

17 December 2021

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## **Agreement**

### **Concerning the Adoption of Harmonized Technical United Nations Regulations for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these United Nations Regulations\***

(Revision 3, including the amendments which entered into force on 14 September 2017)

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### **Addendum 149 – UN Regulation No. 150**

#### **Amendment 3**

Supplement 3 to the original version of the Regulation – Date of entry into force:  
30 September 2021

### **Uniform provisions concerning the approval of retro-reflective devices and markings for powerdriven vehicles and their trailers**

This document is meant purely as documentation tool. The authentic and legal binding text is: ECE/TRANS/WP.29/2021/47.



**UNITED NATIONS**

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\* Former titles of the Agreement:

Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, done at Geneva on 20 March 1958 (original version);  
Agreement concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these Prescriptions, done at Geneva on 5 October 1995 (Revision 2).



*Paragraph 2.3.2.5.*, amend to read:

"2.3.2.5. "Colour of the reflected light of the device" - the definitions of the colour of the reflected light are given in paragraph 2.11. of UN Regulation No. 48."

*Paragraph 3.1.1.1.*, amend to read:

"3.1.1.1. In case of retroreflectors:

- (a) At the choice of the applicant, the application for type approval will specify that the device may be installed on a vehicle with different inclinations of the reference axis in respect to the vehicle reference planes and to the ground or, in the case of Classes IA, IB and IVA retro-reflectors, rotate around its reference axis; these different conditions of installation shall be indicated in the communication form;
- (b) Drawings, in triplicate, in sufficient detail to permit identification of the type, showing geometrically the position(s) in which the retro-reflecting device may be fitted to the vehicle, and in case of class IB or IIIB-retro-reflectors details of installation. The drawings must show the position intended for the approval number and class indicator in relation to the circle of the approval mark;
- (c) A brief description giving the technical specifications of the materials of which the retro-reflecting optical unit is made;
- (d) Samples of the retro-reflecting device of a colour specified by the manufacturer and, if necessary, the means of fixation; the number of samples to be submitted is specified in paragraphs 5.1. and 5.2.;
- (e) If necessary, two samples in other colour(s) for simultaneous or subsequent extension of the approval to devices in other colour(s);
- (f) In the case of devices of Class IVA: samples of the retro-reflecting device and, if necessary, the means of fixation; the number of samples to be submitted is specified in paragraph 5.3."

*Paragraph 3.1.1.2.*, amend to read:

"3.1.1.2. In case of advance warning triangles:

- (a) Dimensional drawings in triplicate in sufficient detail to permit identification of the type;
- (b) A brief description giving the technical specifications of the materials constituting the advance warning triangle and instructions for use;
- (c) A copy of the instructions on its assembly for use;
- (d) Samples of the retro-reflective and of the fluorescent areas; the number of samples to be submitted is specified in paragraph 5.9."

*Paragraph 3.1.1.3.*, amend to read:

"3.1.1.3. In case of marking plates:

- (a) Drawings, in triplicate, sufficiently detailed to permit identification of the type. The drawings shall show geometrically the position in which the marking plate is to be fitted to the rear end of the vehicle. They shall also show the position intended for the approval number and the identification symbol in relation to the circle of the approval mark;
- (b) A brief description giving the technical specifications of the materials of which the retro-reflective areas are made;
- (c) A brief description giving the technical specifications of the materials of which the fluorescent areas are made;
- (d) Samples of the retro-reflective and of the fluorescent areas; the number of samples to be submitted is specified in paragraphs 5.7. and 5.8."

Paragraph 3.1.1.4., amend to read:

- "3.1.1.4. In case of retro-reflective marking material:
- (a) Drawings, in triplicate, sufficiently detailed to permit identification of the type. The drawings shall show geometrically the orientation in which the marking materials are to be fitted to a vehicle. They shall also show the position intended for the approval number and the identification symbol in relation to the circle of the approval mark;
  - (b) A brief description giving the technical specifications of the retro-reflective marking materials;
  - (c) Samples of the retro-reflective marking materials, as specified in paragraphs 5.4. and 5.5.;
  - (d) In the case of a type of reflective marking material differing only by the trade name or mark from a type that has already been approved it shall be sufficient to submit:
    - (i) A declaration by the reflective marking material manufacturer that the type submitted is identical with (except in the trade name or mark) and has been produced by the same manufacturer as the type already approved, the latter being identified by its approval code;
    - (ii) Two samples bearing the new trade name or mark or equivalent documentation."

Paragraph 3.2.3., amend to read:

- "3.2.3. An approval number shall be assigned to each type approved and shall be marked on the device following the requirements of paragraph 3.3. The same Contracting Party shall not assign the same number to another type of device of the same function, except in the case of an extension of the approval to a device differing only in colour."

Insert a new paragraph 3.2.4., to read:

- "3.2.4. If the approval granted in respect of a retro-reflecting device is extended to other such devices differing only in colour, the two samples in any other colour submitted in conformity with paragraph 3.1.1.1. (d) of this Regulation shall be required to meet only the colorimetric and photometric specifications, the other tests no longer being required. This paragraph is not applicable to devices of Class IVA."

Paragraph 3.2.4. (former), renumber as 3.2.5. and amend to read:

- "3.2.5. The symbols identifying the retro-reflective devices to be referenced in the Annex 1 shall be as follows:

Table 1  
List of retro-reflective devices and their symbols

<i>Retro-reflective devices</i>	<i>Symbol</i>	<i>Additional symbol</i>	<i>Minimum "a" for Figure A24-I (values in mm)</i>	<i>Paragraph</i>
Retro-reflector for motor vehicles (independent)	IA		4	5.1.
Retro-reflector for motor vehicles (combined with other signal lamps which are not watertight)	IB		4	5.1.
Retro-reflector for trailers (independent)	IIIA		4	5.2.
Retro-reflector for trailers (combined with other signal lamps which are not watertight)	IIIB		4	5.2.

