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**Cycles — Lighting and retro-reflective  
devices —**

**Part 2:  
Retro-reflective devices**

*Cycles — Éclairage et dispositifs rétro réfléchissants —  
Partie 2: Dispositifs rétro réfléchissants*

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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 document 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](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 149, *Cycles*, Subcommittee SC 1, *Cycles and major sub-assemblies*.

This fourth edition cancels and replaces the third edition (ISO 6742-2:2015) which has been technically revised. It also incorporates the Amendment ISO 6742-2:2015/Amd:2018.

The main changes are as follows:

- terms and definitions: “pedal reflector” was added;
- change all angle units to degrees;
- addition of [7.1.2.4](#) b);
- improvement of [8.2.4](#);
- addition of [Annex A](#).

A list of all parts in the ISO 6742 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

# Cycles — Lighting and retro-reflective devices —

## Part 2: Retro-reflective devices

### 1 Scope

This document is applicable to retro-reflective devices used on cycles intended to be used on public roads and, especially, bicycles complying with ISO 4210<sup>[1]</sup> and ISO 8098<sup>[2]</sup>.

This part of ISO 6742 specifies photometric and physical requirements of retro-reflective devices.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

CIE 15, *Colorimetry: official recommendations of the International Commission on Illumination*

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.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

#### 3.1

##### **retro-reflective device reflector**

assembly ready for use and comprising one or more retro-reflecting optical units

#### 3.2

##### **wide angle reflector**

device providing retro-reflection through horizontal entrance angles of not less than 50° on either side of the reference axis

#### 3.3

##### **conventional reflector**

device providing retro-reflection through entrance angles of not less than 20° on either side of the reference axis

#### 3.4

##### **high values reflector**

red *retro-reflective device* (3.1) with high values of reflection e.g. dedicated to be mounted on luggage carrier

**3.5 retro-reflective spoke**  
spoke with retro-reflective surface

**3.6 retro-reflective spoke case**  
device, e.g. cylinder, with retro-reflective surface with or without a gap, providing a secured mounting on a spoke

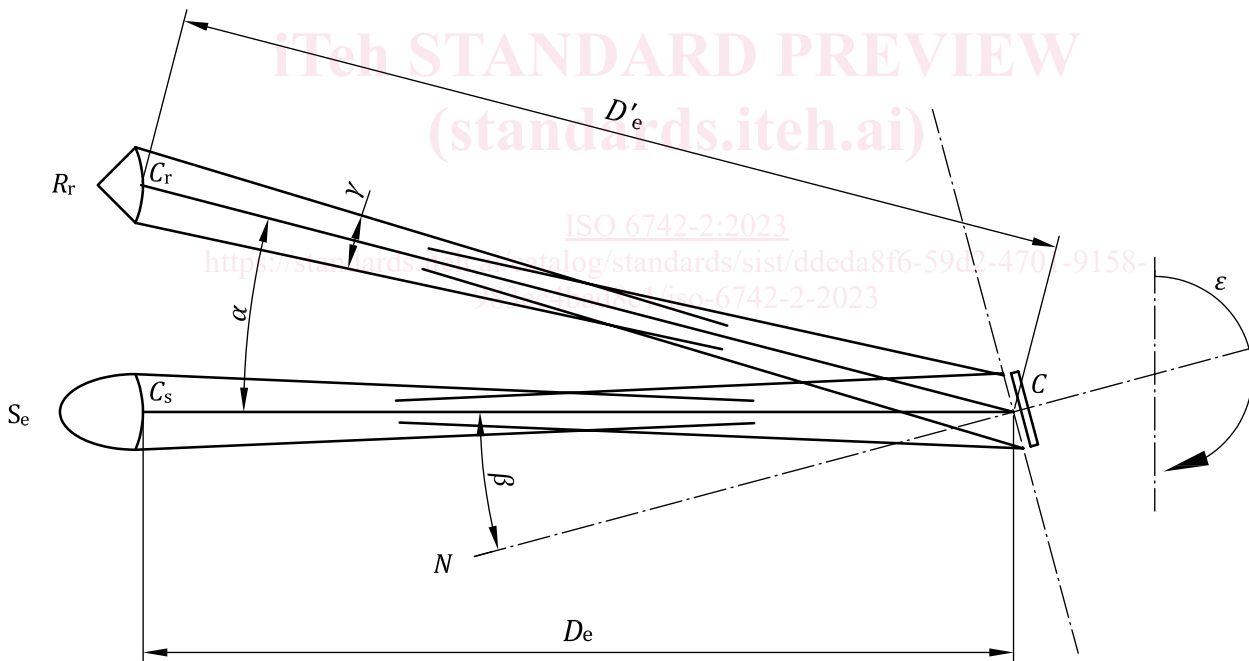
**3.7 retro-reflective tyre**  
tyre ready for use and comprising retro-reflecting annuli moulded on to each sidewall of the tyre

