
Cycles — Lighting and retro-reflective devices —

Part 1:
Lighting and light signalling devices

*Cycles — Éclairage et dispositifs rétro-réfléchissants —
Partie 1: Équipements de signalisation et d'éclairage*





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Foreword

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

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: [Foreword — Supplementary information](#).

The committee responsible for this document is ISO/TC 149, *Cycles*, SC 1, *Cycles and major sub-assemblies*.

This third edition cancels and replaces the second edition (ISO 6742-1:1987), which has been technically revised.

ISO 6742 consists of the following parts, under the general title *Cycles — Lighting and retro-reflective devices*:

- *Part 1: Lighting and light signalling devices*
- *Part 2: Retro-reflective devices*
- *Part 3: Installation and use of lighting and retro-reflective devices*
- *Part 4: Lighting systems powered by the cycle's movement*
- *Part 5: Lighting systems not powered by the cycle's movement*

Cycles — Lighting and retro-reflective devices —

Part 1: Lighting and light signalling devices

1 Scope

This part of the ISO 6742 is applicable to lighting devices used on cycles intended to be used on public roads and, especially, bicycles complying with ISO 4210 and ISO 8098.

This part of ISO 6742 specifies the functions, safety requirements, photometric performance and test methods of lighting and signalling devices that can be used on cycles.

2 Normative references

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

ISO 6742-4:2015, *Cycles — Lighting and retro-reflective devices — Part 4: Lighting systems powered by the cycle's movement*

ISO 6742-5:2015, *Cycles — Lighting and retro-reflective devices — Part 5: Lighting systems not powered by the cycle's movement*

CIE 1931, *XYZ colour space of the International Commission on Illumination*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

front position lamp

lamp emitting a white or an amber light to the front of the cycle, so as to indicate its presence on the road

3.2

headlamp

lamp to light the road to the front of the cycle that has either low beam, high beam or both

3.3

rear lamp

lamp emitting a red light to the rear of the cycle and used to indicate its presence on the road

3.4

stop-lamp

lamp used to indicate to other road users that the cycle brakes or significantly decelerates

3.5

low beam

light that illuminates the road in front of the cycle without dazzling other road users from the opposite direction

3.6

high beam

light that illuminates the road for a long distance ahead of the vehicle

3.7

direction indicators

lamps used to indicate to other road users that the cyclist intends to change direction to the right or left

3.8

stand-light

light emitted by a lamp for a time after the cycle has stopped

3.9

lamp equipped with replaceable light source

lamp whose light source(s) can be replaced by the user with an equivalent light source(s) of the same type

3.10

lamp equipped with non-replaceable light source

lamp whose light source(s) is permanently fitted, and not designed to be replaced by the user

3.11

cycles

any vehicle that has at least two wheels and is propelled solely or mainly by the muscular energy of the person on that vehicle, in particular by means of pedals

3.12

reference axis

characteristic horizontal axis of the lamp, as determined by the manufacturer or by the direction light is emitted with greatest intensity, to serve as a direction of reference during use in service and during test measurements

3.13

plane HH

horizontal plane parallel to the ground passing through the reference axis

3.14

plane VV

vertical plane through the reference axis

3.15

public road

any designed and adopted road pavement, path or track on which a bicycle permitted to travel and on most through not all such public roads, bicycles will share use with other forms of transport including motorised traffic

3.16

short pulse

light flash shorter than 0,2 s

4 Photometrical requirements

4.1 General

If the reference axis is not mentioned by manufacturer, this direction shall be determined by that in which light is emitted with greatest intensity.

Within the field of light distribution, schematically shown as a grid, the light intensity in each direction of a part of the field formed by the grid lines meets at least the lowest minimum percentage value being shown on the grid lines surrounding the questioned direction.