<i>Retro-reflective devices</i>	<i>Symbol</i>	<i>Additional symbol</i>	<i>Minimum "a" for Figure A24-I (values in mm)</i>	<i>Paragraph</i>
Wide-angle retro reflector	IVA		4	5.3.
Conspicuity marking (material for contour/strip marking)	C	104R	12	5.4.
Conspicuity marking (material for distinctive markings/graphics intended for a limited area)	D	104R	12	5.5
Conspicuity marking (material for distinctive markings/graphics intended for an extended area)	E	104R	12	5.5.
Conspicuity marking (materials for distinctive markings or graphics as base or background in printing process for fully coloured logos and markings of class "E" in use which fulfil the requirements of class "D" materials)	D/E	104R	12	5.5.
Retro-reflective materials for extremities marking of class F	F	104R	12	5.6.
Retro-reflective marking for long or heavy vehicles (retro-reflective and fluorescent materials) Marking plate of class 1 or class 2	RF		5	5.7.
Retro-reflective marking for long or heavy vehicles (retro-reflective only materials) - Marking plate of class 3, class 4 or class 5	RR		5	5.7. for class 3 or 4 5.6. for class 5
Marking for slow moving vehicles (retro-reflective and fluorescent materials) - Marking plate of class 1	RF		5	5.8.
Marking for slow moving vehicles (retro-reflective only materials) - Marking plate of class 2	RR		5	5.8.
Advance Warning Triangle	-	27R	8	5.9.

"

Paragraph 3.2.5.(former), renumber as 3.2.6. and amend to read:

"3.2.6. The applicable change indexes for each device relating to the series of amendments shall be as follows (see also paragraph 6.1.1.):

Table 2  
**Series of amendments and change index**

<i>Series of amendments to the Regulation</i>	<i>00</i>		
<i>Device</i>	<i>Change Index for the specific device</i>		
Retro-reflector for motor vehicles (independent)	0		
Retro-reflector for motor vehicles (combined with other signal lamps which are not watertight)	0		
Retro-reflector for trailers (independent)	0		
Retro-reflector for trailers (combined with other signal lamps which are not watertight)	0		
Wide-angle retro reflector	0		
Conspicuity marking (material for contour/strip marking)	0		

<i>Series of amendments to the Regulation</i>	<i>00</i>		
<i>Device</i>	<i>Change Index for the specific device</i>		
Conspicuity marking (material for distinctive markings/graphics intended for a limited area)	0		
Conspicuity marking (material for distinctive markings/graphics intended for an extended area)	0		
Conspicuity marking (materials for distinctive markings or graphics as base or background in printing process for fully coloured logos and markings of class "E" in use which fulfil the requirements of class "D" materials)	0		
Retro-reflective materials for extremities marking of class F	0		
Retro-reflective marking for long or heavy vehicles (retro-reflective and fluorescent materials) Marking plate of class 1 or class 2	0		
Retro-reflective marking for long or heavy vehicles (retro-reflective only materials) Marking plate of class 3, class 4 or class 5	0		
Marking for slow moving vehicles (retro-reflective and fluorescent materials) Marking plate of class 1	0		
Marking for slow moving vehicles (retro-reflective only materials) Marking plate of class 2	0		
Advance Warning Triangle	0		

"

*Paragraph 3.3.1.1.*, amend to read:

"3.3.1.1. Every device belonging to an approved type shall comprise a space of sufficient size for the Unique Identifier (UI) as referred to in the 1958 Agreement and other markings as defined in paragraph 3.3.4.2. to 3.3.4.6. or, if technically not possible, the approval marking with the additional symbols and other markings as defined in paragraph 3.3.2."

*Insert a new paragraph 3.3.2.6.*, to read:

"3.3.2.6. On devices with reduced light distribution, in conformity with paragraph 5.1.4.5., 5.2.3.2. or 5.3.4.2. to this Regulation, a vertical arrow starting from a horizontal segment and directed downwards."

*Insert new paragraphs 3.3.4.2.2. and 3.3.4.2.3.*, to read:

"3.3.4.2.2. In case of Class C, D, E or F, an orientation mark "TOP" which must be inscribed on any marking material whose retro-reflective system is not omni-rotational at least:

- (a) On strips in a 0.5 m distance,
- (b) On areas within 100 x 100 mm<sup>2</sup>.

3.3.4.2.3. In case of Class 1, 2, 3, 4 or 5, on the plates whose retro-reflective system is not omni-rotational, the word "TOP" is inscribed horizontally on the part of the plates which is intended to be the highest part of the plate when mounted on the vehicle."

*Insert a new paragraph 3.3.4.4.1.*, to read:

"3.3.4.4.1. In case of Class C, D, E or F, the approval mark shall be visible and clearly legible on the outside of the marking material and shall be indelible and positioned at least once:

- (a) At 0.5 m intervals on strips,

- (b) On areas within 100 x 100 mm<sup>2</sup>."

*Paragraph 3.3.4.5.*, amend to read:

- "3.3.4.5. The approval number and the additional symbols shall be placed close to the circle and either above or below the letter "E", or to the right or left of that letter. The digits of the approval number shall be on the same side of the letter "E" and face the same direction."