**3.8 pedal reflector**  
reflector located on the pedal

## 4 General

### 4.1 Symbols and units used

Symbols are shown in [Figure 1](#). Their meaning and units used are given in [Table 1](#).



**Figure 1 — Symbols**

NOTE The following symbols are in accordance with UN/ECE Regulation No.150<sup>[3]</sup> concerning retro-reflective devices.

**Table 1 — Meaning and units of symbols used**

Symbol	Meaning	Unit
C	Reference centre	—
NC	Reference axis	—
R <sub>r</sub>	Receiver, observer or measuring device	—
C <sub>r</sub>	Centre of receiver	—
S <sub>e</sub>	Source of illumination	—
C <sub>s</sub>	Centre of source of illumination	—
D <sub>e</sub> <sup>a</sup>	Distance from centre C <sub>s</sub> to centre C	m
D' <sub>e</sub> <sup>a</sup>	Distance from centre C <sub>r</sub> to centre C	m
D	Mean diameter of retro-reflective annulus on retro-reflective tyres	mm
α	Observation angle	degree (°)
β	Entrance angle. With respect to line C <sub>s</sub> C which always considered to be horizontal, this angle is prefixed with signs – (left), + (right), + (up) or – (down), according to the position of the source S <sub>e</sub> in relation to the axis NC, as seen when looking towards the retro-reflective device. For any direction defined by two angles, vertical and horizontal, the vertical angle is always given first.	degree (°)
γ	Angular subtense of measuring device R <sub>r</sub> , as seen from point C	degree (°)
δ	Angular subtense of the source S <sub>e</sub> , as seen from point C	degree (°)
ε	Rotation angle. This angle is positive when the rotation is clockwise as seen when looking towards the illuminated surface. If reflecting device is marked “TOP”, the position thus indicated is taken as origin.	degree (°)

<sup>a</sup> D<sub>e</sub> and D'<sub>e</sub> are generally very nearly the same and under normal conditions of observation it may be assumed that D<sub>e</sub> = D'<sub>e</sub>. Furthermore, the effective distances may be used when a collimated system is used in order to obtain an artificially increased measuring distance.

#### 4.2 Chronological order of tests

The applicant shall submit for approval samples which shall be tested in the chronological order indicated in [Table 2](#).

**Table 2 — Chronological order of tests**

Number of paragraph	Tests for retro-reflective devices	Sample					
		a	b	c	d	e	f
<a href="#">7.1.2.2</a>	Temperature resistance test	X	X	X	X	X	X
<a href="#">Clause 6</a>	Colorimetry: visual inspection Trichromatic coordinates in case of doubt	X	X	X	X	X	X
<a href="#">Clause 5</a>	Photometry only at V = H = 0°	X	X	X	X	X	X
<a href="#">Clause 5</a>	Photometry at all test points	X	X				
<a href="#">7.1.2.4</a>	Moisture resistance test			X	X		
<a href="#">7.1.2.5</a>	Resistance to fuels			X	X		
<a href="#">7.1.2.6</a>	Resistance to lubricating oils			X	X		
<a href="#">Clause 6</a>	Colorimetry: visual inspection Trichromatic coordinates in case of doubt			X	X		
<a href="#">Clause 5</a>	Photometry only at V = H = 0°			X	X		
<a href="#">7.1.2.3</a>	Impact test (only for wide angle reflector and conventional reflector of Group B)					X	X
<a href="#">Clause 6</a>	Colorimetry: visual inspection Trichromatic coordinates in case of doubt					X	X

**Table 2 (continued)**

Number of paragraph	Tests for retro-reflective devices	Sample					
		a	b	c	d	e	f
<a href="#">Clause 5</a>	Photometry only at $V = H = 0^\circ$					X	X

## 5 Photometrical requirements

### 5.1 General

In order to follow different requirements in different countries, the photometrical requirements are divided into 2 groups: Group A and Group B, see [Table 3](#).