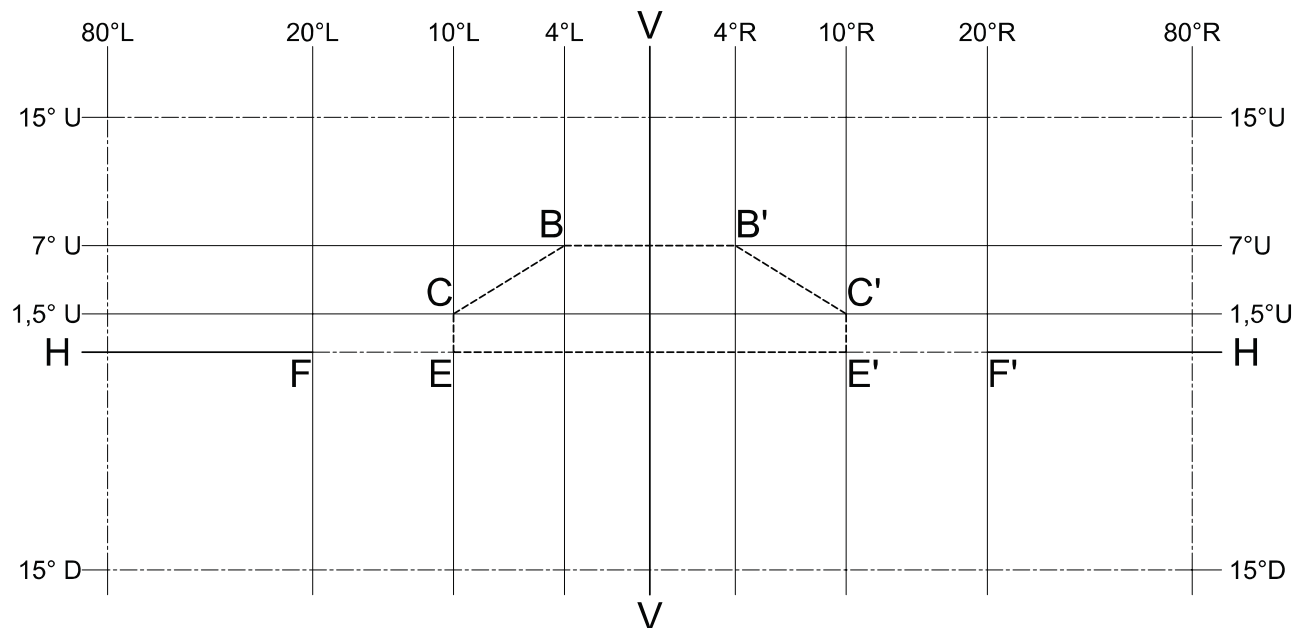
4.2 Front position lamp

4.2.1 Photometric requirements

The requirements of the front position lamp contained below in [Table 1](#) shall correspond to the illustrative dimensions as shown further below in [Figure 1](#).

Table 1 — Light distribution for front position lamp

Position	Value in cd
In area bound by straight lines connecting dots E, C, B, B', C', E' and E	≥ 4
From E to F and E' to F'	≥ 2
In rectangular area bounded by lines 15°U, 15°D, 80°L and 80°R	$\geq 0,05$
Upper limit on the H-H line and above H-H line	140 max



Key

- H represents the horizontal plane to the ground through the reference axis
- V represents the vertical plane through the reference axis
- U and D represent the degrees of arc, respectively, above and below the horizontal plane
- L and R represent the degrees of arc, respectively, to the left and right of the vertical plane

Figure 1 — Measuring and aiming screen for front position lamp

4.2.2 Mode of illumination

A front position lamp could either emit a continuous light or flash at a frequency from 1 Hz to 4 Hz. Such a lamp may be capable of only one mode or be switched between modes.

NOTE Some national or regional regulations do not permit the use of flashing lights on pedal cycles, apart from direction indicators.

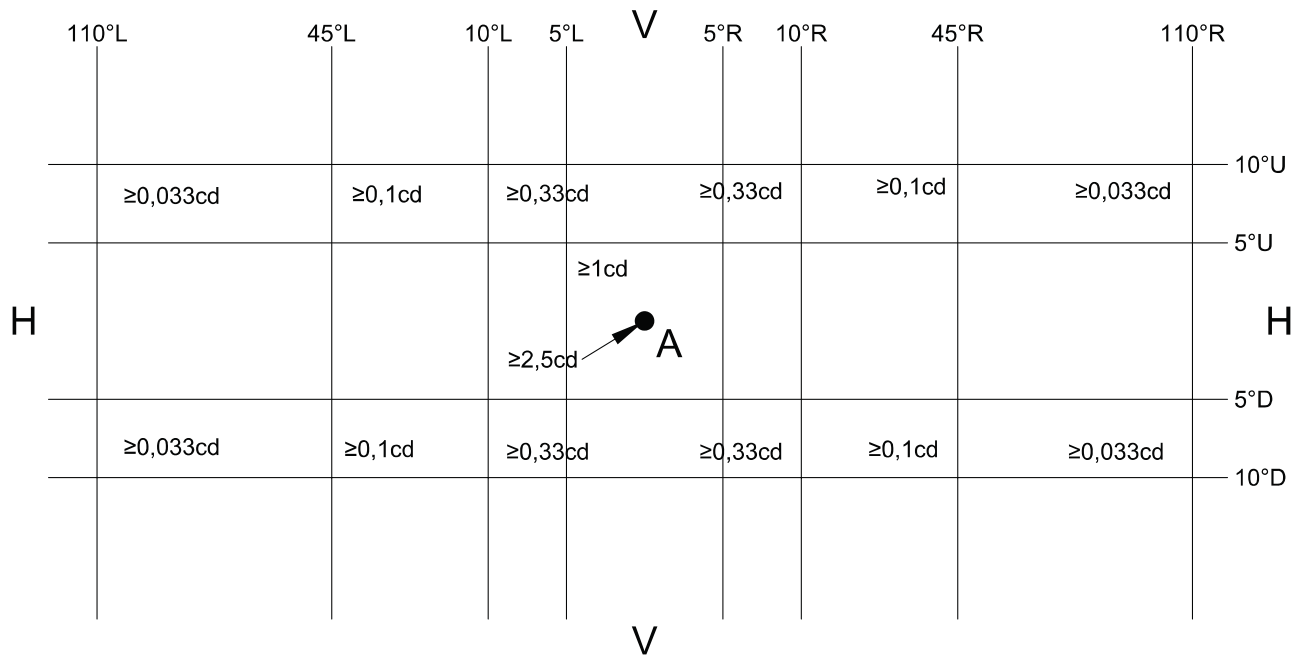
4.3 Rear lamp

4.3.1 Photometric requirements

The requirements of the rear lamp contained in Table 2 shall correspond to the illustrative dimensions as shown further below in Figure 2. Rear lamps with a function of the stand light shall correspond with the requirement of 4.8.

