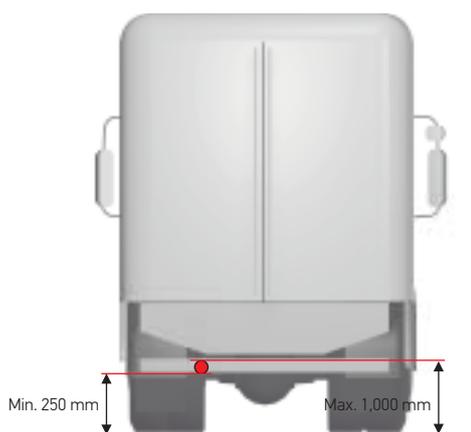


Reversing lamp

ECE-R48 section 6.4 and ECE-R23

Presence ECE-R48 § 6.4.1	Mandatory for all passenger car classes.
Number ECE-R48 § 6.4.2	1 device mandatory and a second one mandatory on M ₁ vehicles and all other vehicles with a length of < 6 m. 2 devices mandatory and 2 devices optional* on all vehicles with lengths of > 6 m, except M ₁ vehicles.
Color ECE-R48 § 5.15	White
Position in width ECE-R48 § 6.4.4.1	No regulations
Position in height ECE-R48 § 6.4.4.2	Min. 250 mm, max. 1,200 mm.
Visibility ECE-R48 § 6.4.5	1 lamp: horizontal ± 45°. 2 lamps: horizontal 30° inwards to 45° outwards. Vertical 15° upwards, to 5° downwards.
Electrical connections ECE-R48 § 6.4.7	Only lights up when the reverse gear is engaged and the vehicle is in running order. The special conditions in section 6.4.7.2 apply to the optional reversing lamps.
Tell-tale ECE-R48 § 6.4.8	Optional

* Installation of the two optional reversing lamps also allowed on the vehicle side.



Rear fog lamp

ECE-R48 section 6.11 and ECE-R38

Presence ECE-R48 § 6.11.1	Mandatory for all passenger car classes. Category F, F1 or F2.
Number ECE-R48 § 6.11.2	1 or 2 units
Color ECE-R48 § 5.15	Red
Position in width ECE-R48 § 6.11.4.1	No regulations
Position in height ECE-R48 § 6.11.4.2	Min. 250 mm, max. 1,000 mm. For N ₃ G or if built together with another rear lamp: max. 1,200 mm.
General position ECE-R48 § 6.11.4.1	With 1 rear fog lamp: left of center = right-hand traffic, right of center = left-hand traffic. Presence in the middle is allowed.
Visibility ECE-R48 § 6.11.5	Horizontal ± 25°. Vertical ± 5°.
Electrical connections ECE-R48 § 6.11.7	Cannot be switched on unless the low beam, high beam or fog lamps are switched on.
Tell-tale ECE-R48 § 6.11.8	Mandatory. An independent, non-flashing warning light.
Other regulations ECE-R48 § 6.11.9	The clearance to the stop lamp must be > 100 mm. The rear fog lamp of the tractor vehicle can switch off automatically if a trailer is towed and its rear fog lamp is thereby switched on.

ECE-R38 § 6.1

Category F, F1 (fixed) = luminous intensity min. 150 cd, max. 300 cd

Category F2 (variable) = luminous intensity min. 150 cd, max. 840 cd



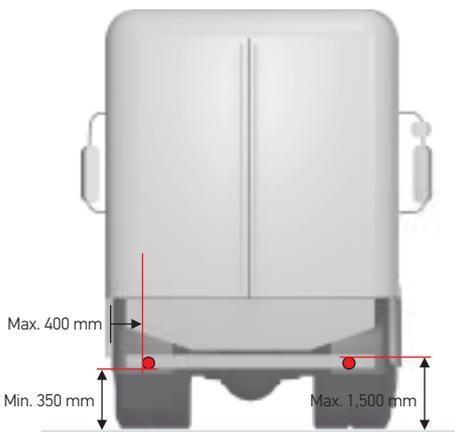
Registration plate lamp
ECE-R48 section 6.8 and ECE-R4

Presence ECE-R48 § 6.8.1	Mandatory for all passenger car classes.
Number ECE-R48 § 6.8.2	1 or more
Color ECE-R48 § 5.15	White
Arrangement ECE-R48 § 6.8.3	In a way that the registration plate is illuminated.
Electrical connections ECE-R48 § 6.8.7	Must be designed so that the position lamp, registration plate lamp, tail lamp and side marker lamps can only be switched on and off simultaneously.
Tell-tale ECE-R48 § 6.8.8	Optional. If there is a tell-tale, its function must be satisfied by the mandatory tell-tale for the position lamps and tail lamps



Parking lamps, rear
ECE-R48 section 6.12 and ECE-R77 or ECE-R7

Presence ECE-R48 § 6.12.1	Optional for vehicles ≤ 6 m long and ≤ 2 m wide. Prohibited for all other vehicles.
Number ECE-R48 § 6.12.3	2 lamps at the front and 2 lamps at the back or 1 lamp on each side.
Color ECE-R48 § 5.15	Red
Position in width ECE-R48 § 6.12.4.1	Max. 400 mm from the extreme outer edge of the vehicle. If only two lamps are installed, then install on the vehicle sides.
Position in height ECE-R48 § 6.12.4.2	No specific regulations for M ₁ and N ₁ vehicles. For all other vehicle classes: min. 350 mm, max. 1,500 mm (exception: 2,100 mm)*.
Visibility ECE-R48 § 6.12.5	Horizontal 45°. Vertical $\pm 15^\circ$, but for a position in height of < 750 mm 5° downwards is also sufficient.
Electrical connections ECE-R48 § 6.12.7	It must be possible to switch the parking lamps on and off independently of all other functions.
Tell-tale ECE-R48 § 6.12.8	Optional. If one is available, it must not be confused with the tell-tale for the position lamps and tail lamps.



* An exception is only possible if the vehicle geometry does not make standard installation possible.