**Table 3 — Tables link with groups**

Classification	Type	Colour	Group A	Group B
Front	Conventional reflector	White	<a href="#">Table 4</a>	<a href="#">Table 5</a>
	Wide angle reflector		<a href="#">Table 6</a>	<a href="#">Table 7</a>
Rear	Conventional reflector	Red	<a href="#">Table 4</a>	<a href="#">Table 5</a>
	Wide angle reflector		<a href="#">Table 6</a>	<a href="#">Table 7</a>
	High value reflector		<a href="#">Table 10</a>	
Side	Conventional reflector	White or yellow	<a href="#">Table 4</a>	<a href="#">Table 5</a>
	Wide angle reflector		<a href="#">Table 6</a>	<a href="#">Table 7</a>
	Retro-reflective tyre		<a href="#">Table 11</a>	<a href="#">Table 12</a>
	Retro-reflective spoke	White	<a href="#">Table 13</a>	
	Retro-reflective spoke case	White	<a href="#">Table 14</a>	
Pedal	Pedal reflector	Yellow	<a href="#">Table 8</a>	<a href="#">Table 9</a>

NOTE Groups A or B are chosen according to national regulations.

### 5.2 Reflectors

When tested by the method given in [Clause 8](#), the coefficients of luminous intensity,  $C_{IL}$ , values for reflectors shall not be less than those specified in [Tables 4, 5, 6, 7, 8, 9](#) or [10](#).

[Tables 4](#) to [7](#) applies to front, side and rear reflectors.

[Tables 8](#) and [9](#) applies to pedal reflectors.

[Table 10](#) applies to high values reflectors. High values reflectors are only applicable in Group A.



**Table 4 —  $C_{IL}$  for conventional reflectors (Group A)**

$C_{IL}$  in mcd/lx

Colour	Observation angle, $\alpha$	Entrance angle, $\beta$			
		vertical V horizontal H	0° 0°	±10° 0°	±5° ±20°
White	0,33°		1 200	800	400
	1,50°		20	11,2	10
Yellow	0,33°		750	500	250
	1,50°		12,5	7	6,25
Red	0,33°		300	200	100
	1,50°		5	2,8	2,5

**Table 5 —  $C_{IL}$  for conventional reflectors (Group B)**

$C_{IL}$  in mcd/lx

Colour	Observation angle, $\alpha$	Entrance angle, $\beta$			
		vertical V horizontal H	0° 0°	±10° 0°	0° ±20°
White	0,20°		2 500	1 650	850
	1,50°		26	18	11
Yellow	0,20°		1 560	1 030	530
	1,50°		16	11	7
Red	0,20°		625	410	210
	1,50°		7	5	3

**Table 6 —  $C_{IL}$  for wide angle reflectors (Group A)**

$C_{IL}$  in mcd/lx

Colour	Observation angle, $\alpha$	Entrance angle, $\beta$						
		vertical V horizontal H	0° 0°	±10° 0°	0° ±20°	0° ±30°	0° ±40°	0° ±50°
White	0,33°		1 800	1 200	610	540	470	400
	1,50°		34	24	15	15	15	15
Yellow	0,33°		1 125	750	380	335	290	250
	1,50°		21	15	10	10	10	10
Red	0,33°		450	300	150	135	115	100
	1,50°		9	6	4	4	4	4

**Table 7 —  $C_{IL}$  for wide angle reflectors (Group B)**

$C_{IL}$  in mcd/lx

Colour	Observation angle, $\alpha$	Entrance angle, $\beta$						
		vertical V horizontal H	0° 0°	±10° 0°	0° ±20°	0° ±30°	0° ±40°	0° ±50°
White	0,20°		2 500	1 650	850	750	650	550
	1,50°		26	18	11	11	11	11
Yellow	0,20°		1 560	1 030	530	465	405	340
	1,50°		16	11	7	7	7	7
Red	0,20°		625	410	210	185	160	135
	1,50°		7	5	3	3	3	3

