INTERNATIONAL STANDARD

ISO 6742-2

Third edition
2015-05-15

Cycles — Lighting and retro-reflective devices —

Part 2: Retro-reflective devices

Cycles — Dispositifs d'éclairage et dispositifs rétroréfléchissants —

Partie 2: Dispositifs rétroréfléchissants

Reference number
ISO 6742-2:2015(E)

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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).

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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 6742-2:1985), 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 2: Retro-reflective devices

1 Scope

This part of ISO 6742 is applicable to retro-reflective 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 photometric and physical requirements of retro-reflective devices.

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 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.

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 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

4 General

4.1 Symbols and units used

Symbols are shown in Figure 1. Their meaning and units used are given in Table 1.

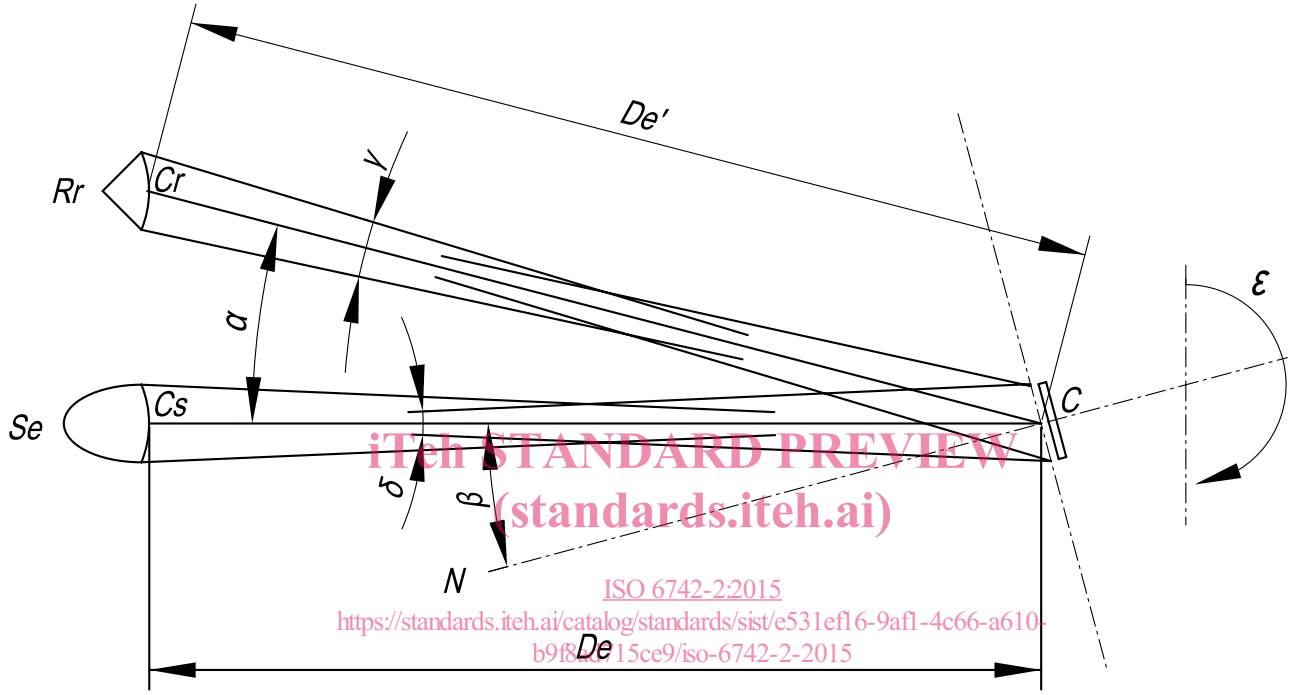

Figure 1 — Symbols

NOTE The following symbols are in accordance with Regulation No.3 of the UN/ECE concerning retro-reflective devices.