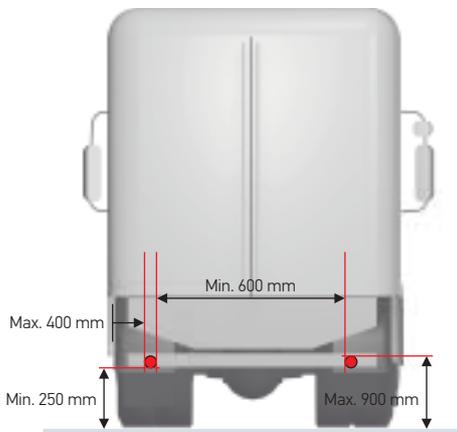
Rear contour lamp

ECE-R48 section 6.13 and ECE-R7

Presence ECE-R48 § 6.13.1	Mandatory for vehicles > 2.1 m wide. Optional for vehicles > 1.8 m length and ≤ 2.1 m wide. Optional on chassis with cab. Category R, R1, R2, RM1 or RM2.
Number ECE-R48 § 6.13.2	2 units, further 2 optional
Color ECE-R48 § 5.15	Red
Position in width ECE-R48 § 6.13.4.1	Max. 400 mm from the extreme outer edge of the vehicle.
Position in height ECE-R48 § 6.13.4.2	As high as possible. Optional and mandatory with the greatest possible clearance.
Visibility ECE-R48 § 6.13.5	Horizontal 80° outwards, vertical 5° over and 20° below the horizontal.
Electrical connections ECE-R48 § 6.13.7	Must be designed so that the position lamp, tail lamp, side marker lamps and registration plate lamps can only be switched on and off simultaneously.
Tell-tale ECE-R48 § 6.13.8	Optional. If there is a tell-tale, its function must be satisfied by the mandatory tell-tale for the position lamps and tail lamps.
Other regulations ECE-R48 § 6.13.9	The front white and rear contour lamps may be combined in one lamp as long as the installation instructions and visibility values are satisfied. Clearance of the clearance lamp to the tail lamp min. 200 mm.

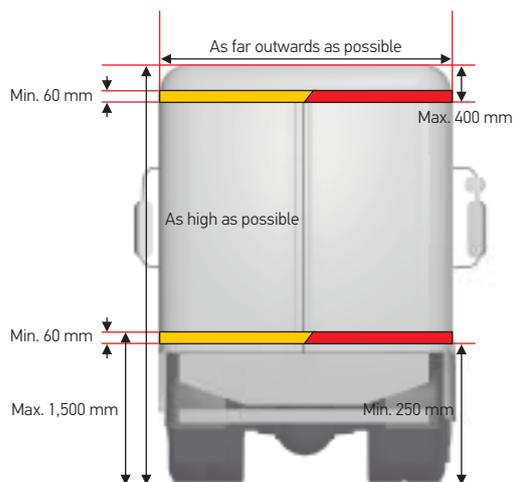
ECE-R7 § 6.1

Category R, R1, RM1 (fixed) = luminous intensity min. 4 cd, single lamp max. 17 cd, type "D" lamp max. 8.5 cd
 Category R2, RM2 (variable) = luminous intensity min. 4 cd, single lamp max. 42 cd, type "D" lamp max. 21 cd



Rear reflectors
ECE-R48 section 6.14 and ECE-R3

Presence ECE-R48 § 6.14.1	Mandatory for all passenger car classes.
Number ECE-R48 § 6.14.2	2 devices, additional devices optional.
Color ECE-R48 § 5.15	Red
Shape ECE-R48 § 6.14	Not triangular
Position in width ECE-R48 § 6.14.4.1	Max. 400 mm from the extreme outer edge of the vehicle. The clearance between the reflectors for M ₁ and N ₁ vehicles is not defined. For all other vehicle classes, min. 600 mm between both reflectors, but min. 400 mm for vehicle widths < 1,300 mm.
Position in height ECE-R48 § 6.14.4.2	Min. 250 mm, max. 900 mm. Not more than 1,200 mm, if it is installed with another rear lamp function (exception: 1,500 mm).
Visibility ECE-R48 § 6.14.5	Horizontal ± 30°. Vertical ± 10°, but for a position in height of < 750 mm 5° downwards.
Other regulations ECE-R48 § 6.14.7	The illuminating surface of the reflex reflector may be installed with any other lamp. The max. position in height of the reflector needs to be observed here!



Conspicuity markings

ECE-R48 section 6.21 and ECE-R104

Presence

ECE-R48 § 6.21.1

Full contour markings mandatory for the following classes with a width of > 2,100mm: N₂ > 7.5 t and N₃ (exception: chassis with cab, incomplete vehicles and semitrailer tractors). However, if it is not possible to install the mandatory contour markings due to the shape, structure, type or operating conditions, line markings may be installed. Optional on vehicles in all other classes except M₁ vehicles. A full contour marking may be used in place of a partial contour marking. Partial or full contour marking is permissible in place of line marking.

Arrangement

ECE-R48 § 6.21.3

Horizontal and vertical if compatible with the shape, structure and design of the vehicle.

Color

ECE-R48 § 5.15

Red or amber
Some countries allow white.

Position in width

ECE-R48 § 6.21.4.1

As close as practicable to the edge of the vehicle. The effective total width of the horizontal marking must be min. 80 % of the vehicle width. If this is not technically feasible, this value can be reduced to 60%/40%.

Position in height

ECE-R48 § 6.21.4.3

Lower marking: as low as possible, but min. 250 mm above the ground, max. 1,500 mm above the ground (exception: to 2,500 mm). Upper marking: as high as possible, max. 400 mm from the upper edge of the vehicle.

Visibility

ECE-R48 § 6.21.5

Min. 80% of the marking must be visible to an onlooker.

Position at rear

ECE-R48 § 6.21.6.2

As close as practicable to being parallel to the transverse plane of the vehicle.