*Insert new paragraphs 3.3.4.7. to 3.3.4.10.*, to read:

- "3.3.4.7. When two or more lamps are part of the same unit of grouped, combined or reciprocally incorporated lamps (including a retro-reflector), approval is granted only if each of these lamps satisfies the requirements of this Regulation or of another Regulation. Lamps not satisfying any one of those Regulations shall not be part of such a unit of grouped, combined or reciprocally incorporated lamps.
- 3.3.4.8. Where grouped, combined or reciprocally incorporated lamps comply with the requirements of several Regulations, a single international approval mark may be applied, consisting of a circle surrounding the letter "E" followed by the distinguishing number of the country which has granted the approval, an approval number and, if necessary, the required arrow. This approval mark may be placed anywhere on the grouped, combined or reciprocally incorporated lamps provided that:
- 3.3.4.8.1. It is visible after their installation;
- 3.3.4.8.2. No part of the grouped, combined or reciprocally incorporated lamps that transmits light can be removed without at the same time removing the approval mark.
- 3.3.4.9. The identification symbol for each lamp appropriate to each Regulation, under which approval has been granted, together with the corresponding series of amendments incorporating the most recent major technical amendments to the Regulation at the time of issue of the approval, shall be marked:
- 3.3.4.9.1. Either on the appropriate light-emitting surface,
- 3.3.4.9.2. Or in a group, in such a way that each lamp of the grouped, combined or reciprocally incorporated lamps may be clearly identified (see the possible examples shown in Annex 24).
- 3.3.4.10. The size of the components of a single approval mark shall not be less than the minimum size required for the smallest of the individual marks by a Regulation under which approval has been granted."

*Paragraph 3.3.4.7. (former)*, renumber as 3.3.4.11. and amend to read:

- "3.3.4.11. The space for the approval mark shall be shown in the drawings mentioned in paragraph 3.1.1."

*Paragraph 3.4.2.*, amend to read:

- "3.4.2. Confirmation or refusal of approval, specifying the alterations, shall be communicated by the procedure specified in paragraph 3.2.2. to the Contracting Parties to the 1958 Agreement applying this Regulation."

*Insert new paragraphs 3.5.5. to 3.5.5.3.*, to read:

- "3.5.5. Any retro-reflective marking plates approved to this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set forth in paragraphs 4. and 5. (as to resistance to external agents, only paragraph 5.7.6.1. is applied).
- 3.5.5.1. The minimum requirements for conformity of production control procedures set forth in Annex 2 to this Regulation shall be complied with.
- 3.5.5.2. The minimum requirements for sampling by an inspector set forth in Annex 3

to this Regulation shall be complied with.

- 3.5.5.3. The authority which has granted type approval may at any time verify the conformity control methods applied in each production facility. The normal frequency of these verifications shall be once every two years."

*Paragraph 4.*, amend to read:

## "4. General requirements

The requirements contained in sections 5. "General specifications" and 6. "Individual specifications" and in the Annexes referenced in the said sections of UN Regulations Nos. 48, 53, 74 or 86, and their series of amendments in force at the time of application for the retro-reflecting device type approval shall apply to this Regulation.

The requirements pertinent to each retro-reflecting device and to the category/ies of vehicle on which the retro-reflecting device is intended to be installed shall be applied, where its verification at the moment of retro-reflecting device type approval is feasible."

*Paragraph 4.2.1.1.*, amend to read:

- "4.2.1.1. These specifications shall apply only to white, red or amber retro-reflective devices."

*Paragraph 4.2.1.3.*, amend to read:

- "4.2.1.3. White retro-reflective devices must not produce a selective reflection, that is to say, the trichromatic coordinates "x" and "y" of Standard Illuminant "A" used to illuminate the retro-reflective device must not undergo a change of more than 0.01 after reflection by the retro-reflective device."

*Paragraph 5.1.3.1.*, amend to read:

- "5.1.3.1. After verification of the general specifications (paragraph 4.) and the specifications of shape and dimensions (Annex 5), the ten samples shall be subjected to the heat resistance test described in Annex 6 and at least one hour after this test examined as to their colorimetric characteristics in paragraph 5.1.5. and CIL in paragraph 5.1.4., for an angle of divergence of 20' and an illumination angle  $V = H = 0^\circ$  or if necessary, in the position defined in Annex 4, paragraphs 1.1. and 1.2.

The two retro-reflective devices giving the minimum and maximum values shall then be fully tested as shown in paragraph 5.1.4.

These two samples shall be kept by the laboratories for any further checks which may be found necessary.

The other eight samples shall be divided into four groups of two:

First group: The two samples shall be subjected successively to the water penetration test (Annex 7) and then, if this test is satisfactory, to the tests for resistance to fuels and lubricants (Annex 9 and Annex 10).

Second group: The two samples shall, if necessary, be subjected to the corrosion test in Annex 11, and then to the abrasive-strength test of the rear face of the retro-reflective device Annex 12.

Third group: The two samples shall be subjected to the test for stability in time of the optical properties of retro-reflective device Annex 14.

Fourth group: The two samples shall be subjected to the colour-fastness test (Annex 21)."

Paragraph 5.1.3.2.2., amend to read:

"5.1.3.2.2. A CIL which satisfies the conditions laid down in paragraph 5.1.4. The verification shall be performed only for an angle of divergence of 20' and an illumination angle of  $V = H = 0^\circ$  or, if necessary, in all positions specified in Annex 4, paragraphs 1.1. and 1.2."

Paragraph 5.1.4.4.3., amend to read:

"5.1.4.4.3. CIL values for white retro-reflective devices in Class IA or IB must be at least equal to those in Table 3 multiplied by the coefficient 4."