Table 1 — Meaning and units of symbols used

Symbol	Meaning	Unit
A	Area of the effective reflex surface of the retro-reflective device	cm^2
C	Reference centre	—
NC	Reference axis	—
R_r	Receiver, observer or measuring device	—
C_R	Centre of receiver	—
$Ø_R$	Diameter of receiver R_r, if circular	*cm*
S_e	Source of illumination	—
C_S	Centre of source of illumination	—
$Ø_S$	Diameter of source of illumination	*cm*
D_e[a]	Distance from centre C_S to centre C	*m*
D'_e[a]	Distance from centre C_R to centre C	*m*
D	Mean diameter of retro-reflective annulus on retro-reflective tyres	*mm*
α	Observation angle	*Degree and minutes*
β	Entrance angle. With respect to line C_SC 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_e 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 and minutes*
γ	Angular subtense of measuring device R_r, as seen from point C	*Degree and minutes*
δ	Angular subtense of the source S_e, as seen from point C	*Degree and minutes*
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 and minutes*
E	Illuminance of retro-reflective device	*lux*
CIL	Coefficient of luminous intensity	*millicandelas per lux*

[a] D_e and D'_e are generally very nearly the same and under normal conditions of observation it may be assumed that $D_e = D'_e$. 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 (only for reflectors)

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	Samples					
		a	b	c	d	e	f
7.1.2.2	Temperature resistance test	X	X	X	X	X	X
Clause 6	Colorimetry: visual inspection Trichromatic coordinates in case of doubt	X	X	X	X	X	X
Clause 5	Photometry only at V = H = 0 °	X	X	X	X	X	X
Clause 5	Photometry at all test points	X	X				
7.1.2.4	Moisture resistance test			X	X		
7.1.2.5	Resistance to fuels			X	X		
7.1.2.6	Resistance to lubricating oils			X	X		
Clause 6	Colorimetry: visual inspection Trichromatic coordinates in case of doubt			X	X		
Clause5	Photometry only at V = H = 0 °			X	X		
7.1.2.3	Impact test (only for wide angle reflector and conventional reflector of Group B)					X	X
Clause 6	Colorimetry: visual inspection Trichromatic coordinates in case of doubt					X	X
Clause 5	Photometry only at V = H = 0 °					X	X

5 Photometrical requirements

In order to follow different requirements in different countries, the photometrical requirements are divided into 2 groups: Group A and Group B.

Table 3 — Tables link with groups

Group A	Group B
Table 4	Table 5
Table 6	Table 7
Table 8	Table 9
Table 10	—
Table 11	Table 12
Table 13	—
Table 14	—

NOTE Groups A or B have to be chosen according to national regulations.

5.1 Reflectors

When tested by the method given in Clause 8, the CIL 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 — Coefficients of luminous intensity, CIL, for conventional reflectors

Colour	Observation angle α	Entrance angle β (in degree)			
		vertical V horizontal H	0 ° 0 °	±10 ° 0 °	±5 ° ±20 °
White	0 °20′		1 200	800	400
	1 °30′		20	11,2	10
Yellow	0 °20′		750	500	250
	1 °30′		12,5	7	6,25
Red	0 °20′		300	200	100
	1 °30′		5	2,8	2,5

Table 5 — Coefficients of luminous intensity, CIL, for conventional reflectors

Colour	Observation angle α	Entrance angle β (in degree)			
		vertical V horizontal H	0 ° 0 °	±10 ° 0 °	0 ° ±20 °
White	0 °12′		2 500	1 650	850
	1 °30′		26	18	11
Yellow	0 °12′		1 560	1 030	530
	1 °30′		21	15	10
Red	0 °12′		625	410	210
	1 °30′		9	6	4

Table 6 — Coefficients of luminous intensity, CIL, for wide angle reflectors

Colour	Observation angle α	Entrance angle β (in degree)						
		vertical V horizontal H	0 ° 0 °	±10 ° 0 °	0 ° ±20 °	0 ° ±30 °	0 ° ±40 °	0 ° ±50 °
White	0 °20′		1 800	1 200	610	540	470	400
	1 °30′		34	24	15	15	15	15
Yellow	0 °20′		1 125	750	380	335	290	250
	1 °30′		21	15	10	10	10	10
Red	0 °20′		450	300	150	135	115	100
	1 °30′		9	6	4	4	4	4