Other regulations

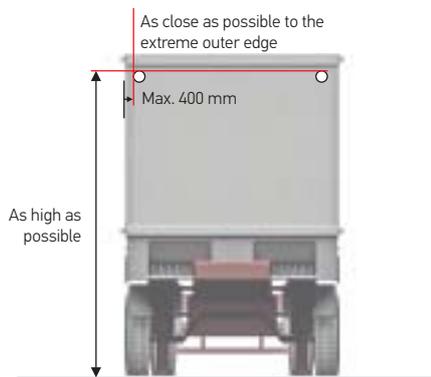
ECE-R48 § 6.21.7

1. Conspicuity markings are deemed continuous if the clearances between parts arranged next to each other is as small as possible and no more than 50% of the shortest length of one of these parts. (if this is not possible, a value > 50% but < 1 m is allowed.)
2. The clearance between the conspicuity markings installed at the rear of the vehicle and every mandatory stop lamp should be greater than 200 mm.
3. If rear registration plates of regulation ECE-R70 are installed, these can be considered as part of the rear conspicuity marking at the manufacturer's discretion when calculating the conspicuity marking and its clearance to the side of the vehicle.
4. The locations of the vehicle where the conspicuity markings are to be installed must be big enough to bear markings that are min. 60 mm wide.

Note: due to the multitude of restrictions and modifications for conspicuity markings in ECE-R48, we strongly recommend using the unshortened original version in your planning processes.

4 Front lighting – trailers





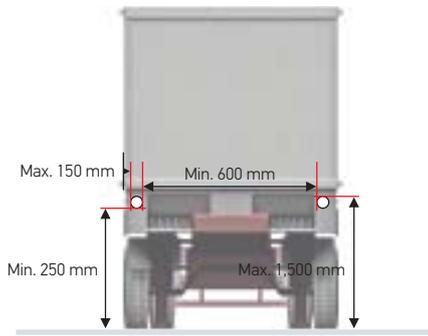
Front clearance lamp

ECE-R48 section 6.13 and ECE-R7

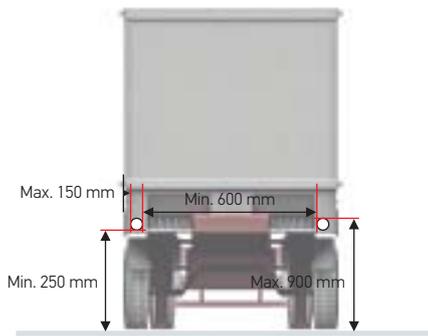
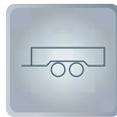
Presence ECE-R48 § 6.13.1	Mandatory for all trailers > 2.1 m wide. Optional for trailers > 1.8 m to ≤ 2.1 m width. Category A or AM.
Number ECE-R48 § 6.13.2	2 lamps, 2 additional lamps optional
Color ECE-R48 § 5.15	White
Position in width ECE-R48 § 6.13.4.1	Max. 400 mm from the extreme outer edge of the vehicle.
Position in height ECE-R48 § 6.13.4.2	As high as possible.
Visibility ECE-R48 § 6.13.5	Horizontal 80° outwards, vertical 5° over and 20° below the horizontal.
Electrical connections ECE-R48 § 6.13.7	Must be designed so that the position lamp, tail lamp, side marker lamps and registration plate lamps can only be switched on and off simultaneously.
Tell-tale ECE-R48 § 6.13.8	Optional. If there is a tell-tale, its function must be satisfied by the mandatory tell-tale for the position lamps and tail lamps.
Other regulations ECE-R48 § 6.13.9	The front white and rear contour lamps may be combined in one lamp as long as the installation instructions and visibility values are satisfied. Clearance from clearance lamp to position lamp > 200 mm.

ECE-R7 § 6.1.1

Category A, AM = luminous intensity min. 4 cd, single lamp max. 140 cd, type "D" lamp max. 70 cd



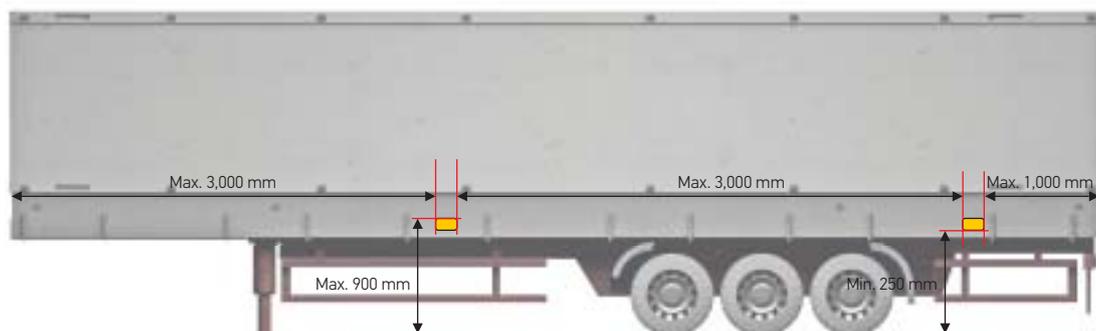
Front position lamp ECE-R48 section 6.9 and ECE-R7	
Presence ECE-R48 § 6.9.1	Mandatory for all trailers > 1.6 m wide. Optional for trailers ≤ 1.6 m wide.
Number ECE-R48 § 6.9.2	2 lamps
Color ECE-R48 § 5.15	White
Position in width ECE-R48 § 6.9.4.1	Max. 150 mm from the extreme outer edge of the vehicle. Min. 600 mm between both position lamps, but min. 400 mm for vehicle widths < 1,300 mm.
Position in height ECE-R48 § 6.9.4.2	Min. 250 mm, max. 1,500 mm (exception: 2,100 mm only for trailers in classes O ₁ and O ₂ or if max. 1,500 mm is not possible for other trailers).
Visibility ECE-R48 § 6.9.5	Horizontal 5° inwards and 80° outwards. Vertical ± 15°, but for a position in height of < 750 mm also 5° downwards.
Electrical connections ECE-R48 § 6.9.7	Must be designed so that the position lamp, tail lamp, side marker lamps and registration plate lamps can only be switched on and off simultaneously. Can be switched off when indicating.
Tell-tale ECE-R48 § 6.9.8	Mandatory. The tell-tale must not flash. Not necessary if the lighting equipment in the dashboard can only be switched on at the same time as the position lamps.