Paragraph 5.1.7., Table 4, amend to read:

"Table 4

**Chronological order of tests (Classes IA and IB)**

Number of Annex	Tests	Samples									
		a	b	c	d	e	f	g	h	i	j
-	General specifications: visual inspection	x	x	x	x	x	x	x	x	x	x
5	Shapes and dimensions: visual inspection	x	x	x	x	x	x	x	x	x	x
6	Heat: 48 h at $65^\circ \pm 2^\circ\text{C}$	x	x	x	x	x	x	x	x	x	x
	Visual inspection for distortion	x	x	x	x	x	x	x	x	x	x
23	Colorimetry: visual inspection	x	x	x	x	x	x	x	x	x	x
	Trichromatic coordinates in case of doubt		x								
4	Photometry: limited to 20' and $V = H = 0^\circ$	x	x	x	x	x	x	x	x	x	x
4	Complete photometry			x	x						
7	Water: 10 min. in normal position							x	x		
	10 min. in inverted position							x	x		
	visual inspection							x	x		
23	Colorimetry: visual inspection							x	x		
	Trichromatic coordinates in case of doubt							x	x		
4	Photometry: limited to 20' and $V = H = 0^\circ$							x	x		
9	Motor fuels: 5 min.							x	x		
	visual inspection							x	x		
10	Oils: 5 min.							x	x		
	visual inspection							x	x		
23	Colorimetry: visual inspection							x	x		
	Trichromatic coordinates in case of doubt							x	x		
4	Photometry: limited to 20' and $V = H = 0^\circ$							x	x		
8	Corrosion: 24 hours					x	x				
	2 hours interval					x	x				
	24 hours					x	x				
	visual inspection					x	x				
12	Rear face: 1 min.					x	x				
	visual inspection					x	x				
	Colorimetry: visual inspection					x	x				
	Trichromatic coordinates in case of doubt					x	x				
	Photometry: limited to 20' and $V = H = 0^\circ$					x	x				
14	Stability in time										



Number of Annex	Tests	Samples									
		a	b	c	d	e	f	g	h	i	j
23	Colorimetry: Visual inspection or trichromatic coordinates										
4	Photometry: limited to 20' and V = H = 0°										
13	Colour-fastness										
23	Colorimetry: Visual inspection or trichromatic coordinates										
4	Photometry: limited to 20' and V = H = 0°										
	Deposit of samples with authority			x	x						

..."

Paragraph 5.2.2.1., amend to read:

"5.2.2.1. After verification of the general specifications (paragraph 4.) and the specifications of shape and dimensions (Annex 5), the ten samples shall be subjected to the heat resistance test described in Annex 6 and at least one hour after this test examined as to their colorimetric characteristics in paragraph 5.2.4. and CIL in paragraph 5.2.3., for an angle of divergence of 20' and an illumination angle  $V = H = 0^\circ$  or if necessary, in the position defined in Annex 4, paragraphs 1.1. and 1.2.

The two retro-reflective devices giving the minimum and maximum values shall then be fully tested as shown in paragraph 5.2.4.

These two samples shall be kept by the laboratories for any further checks which may be found necessary.

The other eight samples shall be divided into four groups of two:

First group: The two samples shall be subjected successively to the water penetration test (Annex 7) and then, if this test is satisfactory, to the tests for resistance to fuels and lubricants (Annex 9 and Annex 10).

Second group: The two samples shall, if necessary, be subjected to the corrosion test in Annex 11, and then to the abrasive-strength test of the rear face of the retro-reflective device Annex 12.

Third group: The two samples shall be subjected to the test for stability in time of the optical properties of retro-reflective device Annex 14.

Fourth group: The two samples shall be subjected to the colour-fastness test (Annex 21)."

Paragraph 5.2.2.2., amend to read:

"5.2.2.2. A CIL which satisfies the conditions laid down in paragraph 5.2.3. The verification shall be performed only for an angle of divergence of 20' and an illumination angle of  $V = H = 0^\circ$  or, if necessary, in all positions specified in Annex 4, paragraphs 1.1. and 1.2."

Paragraph 5.2.6., Table 6, amend to read:

"Table 6  
Chronological order of tests (Classes IIIA and IIIB)

Number of Annex	Tests	Samples									
		a	b	c	d	e	f	g	h	i	j
-	General specifications: visual inspection	x	x	x	x	x	x	x	x	x	x
5	Shapes and dimensions: visual inspection	x	x	x	x	x	x	x	x	x	x
6	Heat: 48 h at 65° ± 2°C	x	x	x	x	x	x	x	x	x	x
	Visual inspection for distortion	x	x	x	x	x	x	x	x	x	x
23	Colorimetry: visual inspection	x	x	x	x	x	x	x	x	x	x
	Trichromatic coordinates in case of doubt		x								
	Photometry: limited to 20' and V = H = 0°	x	x	x	x	x	x	x	x	x	x
4	Complete photometry			x	x						
7	Water: 10 min. in normal position							x	x		
	10 min. in inverted position							x	x		
	visual inspection							x	x		
23	Colorimetry: visual inspection							x	x		
	Trichromatic coordinates in case of doubt							x	x		
4	Photometry: limited to 20' and V = H = 0°							x	x		
9	Motor fuels: 5 min.							x	x		
	visual inspection							x	x		
10	Oils: 5 min.							x	x		
	visual inspection							x	x		
23	Colorimetry: visual inspection							x	x		
	Trichromatic coordinates in case of doubt							x	x		
4	Photometry: limited to 20' and V = H = 0°							x	x		
8	Corrosion: 24 hours					x	x				
	2 hours interval					x	x				
	24 hours					x	x				
	visual inspection					x	x				
12	Rear face: 1 min.					x	x				
	visual inspection					x	x				
23	Colorimetry: visual inspection					x	x				
	Trichromatic coordinates in case of doubt					x	x				
4	Photometry: limited to 20' and V = H = 0°					x	x				
14	Stability in time										
23	Colorimetry: Visual inspection or trichromatic coordinates										
4	Photometry: limited to 20' and V = H = 0°										
13	Colour-fastness										
23	Colorimetry: Visual inspection or trichromatic coordinates										
4	Photometry: limited to 20' and V = H = 0°										
	Deposit of samples with authority			x	x						

..."