Table 2 — Light distribution for rear lamp

Position	Value in cd
A on intersection of horizontal plane and vertical plane	≥ 2,5
In rectangular area bounded by lines 5°U, 5°D, 5°L and 5°R	≥ 1
In rectangular area bounded by lines 10°U, 10°D, 10°L and 10°R	≥ 0,33
In rectangular area bounded by lines 10°U, 10°D, 45°L and 45°R	≥ 0,1
In rectangular area bounded by lines 10°U, 10°D, 110°L and 110°R	≥ 0,033
Upper limit on the H-H line and above H-H line	12 max



Key

- H represents the horizontal plane to the ground through the reference axis
- V represents the vertical plane through the reference axis
- U and D represent the degrees of arc, respectively, above and below the horizontal plane
- L and R represent the degrees of arc, respectively, to the left and right of the vertical plane

Figure 2 — Measuring and aiming screen for rear lamp

4.3.2 Mode of illumination

A rear lamp could either emit a continuous light or flash at a frequency from 1 Hz to 4 Hz. Such a lamp may be capable of only one mode or be switched between modes.

NOTE Some national or regional regulations do not permit the use of flashing lights on pedal cycles, apart from direction indicators.

4.4 Stop lamp

4.4.1 Photometric requirements

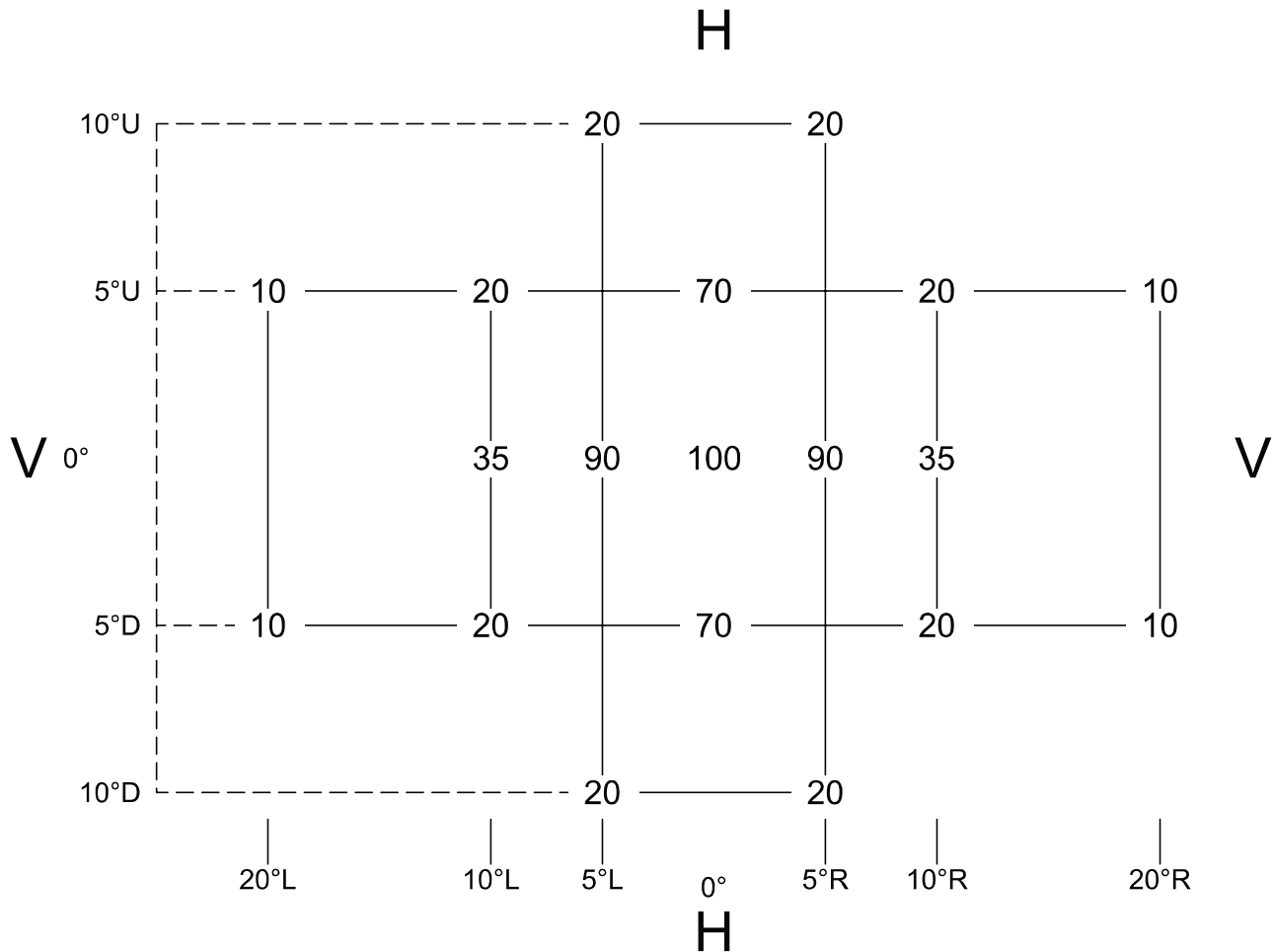
The minimum intensity measured on the reference axis at point $H = V = 0^\circ$ of a stop lamp shall be the highest of the following two values, as appropriate:

- 40 cd min;
- where a stop lamp function is provided by a rear lamp, at least five times the greatest measurable intensity of the rear lamp.

The greatest measurable intensity of the stop lamp shall not exceed 185 cd.

Light shall be emitted from a stop lamp throughout a zone defined as follows with respect to direction point $H = V = 0^\circ$: $\pm 45^\circ$ horizontally and $\pm 15^\circ$ vertically. Throughout the field of emission the intensity shall not be less than 0,3 cd.

The intensity in specified directions within the grid according to [Figure 3](#) shall be not less than specified percentages of the minimum point $H = V = 0^\circ$ intensity. The angles and percentages relative to the point $H = V = 0^\circ$ direction and value (100 %) are specified in [Figure 3](#).