Front reflector ECE-R48 section 6.16 and ECE-R3	
Presence ECE-R48 § 6.16.1	Mandatory for all trailers.
Number ECE-R48 § 6.16.2	Min. 2 devices, further 2 optional
Color ECE-R48 § 5.15	White/colorless
Shape ECE-R48 § 6.16	Not triangular
Position in width ECE-R48 § 6.16.4.1	Max. 150 mm, min. 600 mm between both reflex reflectors, but min. 400 mm for vehicle widths < 1,300 mm.
Position in height ECE-R48 § 6.16.4.2	Min. 250 mm, max. 900 mm (exception: 1,500 mm).
Visibility ECE-R48 § 6.16.5	Horizontal 10° inwards and 30° outwards. Additional reflex reflectors can help with the horizontal values. Vertical ± 10°, but for a position in height of < 750 mm 5° downwards.
Other regulations ECE-R48 § 6.16.9	The illuminating surface of the reflex reflector may be integrated in any other front lamp.

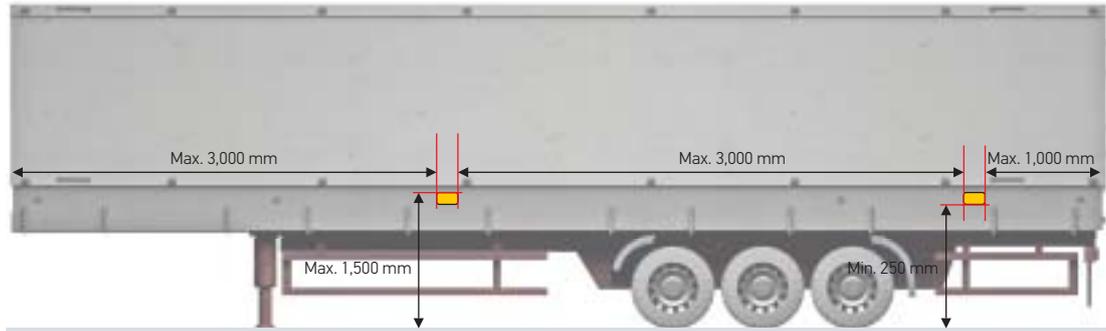
Side lighting – trailers





Side reflector ECE-R48 section 6.17 and ECE-R3

Presence ECE-R48 § 6.17.1	Mandatory for all trailers.
Number ECE-R48 § 6.17.2	See position in length
Color ECE-R48 § 5.15	Amber
Shape ECE-R48 § 6.17	Not triangular
Position in height ECE-R48 § 6.17.4.2	Min. 250 mm, max. 900 mm, max. 1,200 mm if integrated in another lamp (exception: 1,500 mm).
Position in length ECE-R48 § 6.17.4.3	The reflex reflector installed at the foremost point must not be further than max. 3 m from the front of the vehicle. Max. 3 m between the individual reflex reflectors (exception: 4 m). Max. clearance from rear 1 m, min. 1 reflex reflector in the middle third.
Visibility ECE-R48 § 6.17.5	Horizontal $\pm 45^\circ$. Vertical $\pm 10^\circ$, but for a position in height of < 750 mm 5° downwards.
Other regulations ECE-R48 § 6.17.9	The illuminating surface of the reflex reflector may be integrated in any other position lamp.

**Side marker lamp (SM1)**

ECE-R48 section 6.18 and ECE-R91

Presence ECE-R48 § 6.18.1	Mandatory for all trailers > 6 m long. Optional for trailers < 6 m long.
Number ECE-R48 § 6.18.2	See position in length
Color ECE-R48 § 5.15	Front amber, rear amber (in combination with the combination rear lamp, red is also possible)
Position in height ECE-R48 § 6.18.4.2	Min. 250 mm, max. 1,500 mm (exception: 2,100 mm)*.
Position in length ECE-R48 § 6.18.4.3	Foremost side marker lamp not further than max. 3 m from the front, rearmost side marker lamp not further than max. 1 m from rear, max. 3 m between the individual side marker lamps (exception: 4 m). Min. 1 in the front and / or rear third. For vehicle lengths of ≤ 6 m, alternatively min. one in the middle third.
Visibility ECE-R48 § 6.18.5	Horizontal ±45°, with optional side marker lamps ±30°. Vertical ±10°, but for a position in height of < 750 mm 5° downwards.
Electrical connections ECE-R48 § 6.18.7	No regulations
Tell-tale ECE-R48 § 6.18.8	Optional. If there is a tell-tale, its function must be met by the mandatory tell-tale for the position lamps and tail lamps.
Other regulations ECE-R48 § 6.18.9	The illuminating surface of the reflector may be integrated into the side indicator lamp. The max. position in height of the reflex reflector needs to be observed here. The rear side marker lamps must be amber if they flash together with the rear direction indicator.

* An exception is only possible if the vehicle geometry does not make standard installation possible.

ECE-R91 (7.1)

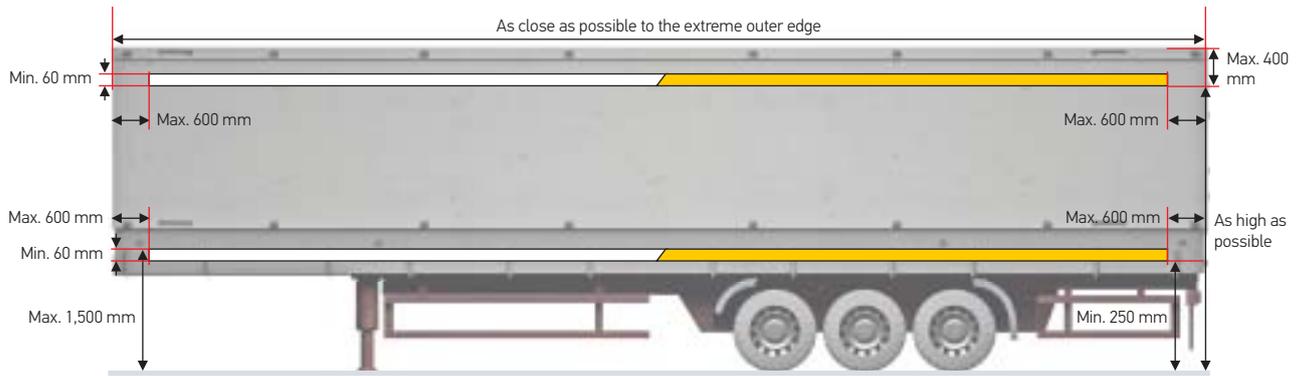
Category SM1 (use in all vehicle classes) = luminous intensity min. 4 cd, max. 25 cd