Paragraph 5.3.3.1., amend to read:

"5.3.3.1. After verification of the specifications in paragraph 4. and the specifications of shape and dimensions in Annex 5, the ten samples shall be subjected to the

heat resistance test in Annex 6 and one hour minimum after this test examined as to their colorimetric characteristics in paragraph 5.3.5. and CIL in paragraph 5.3.4. for an angle of divergence of 20' and an illumination angle  $V = H = 0^\circ$  or, if necessary, in the positions defined in Annex 4, paragraphs 1.1. and 1.2. The two retro-reflective devices giving the minimum and maximum values shall then be fully tested as shown in paragraph 5.3.4. These two samples shall be kept by the laboratories for any further checks which may be found necessary."

*Paragraph 5.3.3.3.1.*, amend to read:

"5.3.3.3.1. A colour which satisfies the conditions laid down in paragraph 5.3.5. This shall be verified by a qualitative method and, in case of doubt, confirmed by a quantitative method;"

*Paragraph 5.3.3.3.2.*, amend to read:

"5.3.3.3.2. A CIL which satisfies the conditions laid down in paragraph 5.3.4.

Verification shall be performed only for an angle of divergence of 20' and an illumination angle of  $V = H = 0^\circ$  or, if necessary, in the positions specified in Annex 4, paragraphs 1.1. and 1.2."

*Paragraph 5.3.3.4.*, amend to read:

"5.3.3.4. The four remaining samples can be utilized, if necessary, for any other purpose."

*Paragraph 5.3.7., Table 8*, amend to read:

"Table 8

**Chronological order of tests (Class IVA)**

Number of Annex	Tests	Samples									
		a	b	c	d	e	f	g	h	i	j
-	General specifications: visual inspection	x	x	x	x	x	x	x	x	x	x
5	Shape and dimensions: visual inspection	x	x	x	x	x	x	x	x	x	x
6	Heat: 48 h at $65^\circ\text{C} \pm 2^\circ\text{C}$	x	x	x	x	x	x	x	x	x	x
	Visual inspection for distortion	x	x	x	x	x	x	x	x	x	x
23	Colorimetry: visual inspection	x	x	x	x	x	x	x	x	x	x
	Trichromatic coordinates in case of doubt		x								
4	Photometry: limited to 20' and $V = H = 0^\circ$	x	x	x	x	x	x	x	x	x	x
4	Complete photometry	x	x								
7	Water: 10 min. in normal position			x	x						
	10 min. in inverted position			x	x						
	visual inspection			x	x						
9	Motor fuels: 5 min.			x	x						
	visual inspection			x	x						
10	Oils: 5 min.			x	x						
	visual inspection			x	x						
23	Colorimetry: visual inspection			x	x						
	Trichromatic coordinates in case of doubt			x	x						
4	Photometry: limited to 20' and $V = H = 0^\circ$			x	x						
8	Corrosion: 24 hours					x	x				
	2 hours' interval					x	x				
	24 hours					x	x				
	visual inspection					x	x				
12	Rear face: 1 min.					x	x				

Number of Annex	Tests	Samples									
		a	b	c	d	e	f	g	h	i	j
	visual inspection					x	x				
18	Impact					x	x				
	visual inspection					x	x				
23	Colorimetry: visual inspection					x	x				
	Trichromatic coordinates in case of doubt					x	x				
4	Photometry: limited to 20' and V = H = 0°					x	x				
	Deposit of samples with Authority	x	x								

..."

Paragraph 5.4. and 5.4.1., amend to read:

"5.4. TECHNICAL REQUIREMENTS CONCERNING RETRO-REFLECTIVE MARKINGS OF CLASS C (SYMBOL "C")"

5.4.1. Every retro-reflective marking of the Class C, when tested according to paragraph 5.4.3., shall meet:

- (a) The dimensions and shape requirements set forth in Annex 5; and
- (b) The photometric and colorimetric requirements as specified in paragraphs 5.4.4. to 5.4.5.; and
- (c) The physical and mechanical requirements set forth in paragraph 5.4.6."

Paragraph 5.4.4., amend to read:

"5.4.4. Minimum values for the coefficient of retro-reflection  
Photometric specifications for retro-reflective markings of Class C:"

Paragraph 5.6.4., amend to read:

"5.6.4. Minimum values for the Coefficient of Retro-reflection  
Photometric specifications for retro-reflective markings of Class F:

Table 11  
Minimum values for the Coefficient of Retro-reflection R' [cd·m<sup>-2</sup>·lx<sup>-1</sup>]

Observation angle α [°]	Entrance Angle β [°]					
	β1	0	0	0	0	0
α=0.33(20')	β2	5	20	30	40	60
Colour						
White		450	--	200	95	16
Red		120	60	30	10	--

Photometric specifications for retro-reflective markings of Class 5:

Table 11-2  
Minimum values for the Coefficient of Retro-reflection R' [cd·m<sup>-2</sup>·lx<sup>-1</sup>]

Observation angle α [°]	Entrance Angle β [°]				
	β1	0	0	0	0
α=0.33(20')	β2	5	30	40	60
Colour					
White		450	200	95	16
Red		120	30	10	2

"

*Paragraph 5.9.1.*, amend to read:

- "5.9.1. Retro-reflective devices of this paragraph must satisfy the conditions as to
- (a) Dimensions and shape set forth in Annex 5; and
  - (b) The photometric and colorimetric as specified in paragraphs 5.9.4. to 5.9.5.; and
  - (c) The physical and mechanical requirements set forth in Annexes 7, 9, 12, 13, 20."

*Paragraph 5.9.4.*, amend to read:

- "5.9.4. Minimum values for the coefficient of retro-reflection
- Photometric specifications for advance warning triangles of Type 1 and 2 "

*Paragraph 5.9.4.1.*, amend to read:

- "5.9.4.1. When measured as described in paragraph 5.9.4.1.1. and Annex 4, paragraphs 2., 3. and 4., the CIL values of the entire red retro-reflective area in new condition shall be at least as indicated in Table 14."