Key

- H represents the horizontal plane to the ground through the reference axis
- V represents the vertical plane through the reference axis
- U and D represent the degrees of arc, respectively, above and below the horizontal plane
- L and R represent the degrees of arc, respectively, to the left and right of the vertical plane

Figure 3 — Light distribution for stop lamp

4.4.2 Mode of illumination

A stop lamp (while stopping) shall emit light continuously.

The stop lamp shall be operated either by electrical switches incorporated within or attached to the bicycles braking system or systems, or shall incorporate a device that operates the stop lamp when the bicycle decelerates more rapidly than $(0,6 \pm 0,4) \text{ m/s}^2$.

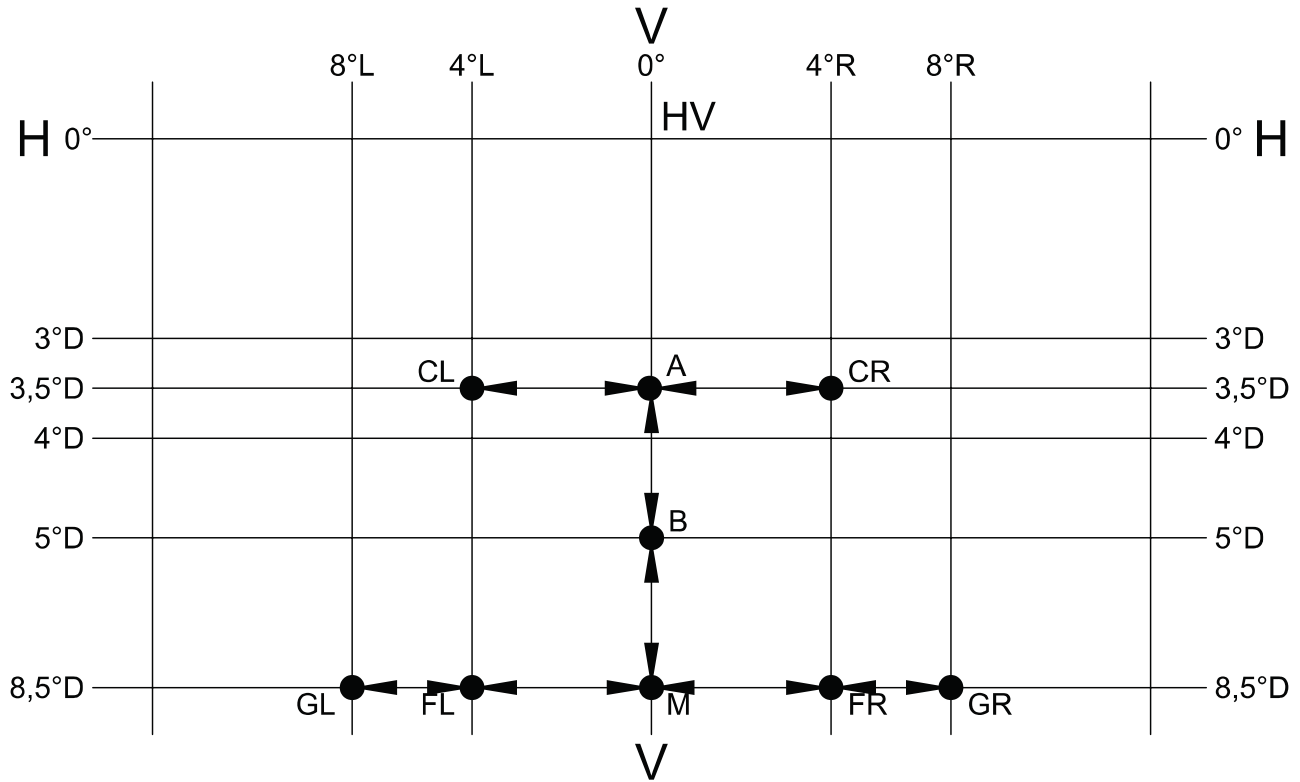
4.5 Low beam

4.5.1 Photometric requirements

The requirements of the low beam contained in [Table 3](#) shall correspond to the illustrative dimensions as shown further in [Figure 4](#).

Table 3 — Light distribution for low beam

Position	Illumination values in lux ^{abc}
On the H-H line and above H-H line	$\leq 2 \text{ lx}$
A	$E_A^c \geq 10 \text{ lx}$
From CL to CR	$E \geq E_A / 2$
Vertical line between A to B (included)	If $E_A \leq 20 \text{ lx}$, E shall be $\geq E_{\max}/2$ If $E_A > 20 \text{ lx}$, E shall be $\geq 10 \text{ lx}$
From B to M	If $E_A \leq 20$, E shall be above 1,5 lx If $E_A > 20$, E shall be above 3 lx
From FL to FR	If $E_A \leq 20$, E shall be above 1 lx If $E_A > 20$, E shall be above 2 lx
From GL to FL and from FR to GR	If $E_A \leq 20$, no requirement If $E_A > 20$, E shall be above 2 lx
Area between line 3 ° down and 4 ° down And between vertical lines at 4 ° left and right	E shall be $\leq 1,2 E_A$
Area below line 4 ° down and between vertical lines at 4 ° left and right	E shall be $\leq E_A$
<p>^a Values in lux measured on a vertical wall at 10 m ahead from headlamp.</p> <p>^b To make measurements, the bicycle light shall be fit in accordance with bicycle light manufacturer. If mounting instruction are not clearly defined, there are two possible alternatives:</p> <ul style="list-style-type: none"> — H-H line is the line where the illumination is just 2 lx — H-H line is the line 3,5 ° above the line including E_{\max} (E_{\max} is the maximum illumination). <p>^c E_A is the illumination in point A.</p>	