Additional side direction indicator (indicator) ECE-R48 section 6.5 and ECE-R6

Presence ECE-R48 § 6.5.1	Optional for O ₂ , O ₃ and O ₄ vehicles > 9 m long.
Number ECE-R48 § 6.5.2	Max. 3 lamps category 5 or 1 lamp category 6 one each side of the vehicle
Color ECE-R48 § 5.15	Amber
Position in height ECE-R48 § 6.5.4.2.1	> 500 mm to max. 1,500 mm (in exceptional cases up to 2,300 mm)*.
Position in length ECE-R48 § 6.5.4.3	Category 5 = distributed evenly along the length of the trailer. Category 6 = between the 1st and the last quarter of the trailer.
Visibility ECE-R48 § 6.5.5	Horizontal min. 5° to 60° rear. Vertical ± 15° for category 5, but for position in heights of < 750 mm also 5° downwards. For category 6, however, additionally 30° over and 5° below the horizontal.
Electrical connections ECE-R48 § 6.5.7	It must switch on independently of the other lamps. They need to be switched on and off on the same side of the vehicle by the same activation device.
Tell-tale ECE-R48 § 6.5.8	Not mandatory

* An exception is only possible if the vehicle geometry does not make standard installation possible.



Conspicuity markings

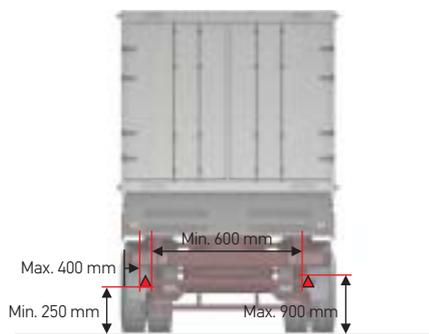
ECE-R48 section 6.21 and ECE-R104

<p>Presence ECE-R48 § 6.21.1</p>	<p>Partial contour marking mandatory on O₃ and O₄ vehicles with a length of > 6,000 mm (exception: incomplete vehicles). However, if it is not possible to install the mandatory contour marking, line markings may be installed. Optional on vehicles in all other classes except O₁ vehicles. A full contour marking may be used in place of a partial contour marking. Partial or full contour marking is permissible in place of line marking.</p>
<p>Arrangement ECE-R48 § 6.21.3</p>	<p>Horizontal and vertical if compatible with the shape, structure and design of the vehicle.</p>
<p>Color ECE-R48 § 5.15</p>	<p>White or amber</p>
<p>Position in length ECE-R48 § 6.21.4.2</p>	<p>Continuous until as close as practicable to both ends of the vehicle, within max. 600 mm of each end of the vehicle. → For trailers, at each end of the vehicle (without towing bar). The total length of the horizontal markings must be min. 70% of the value of the following dimensions: → For trailers: length of the vehicle (without towing bar). If this is not technically feasible, this value can be reduced to 60%/40%.</p>
<p>Position in height ECE-R48 § 6.21.4.3</p>	<p>Lower marking: as low as possible, but min. 250 mm above the ground, max. 1,500 mm above the ground (exception: to 2,500 mm). Upper marking: as high as possible, max. 400 mm from the upper edge of the vehicle.</p>
<p>Visibility ECE-R48 § 6.21.5</p>	<p>Min. 70% of the marking must be visible to an onlooker.</p>
<p>Position on side ECE-R48 § 6.21.6.1</p>	<p>As close as practicable to being parallel to the median longitudinal plane of the vehicle.</p>
<p>Other regulations ECE-R48 § 6.21.7</p>	<ol style="list-style-type: none"> 1. Conspicuity markings are deemed continuous if the clearances between parts arranged next to each other is as small as possible and no more than 50% of the shortest length of one of these parts. (if this is not possible, a value > 50% but < 1 m is allowed.) 2. In the case of a partial contour marking, each upper corner must be clearly marked by two lines at angles of 90°; each line must be min. 250 mm long. 3. The locations of the vehicle where the conspicuity markings are to be installed must be big enough to bear markings that are min. 60 mm wide.

Note: due to the multitude of restrictions and modifications for conspicuity markings in ECE-R48, we strongly recommend using the unshortened original version in your planning processes.

Rear lighting – trailers



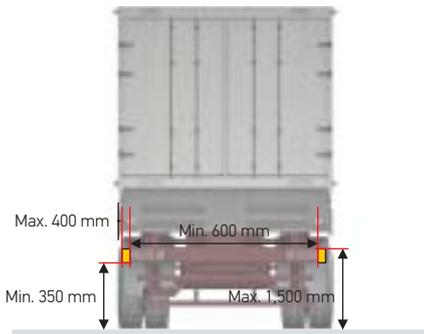


Rear reflectors

ECE-R48 section 6.15 and ECE-R3

Presence ECE-R48 § 6.15.1	Mandatory for all trailers.
Number ECE-R48 § 6.15.2	Min. 2 devices
Color ECE-R48 § 5.15	Red
Shape ECE-R48 § 6.15	Triangular
Arrangement ECE-R48 § 6.15.3	The tip of the triangle must point upwards.
Position in width ECE-R48 § 6.15.4.1	Max. 400 mm from the extreme outer edge of the vehicle, min. 600 mm between the two reflex reflectors, but min. 400 mm for vehicle widths of < 1,300 mm.
Position in height ECE-R48 § 6.15.4.2	Min. 250 mm, max. 900 mm, max. 1,200 mm if integrated in another lamp (exception: 1,500 mm)*.
Visibility ECE-R48 § 6.15.5	Horizontal $\pm 30^\circ$. Vertical $\pm 15^\circ$, but for a position in height of < 750 mm 5° downwards.
Other regulations ECE-R48 § 6.15.9	The illuminating surface of the reflex reflector may be integrated in any other rear lamp.

* An exception is only possible if the vehicle geometry does not make standard installation possible.