*Insert a new paragraph 5.9.4.1.1.*, to read:

- "5.9.4.1.1. For this measurement it is assumed that the direction of illumination  $H = V = \theta$  for the advance warning triangle in its position of use is parallel to the base plane and vertical to the lower side of the triangle, which in turn is parallel to the said base plane."

*Paragraph 5.9.4.2.3.*, amend to read:

- "5.9.4.2.3. The measurements referred to above shall be performed by the method described in Annex 4, paragraph 3."

*Paragraph 5.9.5.2.3.*, amend to read:

- "5.9.5.2.3. The testing of the luminance factor of the fluorescent materials shall be carried out according to the method described in paragraph 4.3.
- The luminance factor including the luminance by reflection and fluorescence shall be:
- (a) For advance warning triangle of type 1, not less than 30 per cent; and
  - (b) For advance warning triangle of type 2, not less than 25 per cent."

*Paragraph 5.9.5.3.*, amend to read:

- "5.9.5.3. The largest measured trichromatic coordinate  $y$  value according to paragraph 4.2.1. (night-time colour) shall be smaller or equal to the largest measured trichromatic coordinate  $y$  value according to paragraph 4.2.2. (day-time colour)."

*Paragraph 5.9.6.2.*, delete.

*Paragraph 5.9.6.3.*, renumber as 5.9.6.2.

*Paragraph 5.9.6.4.*, renumber as 5.9.6.3. and amend to read:

- "5.9.6.3. Resistance to heat
- A specimen of the sample unit shall be subjected to a test as specified in Annex 20."

*Paragraph 5.9.6.5. and 5.9.6.6.*, delete.

*Paragraph 5.9.6.7.*, renumber as 5.9.6.4.

*Paragraph 5.9.6.8. and 5.9.6.9., delete.*

*Paragraph 5.9.6.10., renumber as 5.9.6.5. and amend to read:*

"5.9.6.5. Wind test

A specimen of a complete plate shall be subjected to a test of rigidity of plates as specified in Annex 20."

*Insert a new paragraph 5.9.6.6., to read:*

"5.9.6.6. Test of clearance to ground

A specimen of the sample unit shall be subjected to a test as specified in Annex 20."

*Paragraph 5.9.7.1.2., amend to read:*

"5.9.7.1.2. After verification of the general specifications (paragraph 4) and the specifications of shape and dimensions (Annex 5, Figure A5-VIII or Figure A5-IX), all samples shall be subjected to the heat resistance test (Annex 6) and examined after at least one hour of rest."

*Paragraph 5.9.7.1.4. to 5.9.7.1.4.4, amend to read:*

"5.9.7.1.4. The two samples with the smallest and the largest CIL value in the tests according to paragraph 5.9.7.1.3. shall be subsequently subjected to the following tests:

5.9.7.1.4.1. Measurement of the values of the CIL in respect of the observation and illumination angles referred to in paragraph 5.9.4. according to the method described in paragraph 4.

5.9.7.1.4.2. Testing of the colour of the retro-reflected light according to paragraph 4.2. on the sample with the highest CIL concerned shall be examined.

5.9.7.1.4.3. Test of clearance to ground according to Annex 20, paragraph 1.

5.9.7.1.4.4. Mechanical solidity test according to Annex 20, paragraph 2."

*Paragraph 5.9.7.1.5., amend to read:*

"5.9.7.1.5. One sample other than those referred to in paragraph 5.9.7.1.4. shall be subjected to the following tests:"

*Paragraph 5.9.7.1.6., amend to read:*

"5.9.7.1.6. The second sample, other than those referred to in paragraph 5.9.7.1.4., shall be subjected to the following tests:"

*Paragraphs 5.9.7.1.7. to 5.9.7.1.7.3., amend to read:*

"5.9.7.1.7. After the tests specified in paragraph 5.9.7.1.4., the two samples submitted according to paragraph 3.1 shall be subjected to the following tests:

5.9.7.1.7.1. Colour test according to paragraph 4.2.;

5.9.7.1.7.2. Test of the luminance factor according to paragraph 4.3.;

5.9.7.1.7.3. Test of resistance to weathering according to Annex 13."

*Annex 2*

*Paragraph 2.5., amend to read:*

"2.5. Criteria governing acceptability

The manufacturer is responsible for carrying out a statistical study of the test results and for defining, in agreement with the Type Approval Authority, criteria governing the acceptability of his products in order to meet the specifications laid down in the verification of conformity of products in paragraph 3.5.1. of this Regulation. The criteria governing the acceptability shall be such that, with a confidence level of 95 per cent, the minimum

probability of passing a spot check in accordance with Annex 3 (first sampling) would be 0.95."

*Annex 3*

*Paragraphs 6. and 6.1., amend to read:*

- "6. Resistance to water penetration
- 6.1. One of the retro-reflectors of sample A after the sampling procedure in paragraph 2. shall be tested according to the procedure described in paragraph 1. of Annex 7 or, in the case of the Advance Warning Triangle, the sample A shall be tested according to the procedure described in paragraph 2. of Annex 7.
- The retro-reflectors shall be considered as acceptable if the test has been passed. However, if the test on sample A is not complied with, the two retro-reflective devices of sample B shall be subjected to the same procedure and both shall pass the test."

*Annex 4*

*Paragraph 4.3., amend to read:*

- "4.3. Description of Goniometer
- A goniometer as defined in paragraph 2.3. of this Regulation, which can be used in making retro-reflection measurements in the CIE geometry is illustrated in Figure A4-II. In this illustration, the photometer head (O) is arbitrarily shown to be vertically above the source (I). The first axis is shown to be fixed and horizontal and is situated perpendicular to the observation half-plane. Any arrangement of the components which is equivalent to the one shown can be used."