Key

- A point on the line V-V, 3,5 ° below the line H-H
- CR/CL points on a horizontal line 3,5 ° below the line H-H, 4 ° left and right
- B point 5 ° below H-H on the line V-V
- M point 8,5 ° below H-H on the line V-V
- FL/FR points on a horizontal line 8,5 ° below the line H-H, 4 ° left and right
- GL/GR points on a horizontal line 8,5 ° below the line H-H, 8 ° left and right
- H-H horizontal line at vertical 0 °
- V-V vertical line at horizontal 0 °
- D represent the degrees of arc, respectively, below the horizontal plane
- L and R represent the degrees of arc, respectively, to the left and right of the vertical plane

Figure 4 — Measuring and aiming screen for low beam

4.5.2 Mode of illumination

A headlamp that provides a low beam shall emit light continuously.

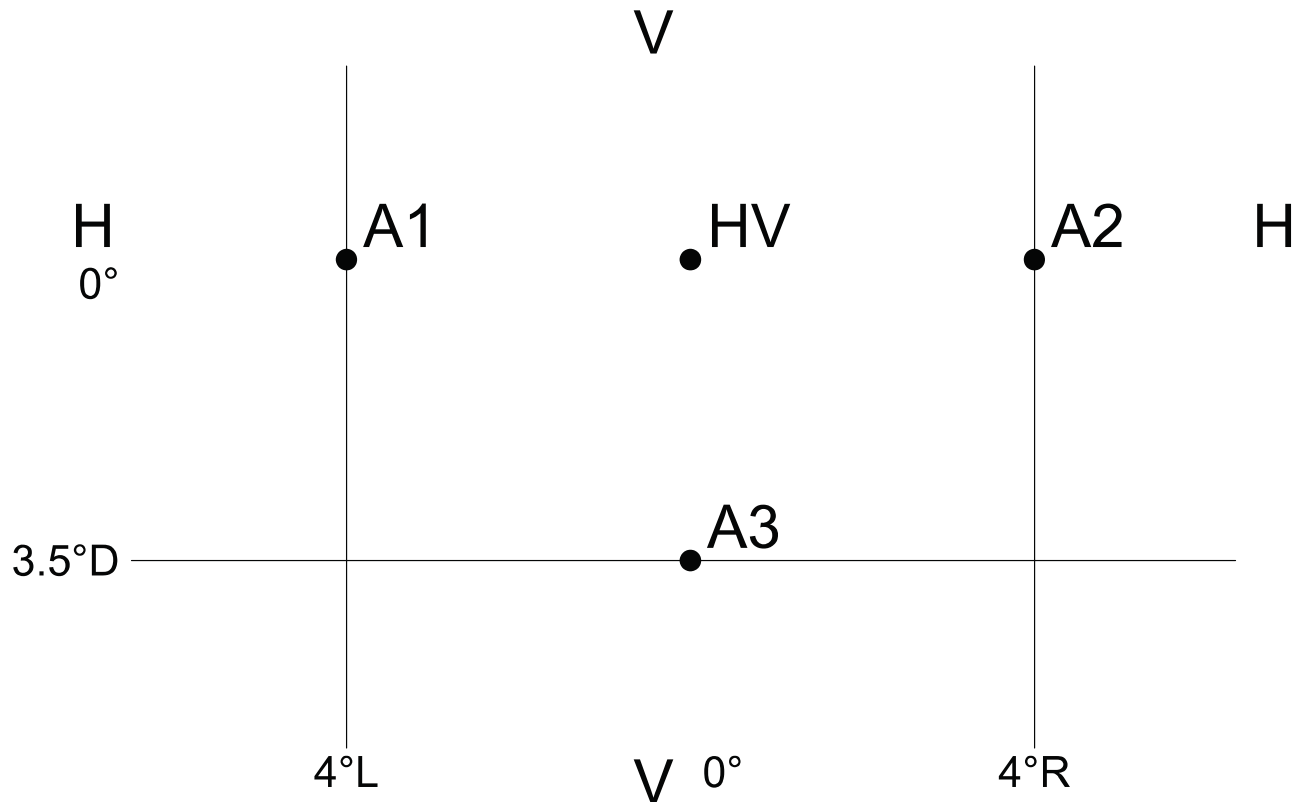
4.6 High beam

4.6.1 Photometric requirements

The requirements of the high beam contained in [Table 4](#) shall correspond to the illustrative dimensions as shown further in [Figure 5](#).

Table 4 — Light distribution for high beam

HV	A1	A2	A3
$E_{HV} \geq 50 \text{ lx}^a$	$E_{A1} \geq E_{HV}/2$	$E_{A2} \geq E_{HV}/2$	$E_{A3} \geq 10 \text{ lx}^a$
^a Values in lux measured on a vertical wall at 10 m ahead from headlamp.			



Key

- H-H line horizontal plane, parallel to the ground
- V-V line vertical plane passing through bicycle
- A1 / A2 on line H-H at 4° left and right
- A3 on line V-V at 3,5° down below H-H
- D represent the degrees of arc, respectively, below the horizontal plane
- L and R represent the degrees of arc, respectively, to the left and right of the vertical plane

Figure 5 — Measuring and aiming screen for high beam

4.6.2 Mode of illumination

Headlamp shall emit light continuously.

4.6.3 Additional requirements

The lamp shall be equipped with a device which ensures that the user can modify the light distribution from high beam to low beam and vice versa with just one movement so that it meets the relevant requirements. An appropriate triggering mechanism/device can be installed separately from the lamp itself.