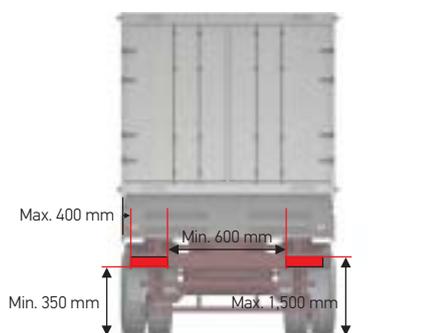


Rear direction indicator (indicator)
ECE-R48 section 6.5 and ECE-R6

Presence ECE-R48 § 6.5.1	Mandatory for all trailers. Category 2a or 2b.
Number ECE-R48 § 6.5.2	2 lamps, additional 2 optional on O ₂ , O ₃ and O ₄ vehicles.
Color ECE-R48 § 5.15	Amber
Position in width ECE-R48 § 6.5.4.1	Max. 400 mm from the extreme outer edge of the vehicle. This does not apply to the additional indicators. Min. 600 mm between the two indicators, but min. 400 mm for vehicle widths < 1,300 mm.
Position in height ECE-R48 § 6.5.4.2	Min. 350 mm, max. 1,500 mm (exception: 2,100 mm, only if the vehicle geometry does not allow for an installation of less than 1,500 mm and if 2 additional indicators are not installed). Position in height of the additional indicators: min. 600 mm above the mandatory indicators.
Visibility ECE-R48 § 6.5.5	Horizontal 45° inwards to 80° outwards. Vertical ± 15°, but for a position in height of < 750 mm also 5° downwards. Optionally with a position in height of 2,100 mm also 5° upwards.
Electrical connections ECE-R48 § 6.5.7	It must switch on independently of the other lamps. They need to be switched on and off on the same side of the vehicle by the same activation device. They must flash synchronously.
Tell-tale ECE-R48 § 6.5.8	Mandatory. The tell-tale is mandatory for the front and rear direction indicators. Vehicles which are equipped to tow a trailer must feature a tell-tale for the direction indicator of the trailer. This is unless every malfunction in the direction indicator of the convoy can be signaled via the tell-tale of the towing vehicle. The tell-tale is not necessary for the two additional direction indicators on trailers.

ECE-R6 (6.1)

Category 2a (fixed) = luminous intensity min. 50 cd, single lamp max. 500 cd, type "D" lamp max. 250 cd
 Category 2b (variable) = luminous intensity min. 50 cd, single lamp max. 1,000 cd, type "D" lamp max. 500 cd



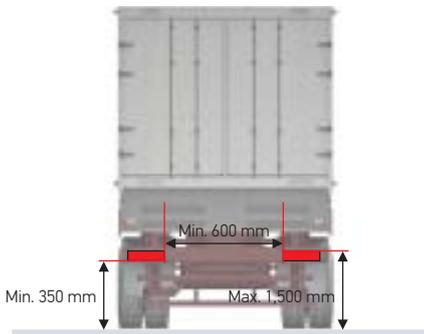
Tail lamp

ECE-R48 section 6.10 and ECE-R7

Presence ECE-R48 § 6.10.1	Mandatory for all trailers. Category R1, R1 or R2.
Number ECE-R48 § 6.10.2	2 lamps, further 2 optionally possible for O ₂ , O ₃ and O ₄ vehicles if clearance lamps are not installed.
Color ECE-R48 § 5.15	Red
Position in width ECE-R48 § 6.10.4.1	Max. 400 mm from the extreme outer edge of the vehicle. This does not apply to the additional tail lamps. Min. 600 mm between the two tail lamps, but min. 400 mm for vehicle widths < 1,300 mm.
Position in height ECE-R48 § 6.10.4.2	Min. 350 mm, max. 1,500 mm (exception: 2,100 mm, only if the vehicle geometry does not allow for an installation of less than 1,500 mm and 2 additional tail lamps are not installed). Position in height of the additional indicators: min. 600 mm above the mandatory tail lamps.
Visibility ECE-R48 § 6.10.5	Horizontal 45° inwards to 80° outwards. Vertical ± 15°, but for a position in height of < 750 mm also 5° downwards. Optionally with a position in height of 2,100 mm also 5° upwards.
Electrical connections ECE-R48 § 6.10.7	Must be designed so that the position lamp, tail lamp, side marker lamps and registration plate lamps can only be switched on and off simultaneously.
Tell-tale ECE-R48 § 6.10.8	Mandatory. It must be combined with the tell-tale for the position lamps.
Other regulations ECE-R48 § 6.10.9	Except if clearance lamps are installed, 2 additional position lamps and tail lamps can be installed to all trailers of the classes O ₂ , O ₃ , O ₄ .

ECE-R7 § 6.1

Category R, R1 (fixed) = luminous intensity min. 4 cd, single lamp max. 17 cd, type "D" lamp max. 8.5 cd
 Category R2 (variable) = luminous intensity min. 4 cd, single lamp max. 42 cd, type "D" lamp max. 21 cd

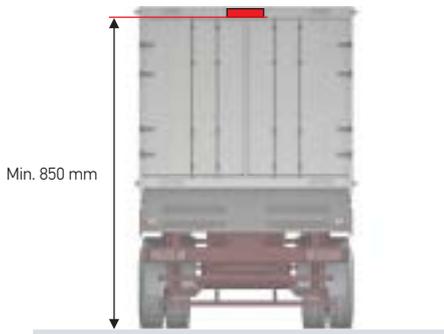


Stop lamp
ECE-R48 section 6.7 and ECE-R7

Presence ECE-R48 § 6.7.1	Mandatory for all trailers. Category S1 or S2.
Number ECE-R48 § 6.7.2	2 lamps Except if stop lamps in category S3 or S4 are installed, two additional stop lamps in category S1 or S2 can be installed to vehicle classes O ₂ , O ₃ and O ₄ .
Color ECE-R48 § 5.15	Red
Position in width ECE-R48 § 6.7.4.1	For all trailers min. 600 mm between both stop lamps, but min. 400 mm for vehicle widths < 1,300 mm.
Position in height ECE-R48 § 6.7.4.2	Min. 350 mm, max. 1,500 mm (exception: 2,100 mm, only if the vehicle geometry does not allow for an installation of less than 1,500 mm and 2 additional stop lamps are not installed). Position in height of the additional stop lamps: min. 600 mm above the mandatory stop lamps.
Visibility ECE-R48 § 6.7.5	Horizontal ± 45°. Vertical ± 15°, but for a position in height of < 750 mm also 5° downwards. Optionally with a position in height of 2,100 mm also 5° upwards.
Electrical connections ECE-R48 § 6.7.7	Must light up when the brake is pressed.
Tell-tale ECE-R48 § 6.7.8	Optional. If there is one, only as an operating tell-tale in the shape of a non-flashing warning lamp that lights up in the event of a fault.
Other regulations ECE-R48 § 6.7.9	The clearance of the stop lamp to the rear fog lamp must be ≥ 100 mm.