**Table 8 —  $C_{IL}$  for pedal reflectors (Group A)**

$C_{IL}$  in mcd/lx

Colour	Observation angle, $\alpha$	Entrance angle, $\beta$			
		vertical V horizontal H	0° 0°	±10° 0°	±5° ±20°
Yellow	0,33°		300	200	100
	1,50°		12	9	6

**Table 9 —  $C_{IL}$  for pedal reflectors (Group B)**

$C_{IL}$  in mcd/lx

Colour	Observation angle, $\alpha$	Entrance angle, $\beta$			
		vertical V horizontal H	0° 0°	±10° 0°	0° ±20°
Yellow	0,20°		450	350	175
	1,50°		16,5	11,5	7,5

**Table 10 —  $C_{IL}$  for high values reflectors (Group A)**

$C_{IL}$  in mcd/lx

Colour	Observation angle, $\alpha$	Entrance angle, $\beta$			
		vertical V horizontal H	0° 0°	±10° 0°	±5° ±20°
Red	0,33°		1 000	700	400
	1,50°		30	20	10

### 5.3 Retro-reflective tyres

When tested by the method given in [Clause 8](#), the  $C_{IL}$  values for a retro-reflective tyre shall not be less than those specified in [Table 11](#) and [Table 12](#). In case where  $D$  is less than 420 mm the minimum photometric value for each observation and entrance angle shall be equal to the value for  $D = 420$  mm.

Table 11 —  $C_{IL}$  for retro-reflective tyres (Group A) $C_{IL}$  in mcd/lx

Colour	Observation angle, $\alpha$	Entrance angle, $\beta$				
		horizontal H	5°	20°	40°	50°
Either White or White/Yellow	0,33°		1,60 <i>D</i>	1,40 <i>D</i>	0,47 <i>D</i>	0,15 <i>D</i>
	1,50°		0,11 <i>D</i>	0,10 <i>D</i>	0,065 <i>D</i>	0,020 <i>D</i>

Table 12 —  $C_{IL}$  for retro-reflective tyres (Group B) $C_{IL}$  in mcd/lx

Colour	Observation angle, $\alpha$	Entrance angle, $\beta$				
		horizontal H	-4°	20°	40°	50°
Either White or White/Yellow	0,20°		1,21 <i>D</i>	1,06 <i>D</i>	0,70 <i>D</i>	0,21 <i>D</i>
	1,50°		0,121 <i>D</i>	0,106 <i>D</i>	0,070 <i>D</i>	0,021 <i>D</i>

#### 5.4 Retro-reflective spokes or spoke cases

Retro-reflective spokes or spoke cases are only applicable in Group A.

When tested by the method given in [Clause 8](#), the  $C_{IL}$  values for retro-reflective spokes shall not be less than those specified in [Table 13](#).

Table 13 —  $C_{IL}$  for retro-reflective spokes $C_{IL}$  in mcd/lx

Colour	Observation angle, $\alpha$	Entrance angle, $\beta$						
		vertical V	0°	0°	0°	0°	0°	0°
		horizontal H	±5°	±10°	±20°	±30°	±40°	±50°
White	0,33°		1 500	1 400	1 300	1 200	1 000	800
	1,50°		90	80	70	70	60	60

When tested by the method given in [Clause 8](#), the  $C_{IL}$  values for retro-reflective spoke cases shall not be less than those specified in [Table 14](#).

Table 14 —  $C_{IL}$  for retro-reflective spoke cases $C_{IL}$  in mcd/lx

Colour	Observation angle, $\alpha$	Entrance angle, $\beta$						
		vertical V	0°	0°	0°	0°	0°	0°
		horizontal H	±5°	±10°	±20°	±30°	±40°	±50°
White	0,33°		600	450	400	250	220	90
	1,50°		70	60	50	50	40	12

The colour of the retro-reflecting light shall be determined according to [Clause 9](#) and shall be within the colour range white of this document.

Retro-reflective spokes or spoke cases which have been coloured with a coat of paint shall be inadmissible.