If the light source of the low beam lamp is different from the light source of the high beam lamp but incorporated into the same casing, the point HV of both light sources must be identical.

4.7 Direction indicators

4.7.1 Photometric requirements

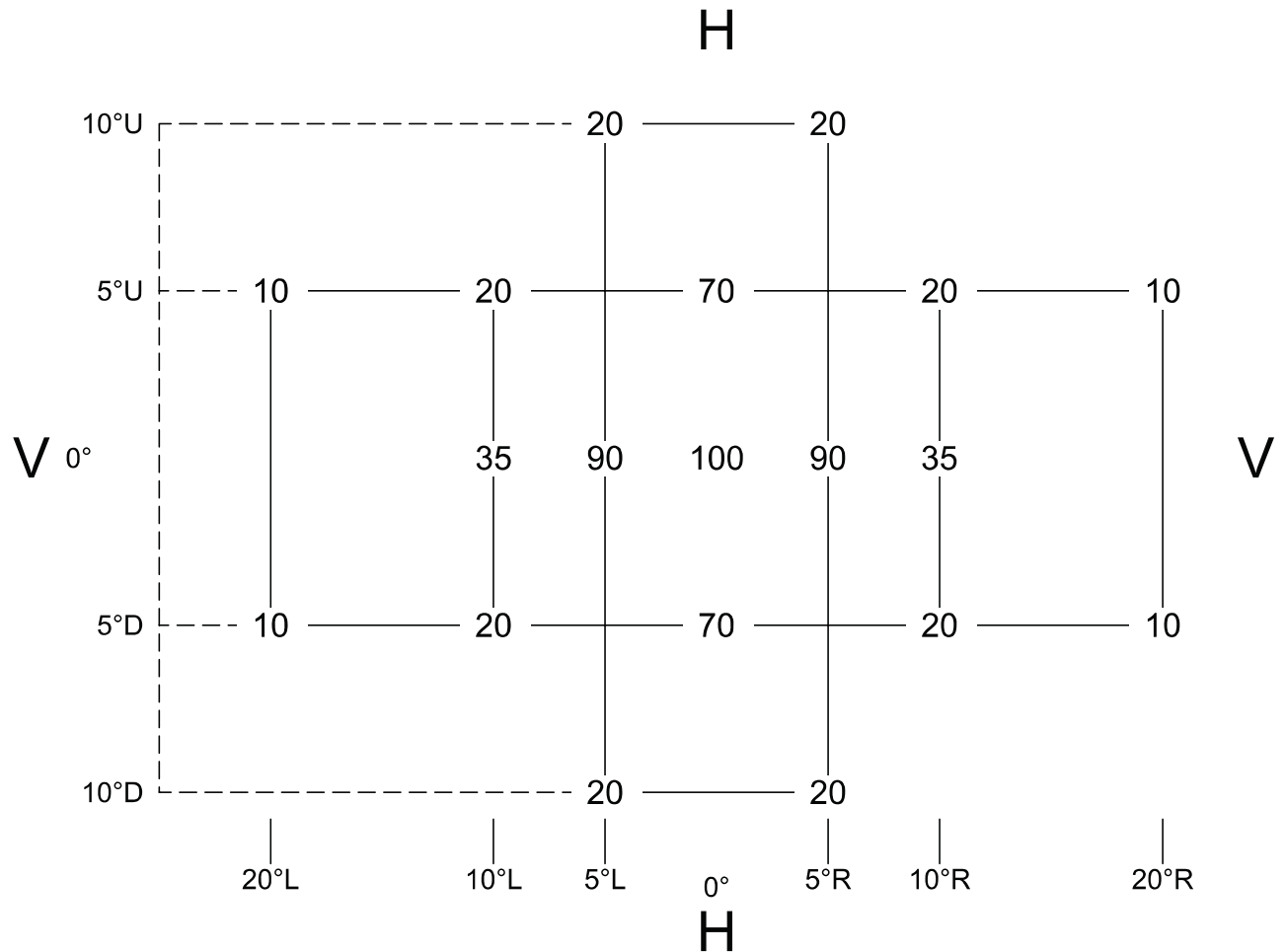
Light shall be emitted throughout a zone defined as follows with respect to direction HV: 80 ° outwards (for example to the right for a right-hand indicator) and 20 ° inwards. The vertical field shall generally be from +15 ° (upwards) to -15 ° (downwards).

The intensity measured on the reference axis of a front or rear direction indicator shall be at least the minimum values of [Table 5](#). The greatest measurable intensity shall not exceed the Maximum value in [Table 5](#). Throughout the field of emission the intensity shall not be less than 0,3 cd.

Table 5 — Intensities in candela

	Minimum	Maximum
Front indicator	50	350
Rear indicator	50	350

The intensity in specified directions within the measurement grid shall be not less than specified percentages in [Figure 6](#) of the minimum intensity. The angles and percentages relative to the reference axis (100 %) are specified in [Figure 6](#).

**Key**

- H represents the horizontal plane to the ground through the reference axis
 V represents the vertical plane through the reference axis
 U and D represent the degrees of arc, respectively, above and below the horizontal plane
 L and R represent the degrees of arc, respectively, to the left and right of the vertical plane

Figure 6 — Light distribution for direction indicator

4.7.2 Mode of illumination

The lights shall flash at frequency from 1 Hz to 2 Hz with a duty cycle of 45 % to 55 %. The intensity during the on-cycle shall be visually constant.