ECE-R7 § 6.1

Category S1 (fixed) = luminous intensity min. 60 cd, single lamp max. 260 cd, type "D" lamp max. 130 cd
Category S2 (variable) = luminous intensity min. 60 cd, single lamp max. 730 cd, type "D" lamp max. 365 cd

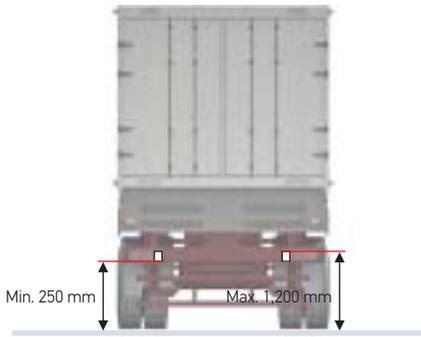


Center high mounted stop lamp ECE-R48 section 6.7 and ECE-R7

Presence ECE-R48 § 6.7.1	Optional for all trailers, category S3 or S4, except if additional stop lamps of the category S1 or S2 are installed.
Number ECE-R48 § 6.7.2	1 unit If the median longitudinal plane of the vehicle is not located on a fixed body panel but separates e.g. doors and there is no space for an S3 or S4 stop lamp, two S3 or S4 stop lamps of the type "D" stop lamp or an S3 or S4 stop lamp can be installed to the left or right of the median longitudinal plane of the vehicle.
Color ECE-R48 § 5.15	Red
Position in width ECE-R48 § 6.7.4.1	The reference point must lie in the median longitudinal plane of the trailer. If two S3 or S4 stop lamps are installed, each one needs to be installed as close as possible to the median longitudinal plane. If only one S3 or S4 stop lamp is installed next to the median longitudinal plane, the clearance may not be greater than 150 mm.
Position in height ECE-R48 § 6.7.4.2	Max. 150 mm below the rear window or min. 850 mm above the ground. Above the S1 and S2 stop lamps.
Visibility ECE-R48 § 6.7.5	Horizontal $\pm 10^\circ$. Vertical 10° over and 5° below the horizontal.
Electrical connections ECE-R48 § 6.7.7	Must light up when the braking system sends a corresponding signal.
Tell-tale ECE-R48 § 6.7.8	Optional. If there is one, only as an operating tell-tale in the shape of a non-flashing warning lamp that lights up in the event of a fault.
Other regulations ECE-R48 § 6.7.9	The S3 or S4 stop lamp can be installed outside or inside the vehicle. If it is installed inside, it must not dazzle the driver. An S3 or S4 stop lamp may not be built into another lamp.

ECE-R7 § 6.1

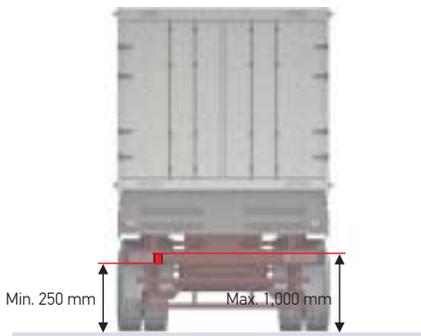
Category S3 (fixed) = luminous intensity min. 25 cd, single lamp max. 110 cd, type "D" lamp max. 55 cd
Category S4 (variable) = luminous intensity min. 25 cd, single lamp max. 160 cd, type "D" lamp max. 80 cd



Reversing lamp
ECE-R48 section 6.4 and ECE-R23

Presence ECE-R48 § 6.4.1	Mandatory for all trailers of the vehicle classes O ₂ , O ₃ and O ₄ . Optional for trailers of the vehicle class O ₁ .
Number ECE-R48 § 6.4.2	1 device mandatory and a second one optional for trailers with a length of < 6 m. 2 devices mandatory for trailers > 6 m and 2 additional ones optional.
Color ECE-R48 § 5.15	White
Position in width ECE-R48 § 6.4.4.1	No regulations
Position in height ECE-R48 § 6.4.4.2	Min. 250 mm, max. 1,200 mm.
Visibility ECE-R48 § 6.4.5	1 lamp: horizontal ± 45°. 2 lamps: Horizontal 30° inwards to 45° outwards. Vertical 15° upwards, to 5° downwards.
Electrical connections ECE-R48 § 6.4.7	Only activated when the reverse gear is engaged and the vehicle is in running order. The special conditions in section 6.4.7.2 apply to the optional reversing lamps.
Tell-tale ECE-R48 § 6.4.8	Optional

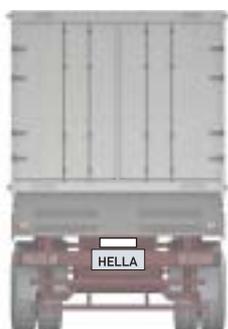
* Installation of the two optional reversing lamps also allowed on the vehicle side.