*Annex 5*

*Paragraph 1.1., amend to read:*

- "1.1. The shape of the illuminating surfaces shall not be easily confused with a triangle at normal observation distances."

*Paragraph 3.1., amend to read:*

- "3.1. The shape of the light emitting surfaces shall not be easily confused with a triangle at normal observation distances. However, a shape resembling the letters and digits of simple form, O, I, U and 8 is permissible."

*Paragraph 7.3., amend to read:*

- "7.3. Dimensions
- The length of the base of the enclosed fluorescent triangle (class 1) or retro-reflective triangle (class 2) shall be: minimum 350 mm and maximum 365 mm. The minimum width of the light-emitting surface of the red retro-reflective border shall be 45 mm, the maximum width 48 mm. These features are illustrated in the example of Figure A5-VI."

*Paragraph 7.4., delete.*

*Insert new paragraphs 8. to 8.3. before Figure A5-VIII, to read:*

- "8. Shape and dimensions of the advance warning triangle (Figure A5-VIII or A5-IX)
- 8.1. Shape and dimensions of the triangle
- 8.1.1. The theoretical sides of the triangle shall be  $500 \pm 50$  mm long.
- 8.1.2. In the case of an advance warning triangle of type 1, the retro-reflecting units shall be arranged along the edge within a strip of an unvarying width which shall be between 25 mm and 50 mm. In the case of an advance warning triangle

- of type 2 with fluorescent retro-reflecting material, the unvarying width shall be between 50 mm and 85 mm.
- 8.1.3. Between the outer edge of the triangle and the retro-reflecting strip there may be an edging not more than 5 mm wide and not necessarily red-coloured.
- 8.1.4. The retro-reflecting strip may be continuous or not. In the latter case the free area of the supporting material shall be red (see also paragraph 5.9.4.2.1. of this Regulation).
- 8.1.5. In the case of an advance warning triangle of type 1, the fluorescent surface shall be continuous to the retro-reflecting units. It shall be arranged symmetrically along the three sides of the triangle. When in use, its surface area shall be not less than 315 cm<sup>2</sup>. However, an edging, continuous or not, not more than 5 mm wide, which need not necessarily be red-coloured, may be placed between the retro-reflecting surface and the fluorescent surface.
- 8.1.6. The side of the open centre of the triangle shall have a minimum length of 70 mm (Figure A5-VIII).
- 8.2. Shape and dimensions of the support
- 8.2.1. The distance between the supporting surface and the lower side of the advance warning triangle shall not exceed 300 mm
- 8.3. The fluorescent retro-reflecting material shall be coloured in the mass, either in the retro-reflective elements or as solid surface layer."

*Annex 7*

*Title*, amend to read:

**"Resistance to water penetration for retro-reflective devices, and advance warning triangles and marking plates."**

*Paragraph 1.3.1.*, amend to read:

- "1.3.1. In the case of retro-reflectors, the CIL shall be measured by the method described in paragraphs 5.1.3.2.2. or 5.3.3.3.2., the retro-reflective device being first lightly shaken to remove excess water from the outside."

*Annex 8*

*Paragraph 2.3.7.*, amend to read:

- "2.3.7. Measured sample evaluation
- Upon completion of the dust exposure test, the exterior of the device shall be cleaned and dried with a dry cotton cloth and the CIL measured according to the method specified in paragraph 5.1.3.2.2."

*Annex 10*

*Paragraph 1.1.*, amend to read:

- "1.1. The outer surface of the retro-reflective device and, in particular, the illuminating surface, shall be lightly wiped with a cotton cloth soaked in a detergent lubricating oil. After about 5 minutes, the surface shall be cleaned. The CIL shall then be measured (paragraphs 5.1.3.2.2. or 5.3.3.3.2.)."

*Annex 12*

*Paragraph 6.*, amend to read:

- "6. The CIL shall then be measured (paragraphs 5.1.3.2.2 or 5.3.3.3.2) after the whole surface of the mirror-backed rear face has been covered with Indian ink."



*Annex 13**Paragraph 2.2., amend to read:*

- "2.2. One of the samples of the fluorescent material submitted according to paragraph 3.1. of this Regulation shall be subjected to a temperature and irradiation test as described in Annex 22 until the contrast No. 4 of the grey scale has been reached for the reference sample No. 5 or the light exposure equivalents for blue wool light fastness references sample No. 5 to fade to the grey scale 4 for exposure by a Xenon-arc lamp has been reached."

*Insert a new paragraph 3. to read:*

- "3. Resistance to weathering in the case of retro-reflective marking plates
- 3.1. Procedure — For each test, two specimens of a sample unit (see paragraph 2.4.17.4. of UN Regulation No. 48) are taken. One specimen shall be stored in a dark and dry container for subsequent use as "reference unexposed specimen".
- The second specimen shall be subjected to a source of illumination in accordance with ISO Standard 105 - B02 - 1978, Section 4.3.1; the retro-reflective material shall be exposed until blue standard No. 7 has faded to No. 4 on the grey scale and the fluorescent material until blue standard No. 5 has faded to No. 4 on the grey scale. After the test, the specimen shall be washed in a dilute neutral detergent solution, dried and examined for conformity with the requirements specified in paragraphs 3.2. to 3.4.
- 3.2. Visual appearance — No area of the exposed specimen shall show any evidence of cracking, scaling, pitting, blistering, delamination, distortion, chalking, staining or corrosion.
- There shall be no shrinkage in excess of 0.5 per cent in any linear direction and no evidence of adhesion failure such as edge lifting from the substrate.
- 3.3. Colour fastness — The colours of the exposed specimen shall still meet the requirements specified in paragraph 5.7.5.
- 3.4. Effect on the coefficient of retro-reflection of the retro-reflective material:
- 3.4.1. For this check, measurement shall be made only at an observation angle of 20° and an entrance angle of 5 degrees by the method given in paragraph 5.7.4.
- 3.4.2. The coefficient of retro-reflection of the exposed specimen when dry shall be not less than 80 per cent of the value in paragraph 5.7.4, Table 12.
- 3.4.3. The specimen shall then be subjected to simulated rainfall as described in paragraph 7.7. of EN 13422(2004) (Vertical road signs. Portable deformable warning devices and delineators. Portable road traffic signs. Cones and cylinders) and its coefficient of retroreflection under this condition shall be not less than 90 per cent of the value obtained when measured in dry condition, as explained in paragraph 3.4.2.
- It is possible to use nozzles other than those described in paragraph 7.7. of EN 13422(2004) provided that the same performance (e.g. water distribution on the surface of the test sample) of the simulated rainfall is achieved."