4.8 Stand light

4.8.1 Photometric requirements

This requirement applies to the rear lamp with a function of the stand light. When tested according to [Clause 6](#), the luminous intensity, measured on point A (see [Figure 2](#)), at the commencement of the test the luminous intensity of the light shall not be lower than 200 mcd and shall fulfil the following values:

- after 1 min at least 140 mcd;
- after 2 min at least 100 mcd;
- after 3 min at least 70 mcd;

— after 4 min at least 50 mcd.

4.8.2 Mode of illumination

A stand light could either emit a continuous light or flash at a frequency from 1 Hz to 4 Hz. Such a lamp may be capable of only one mode or be switched between modes.

NOTE Some national or regional regulations do not permit the use of flashing lights on pedal cycles, apart from direction indicators.

5 Colour requirements

The colour shall be according to [Table 6](#).

Table 6 — Colour requirements

Function	Colour	Trichromatic coordinates
Front position lamp	White or Amber	See Annex B
Rear lamp	Red	
Stop lamp	Red	
Low beam	White	
High beam	White	
Direction indicator	Amber	

6 Test methods

6.1 General

During photometric measurements, stray reflections shall be prevented by appropriate masking.

In all cases, the distance of measurements shall be such that the law of the inverse of the square of the distance is applicable.

For all values expressed in lux, the measurements are performed on a vertical screen P fitted 10 m in front of the lamp. If the distance of measurement is different than 10 m, the result of measurements shall be expressed at 10 m following the law of the inverse of the square of the distance. The measuring equipment shall be such that the angular aperture of the receiver viewed from the reference centre of the lamp is between 10' and 1°.

The intensity requirement for a particular direction of observation shall be deemed to be satisfied if that requirement is met in a direction deviating by not more than 15' from the direction of observation.

For any lamps, except those equipped with filament lamps, the luminous intensities and colour measured after 1 min and after 30 min of operation shall comply with the requirements. The luminous intensity distribution after one minute of operation can be calculated from the luminous intensity distribution after 30 min of operation by applying at each test point the ratio of luminous intensities measured at $H = V = 0^\circ$ after 1 min and after 30 min of operation.

In case of short pulses, the effective intensity of flashing light shall be measured according to [Annex A](#).

If a lamp has flashing and continuous modes provided by the same light source(s), its performance shall be measured mainly in continuous mode. The intensity in flashing mode shall be measured only in reference axis, with flashing intensities in other directions calculated in proportion to the continuous intensity in those directions compared to reference axis.

The LED colour shall be measured according to test method described in CIE 1931.

6.2 Power supply and light source to test photometrical performances

The lamp shall be equipped with the light sources specified by the manufacturer and operated at its reference luminous flux, for the voltage specified by the manufacturer according to ISO 6742-4 and ISO 6742-5.

For lighting devices working with power supplied by cycle's movement defined in ISO 6742-4, Clause 4, it's possible to use DC or AC power supply as described below:

a) Lighting devices with LED

Test voltage 6 V ; the current shall not exceed:

- 1) for 2,4 W headlamps (for 3 W / 2,4 W – systems): 440 mA;
- 2) for 1,2 W headlamps (for 1,5 W – system): 220 mA;
- 3) for 0,6 W rear lamps (for 3 W – system): 110 mA;
- 4) for 0,3 W rear lamps (for 1,5 W – system): 55 mA.

Alternatively the devices can be measured with test current:

- 1) for 2,4 W headlamps (for 3 W / 2,4 W systems): 400 mA;
- 2) for 1,2 W headlamps (for 1,5 W – system): 200 mA;
- 3) for 0,6 W rear lamps (for 3 W – system): 100 mA;
- 4) for 0,3 W rear lamps (for 1,5 W – system): 50 mA.

The voltage shall not exceed 6,7 V.

b) Lighting devices with filament bulbs

- 1) changeable filament lamp: luminous flux according to lamp data sheet;
- 2) non-changeable lamp: 6 V.

6.3 Installation on test bench

The lamp shall be installed on the test bench according to the recommendations of the cycle manufacturer or, those of the constructor of the lamp.

During the measurements the light shall be fit in accordance with the manufacturer.

If this is not clearly defined in the instruction manual there are two possibilities:

- H-H is the line where the illumination on this line and above is not higher than 2 lx;
- H-H is the line 3,5 ° above E_{max} .

NOTE Values in lux measured on a vertical wall at 10 m ahead from headlamp.

Annex A (informative)

Measurement of flashing light

A.1 General

This function of flashing light is only allowed for front position lamp, rear lamp and stand light.

The frequency of flashing shall be higher than 1 Hz, the luminous intensity shall be measured according to the following test method.

The following methods for evaluating the characteristics of flashing lights are derived from UN/ECE Regulation No. 65. [[3]]

A.2 Effective intensity

The effective intensity (J_{eff} measured in candela) of a flashing light is given by the Formula (A.1):

$$J_{eff} = \frac{J_{max}}{1 + \frac{C}{F \cdot T}} \quad (A.1)$$

where

- J_{max} is peak intensity, expressed in candela;
- T is duration of flash, expressed in seconds;
- C is time constant, expressed in seconds (= 0,2 s);
- F is form factor.

The form factor (F) is given by the Formula (A.2):

$$F = \frac{\int_0^T J \cdot dt}{J_{max} \cdot T} \quad (A.2)$$

where

- J is instantaneous intensity, expressed in candela.

NOTE When intensity (J) is charted against time (t), F is the area under the curve expressed as a fraction of the bounding rectangle, e.g. F equals 1 for square wave, 0,637 for a half sine wave, or 0,5 for a triangular spike.