Table 7 — Coefficients of luminous intensity, CIL, for wide angle reflectors

Colour	Observation angle α	Entrance angle β (in degree)						
		vertical V horizontal H	0 ° 0 °	±10 ° 0 °	0 ° ±20 °	0 ° ±30 °	0 ° ±40 °	0 ° ±50 °
White	0 °12′		2 500	1 650	850	750	650	550
	1 °30′		26	18	11	11	11	11
Yellow	0 °12′		1 560	1 030	530	465	405	340
	1 °30′		21	15	10	10	10	10
Red	0 °12′		625	410	210	185	160	135
	1 °30′		9	6	4	4	4	4

Table 8 — Coefficients of luminous intensity, CIL, for pedal reflectors

Colour	Observation angle α	Entrance angle β (in degree)			
		vertical V horizontal H	0 ° 0 °	±10 ° 0 °	±5 ° ±20 °
Yellow	0 °20′		300	200	100
	1 °30′		12	9	6

Table 9 — Coefficients of luminous intensity, CIL, for pedal reflectors

Colour	Observation angle α	Entrance angle β (in degree)			
		vertical V horizontal H	0 ° 0 °	±10 ° 0 °	0 ° ±20 °
Yellow	0 °12′		450	350	175
	1 °30′		16,5	11,5	7,5

Table 10 — Coefficients of luminous intensity, CIL, for high values reflectors

Colour	Observation angle α	Entrance angle β (in degree)			
		vertical V horizontal H	0 ° 0 °	±10 ° 0 °	±5 ° ±20 °
Red	0 °20′		1 000	700	400
	1 °30′		30	20	10

5.2 Retro-reflective tyres

When tested by the method given in Clause 8, the CIL values for a retro-reflective tyre shall not be less 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 — Coefficients of luminous intensity, CIL, for retro-reflective tyres

Colour	Observation angle α	Entrance angle β (in degree)				
		horizontal H	5 °	20 °	40 °	50 °
Either White or White/Yellow	0 °20′		1,60 *D*	1,40 *D*	0,47 *D*	0,15 *D*
	1 °30′		0,11 *D*	0,10 *D*	0,065 *D*	0,020 *D*

Table 12 — Coefficients of luminous intensity, CIL, for retro-reflective tyres

Colour	Observation angle α	Entrance angle β (in degree)				
		horizontal H	−4 °	20 °	40 °	50 °
Either White or White/Yellow	0 °12′		1,21 *D*	1,06 *D*	0,70 *D*	0,21 *D*
	1 °30′		0,121 *D*	0,106 *D*	0,070 *D*	0,021 *D*

5.3 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 CIL values for retro-reflective spokes shall not be less than those specified in Table 13.

Table 13 — Coefficients of luminous intensity, CIL, for retro-reflective spokes

Colour	Observation angle α	Entrance angle β (in degree)						
		vertical V horizontal H	0 ° ±5 °	0 ° ±10 °	0 ° ±20 °	0 ° ±30 °	0 ° ±40 °	0 ° ±50 °
White	0 °20′		1 500	1 400	1 300	1 200	1 000	800
	1 °30′		90	80	70	70	60	60

When tested by the method given in Clause 8, the CIL values for retro-reflective spoke cases shall not be less than those specified in Table 14.

Table 14 — Coefficients of luminous intensity, CIL, for retro-reflective spoke cases

Colour	Observation angle α	Entrance angle β (in degree)						
		vertical V horizontal H	0 ° ±5 °	0 ° ±10 °	0 ° ±20 °	0 ° ±30 °	0 ° ±40 °	0 ° ±50 °
White	0 °20′		600	450	400	250	220	90
	1 °30′		70	60	50	50	40	12

The colour of the retro-reflecting light is to be determined according to Clause 9 and has to be within the colour range white of this part of ISO 6742.

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