*Annex 14**Paragraph 3., amend to read:*

- "3. If other criteria are missing, the notation "systematic failures in use" for a type of retro-reflective material is to be established according to paragraph 4.1."

*Paragraph 6., amend to read:*

- "6. In the absence of other criteria, the concept of "systematic defect" of a type of rear marking plate in use shall be interpreted in conformity with the intention of paragraph 4.1."

Annex 21

Paragraph 3., amend to read:

- "3. In the absence of other criteria, the concept "systematic defect" of a type of retro-reflector in use shall be interpreted in conformity with the intention of paragraph 3.6.1. of this Regulation."

Annex 22

Title, amend to read:

**"Colour fastness to artificial light - Xenon-arc lamp test for advance warning triangles"**

Annex 24, amend to read:

**"Examples of approval marks"**

Figure A 24-I

**Marking examples for single devices**

<p><i>Note:</i> The above approval number must be placed close to, but in any position in relation to, the circle surrounding the letter "E". The digits constituting the approval number must face the same way as the "E". The group of symbols indicating the class must be diametrically opposite the approval number. The Type Approval Authorities shall avoid using approval numbers IA, IB, IIIA, IIIB and IVA which might be confused with the class symbols IA, IB, IIIA, IIIB and IVA.</p> <p>These sketches show various possible arrangements and are given as examples only.</p>	
	<p><b>Model A:</b></p> <p>This approval mark affixed to a retro-reflective device shows that the type of device concerned has been approved in the Netherlands (E 4) under approval number 150R00-216. The approval number shows that approval was granted in accordance with the requirements of this Regulation as modified by the original series of amendments.</p> <p>For a = see Table 1</p>
	<p><b>Model B:</b></p> <p>Same device as Model A, different arrangement.</p>


	<p>Model C: Same device as Model A, different arrangement.</p>
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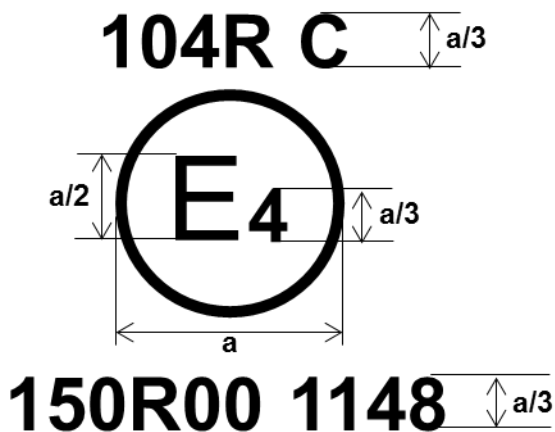
Figure A24-II

**Simplified marking examples for grouped, combined or reciprocally incorporated devices**

*Note:* The two examples of approval marks, models D and E, represent three possible variants of the marking of a lighting device when two or more lamps are part of the same unit of grouped, combined or reciprocally incorporated lamps.

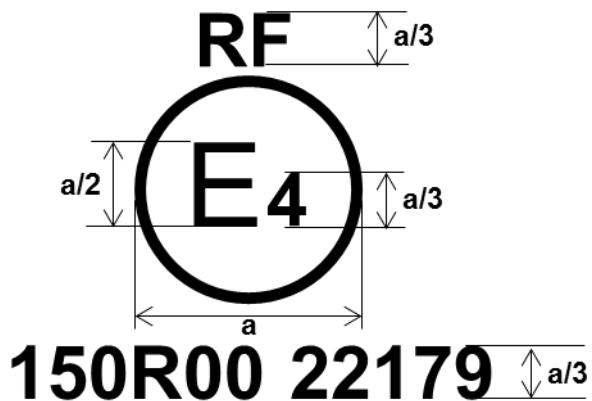
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3333 E4 148R00 150R00	IA	2b	R2							
	F2	AR	S2							
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IA 2b R2 F2 AR S2										
3333 E4 148R00 150R00										

Figure A24-III  
Arrangement example of the approval mark for retro-reflective marking material



For a = see Table 1

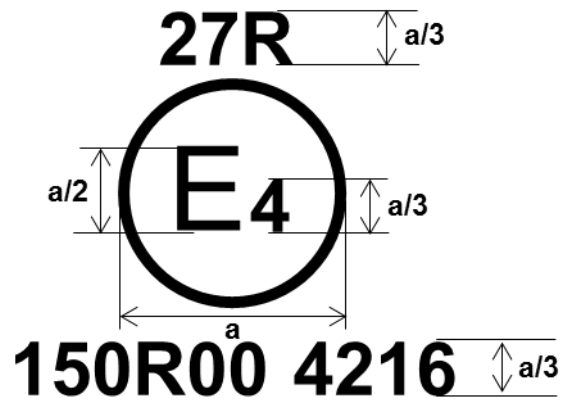
Figure A24-IV  
Arrangement example of the approval mark for rear marking plates and SMV



For a = see Table 1

Figure A24-V

Arrangement example of the approval mark for advance warning triangle



For a = see Table 1

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