A.3 Grouped flashes

If the emitted light consists of groups of two or more closely consecutive flashes, any group of flashes shall be evaluated as one flash depending upon the relationship between three factors:

- the ratio of peak intensity between the brightest (J_h) and least bright (J_l) flash in the group;

- the overall flash frequency (f), i.e. the number of flash groups per second assuming all probable groups may be regarded as such;
- the time interval (T_g) between consecutive flashes in the group.

If the peak to peak interval (T_g) is less than or equal to 0,04 s, then the pulses are always evaluated as one flash. If greater, refer to the [Table A.1](#) below.

Table A.1 — Limiting value of T_g

$\frac{J_h}{J_l}$	Between 1 and 10	Greater than 10
Limiting value of T_g	$\frac{1}{f \left(5,50 - 0,25 \frac{J_h}{J_l} \right)}$	$\frac{1}{3f}$

If T_g exceeds a value calculated from the appropriate formula in the above [Table A.1](#), only the flash with the highest peak intensity shall be evaluated and any adjacent peak shall be regarded as a separate flash.

A.4 On-time and off-time

The on-time is defined as the period of time within which the luminous intensity of the flashing light is greater than 1/10th of the peak value (J_{\max}).

The off-time is defined as the period of time within which the luminous intensity of the flashing light is less than 1/100th of the of the peak value (J_{\max}) or less than 10 cd, whichever is the smaller.

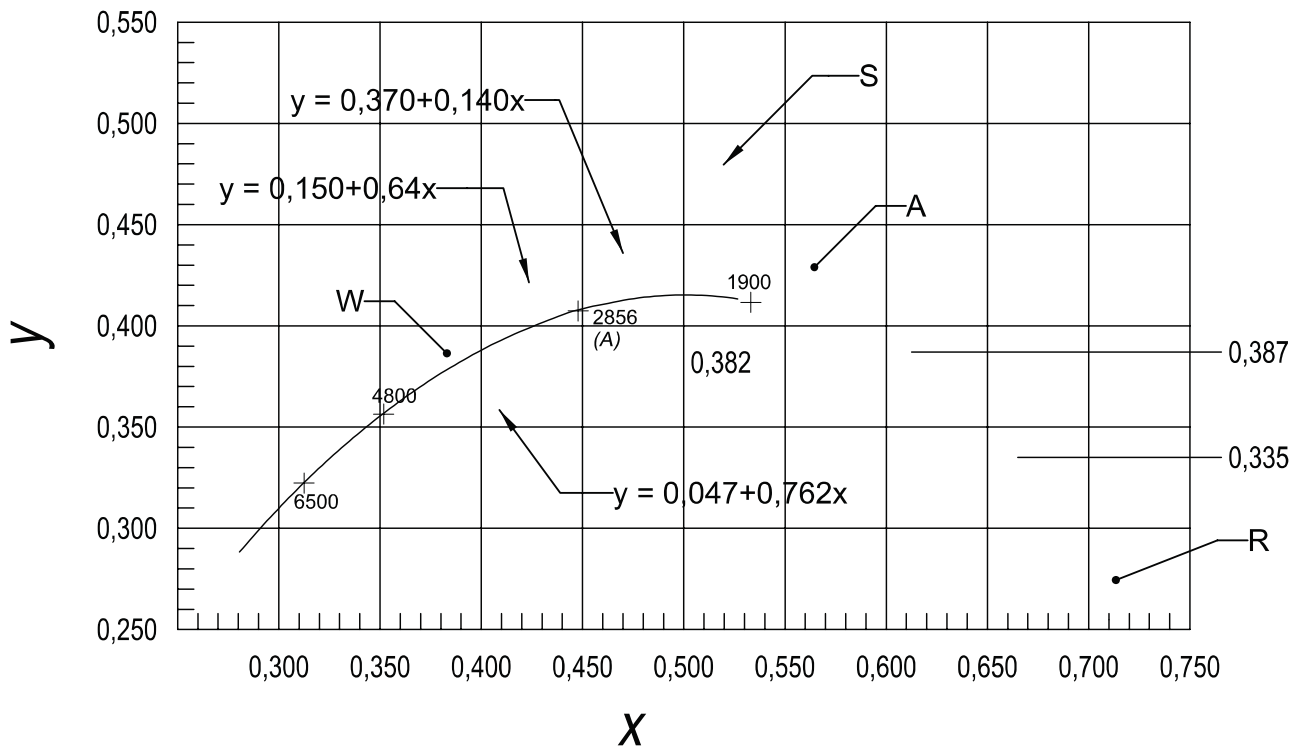
Annex B (normative)

Colour of the light emitted

Table B.1 gives the colour of light.

Table B.1 — x-y chromaticity coordinates of the intersection points of colour boundary lines

Colour	Coordinates						
	x	y	x	y	x	y	x
Red	x	0,665	0,645	0,721	0,735		
	y	0,335	0,335	0,259	0,265		
Amber	x	0,547	0,536	0,613	0,593		
	y	0,452	0,444	0,387	0,387		
White	x	0,300	0,440	0,500	0,500	0,440	0,300
	y	0,342	0,432	0,440	0,382	0,382	0,276



- Key**
- W white light region
 - A amber light region
 - R red light region
 - S spectrum locus

Figure B.1 — Boundaries of colour areas for lighting and light signalling devices

For verifying the limits above, a source of light at a colour temperature of 2 856 K (illuminant *A* of the International Commission on Illumination (CIE)), in combination with appropriate filters, may be used.

Bibliography

- [1] ISO 4210 (all parts), *Cycles — Safety requirements for bicycles*
- [2] ISO 8098, *Cycles — Safety requirements for bicycles for young children*
- [3] UN/ECE Regulation No. 65: *Uniform provisions concerning the approval of special warning lights for power-driven vehicles and their trailers*