Rear fog lamp
ECE-R48 section 6.11 and ECE-R38

Presence ECE-R48 § 6.11.1	Mandatory for all trailers. Category F, F1 or F2.
Number ECE-R48 § 6.11.2	1 or 2 devices
Color ECE-R48 § 5.15	Red
Position in width ECE-R48 § 6.11.4.1	No regulations
Position in height ECE-R48 § 6.11.4.2	Min. 250 mm, max. 1,000 mm or if mounted with another function max. 1200 mm
General position ECE-R48 § 6.11.4.1	With 1 rear fog lamp: left of center = right-hand traffic, right of center = left-hand traffic. Position in the middle is allowed
Visibility ECE-R48 § 6.11.5	Horizontal ± 25°. Vertical ± 5°.
Electrical connections ECE-R48 § 6.11.7	Cannot be switched on unless the low beam, high beam or fog lamps are switched on.
Tell-tale ECE-R48 § 6.11.8	Mandatory. An independent, non-flashing warning light.
Other regulations ECE-R48 § 6.11.9	The clearance to the stop lamp must be > 100 mm. The rear fog lamp of the tractor vehicle can switch off automatically if a trailer is towed and its rear fog lamp is thereby switched on.

ECE-R38 § 6.1
Category F, F1 (fixed) = luminous intensity min. 150 cd, max. 300 cd
Category F2 (variable) = luminous intensity min. 150 cd, max. 840 cd



Registration plate lamp

ECE-R48 section 6.8 and ECE-R4

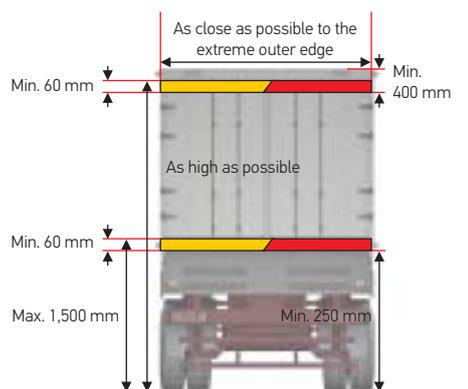
Presence ECE-R48 § 6.8.1	Mandatory for all trailers.
Number ECE-R48 § 6.8.2	1 or more
Color ECE-R48 § 5.15	White
Arrangement ECE-R48 § 6.8.3	In a way that the registration plate is illuminated.
Electrical connections ECE-R48 § 6.8.7	Must be designed so that the position lamp, registration plate lamp, tail lamp and side marker lamps can only be switched on and off simultaneously.
Tell-tale ECE-R48 § 6.8.8	Optional. If there is a tell-tale, its function must be satisfied by the mandatory tell-tale for the position lamps and tail lamps.



Rear contour lamp ECE-R48 section 6.13 and ECE-R7	
Presence ECE-R48 § 6.13.1	Mandatory for all trailers > 2.1 m wide. Optional for trailers > 1.8 m to ≤ 2.1 m width. Category R, R1, R2, RM1 or RM2.
Number ECE-R48 § 6.13.2	2 devices, further 2 clearance lamps optionally possible
Color ECE-R48 § 5.15	Red
Position in width ECE-R48 § 6.13.4.1	As close as possible to the extreme outer edge, max. 400 mm from the extreme outer edge of the vehicle.
Position in height ECE-R48 § 6.13.4.2	As high as possible. Optional and mandatory with the greatest possible clearance.
Visibility ECE-R48 § 6.13.5	Horizontal 80° outwards. Vertical 5° over and 20° below the horizontal.
Electrical connections ECE-R48 § 6.13.7	Must be designed so that the position lamp, tail lamp, side marker lamps and registration plate lamps can only be switched on and off simultaneously.
Tell-tale ECE-R48 § 6.13.8	Optional. If there is a tell-tale, its function must be satisfied by the mandatory tell-tale for the position lamps and tail lamps.
Other regulations ECE-R48 § 6.13.9	The rear red and front white clearance lamps may be combined in one lamp as long as the installation instructions and visibility values are satisfied. Clearance of the clearance lamp to the tail lamp min. 200 mm.

ECE-R7 § 6.1

Category R, R1, RM1 (fixed) = luminous intensity min. 4 cd, single lamp max. 17 cd, type "D" lamp max. 8.5 cd
 Category R2, RM2 (variable) = luminous intensity min. 4 cd, single lamp max. 42 cd, type "D" lamp max. 21 cd



Conspicuity markings

ECE-R48 section 6.21 and ECE-R104

Presence

ECE-R48 § 6.21.1

Full contour markings mandatory in the following classes with a width of > 2,100 mm: O₃ and O₄ vehicles (exception: incomplete vehicles). However, if it is not possible to install the mandatory contour markings due to the shape, structure, type or operating conditions, line markings may be installed.

Optional on vehicles in all other classes except O₁ vehicles. A full contour marking may be used in place of a partial contour marking. Partial or full contour marking is permissible in place of line marking.

Arrangement

ECE-R48 § 6.21.3

Horizontal and vertical if compatible with the shape, structure and design of the vehicle.

Color

ECE-R48 § 5.15

Red or amber

Some countries allow white.

Position in width

ECE-R48 § 6.21.4.1

As close as practicable to the edge of the vehicle. The effective total width of the horizontal marking must be min. 80 % of the vehicle width. If this is not technically feasible, this value can be reduced to 60%/40%.

Position in height

ECE-R48 § 6.21.4.3

Lower marking: as low as possible, but min. 250 mm above the ground, max. 1,500 mm above the ground (exception: to 2,500 mm). Upper marking: as high as possible, max. 400 mm from the upper edge of the vehicle.

Visibility

ECE-R48 § 6.21.5

Min. 70% of the marking must be visible to an onlooker.

Position at rear

ECE-R48 § 6.21.6.2

As close as practicable to being parallel to the transverse plane of the vehicle.

Other regulations

ECE-R48 § 6.21.7

1. Conspicuity markings are deemed continuous if the clearances between parts arranged next to each other is as small as possible and no more than 50% of the shortest length of one of these parts. (if this is not possible, a value > 50% but < 1 m is allowed.)
2. The clearance between the conspicuity markings installed at the rear of the vehicle and every mandatory stop lamp should be greater than 200 mm.
3. If rear registration plates of regulation ECE-R70 are installed, these can be considered as part of the rear conspicuity marking at the manufacturer's discretion when calculating the conspicuity marking and its clearance to the side of the vehicle.
4. The locations of the vehicle where the conspicuity markings are to be installed must be big enough to bear markings that are min. 60 mm wide.

Note: due to the multitude of restrictions and modifications for conspicuity markings in ECE-R48, we strongly recommend using the unshortened original version in your planning processes.

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