41 Reflex reflectors

Refer to: R03 02-S12

41.1 Effective date and Scope:

41.1.1 As for the category symbols M, N and O, the new vehicle types as of 2006/7/1 and all vehicle types as of 2008/7/1, shall comply this regulation.

41.1.2 As for the category symbols L1 and L3, the new vehicle types as of 2009/1/1 and all vehicle types as of 2011/1/1, shall comply with this regulation.

41.1.3 The applicants applying for low volume safety approval could exempt from regulation of “Reflex reflectors” except large passenger vehicle and child-only vehicle.

41.1.4 Applying for vehicle-by-vehicle low volume safety approval, the vehicle could exempt from regulation of “Reflex reflectors”.

41.2 Reflex reflectors shall according to suitable types and range of principle：

41.2.1 Brand

41.2.2 The same photometric characteristics (Class IA or IB, Class IIIA and Class IVA)

41.2.3 Retro-reflecting devices can be considered as belonging to the same type if they have one or more "retro-reflecting optical units" which are identical with those of the standard model, or if not identical are symmetrical and suitable for mounting one on the left and one on the right side of the vehicle, and if their other parts differ from those of the standard model only in ways not affecting the properties to which this Regulation applies.

41.3 Shape and dimensions:

41.3.1 Retro-reflecting devices are divided into three classes according to their photometric characteristics: Class IA or IB, Class IIIA and Class IVA.

41.3.2 Class IA/IB:

The shape of the illuminating surfaces must be simple, and not easily confused at normal observation distances, with a letter, a digit or a triangle. The preceding paragraph notwithstanding, a shape resembling the letters or digits of simple form O, I, U or 8 is permissible. Retro-reflecting devices of Class IB are devices combined with other signal lamps which are not watertight, and which are integrated into the body of a vehicle.

41.3.3 Class IIIA:

41.3.3.1 The illuminating surfaces of retro-reflecting devices in Class III A must have the shape of an equilateral triangle. If the word "TOP" is inscribed in one corner, the apex of that corner must be directed upwards.

41.3.3.2 The illuminating surface may or may not have at its center a triangular, non-retro-reflecting area, with sides parallel to those

of the outer triangle.

41.3.3.3 The illuminating surface may or may not be continuous. In any case, the shortest distance between two adjacent retro-reflecting optical units must not exceed 15 mm. If the illuminated surface is not continuous, the number of separate retro-reflecting optical units including the corner units shall not be less than four on each side of the triangle. The separate retro-reflecting optical units shall not be replaceable unless they consist of approved retro-reflecting devices in Class I A.

41.3.3.4 The outside edges of the illuminating surfaces of triangular retro-reflecting devices in Class III A shall be between 150 and 200 mm long. In the case of devices of hollow-triangle type, the width of the sides, measured at right angles to the latter, shall be equal to at least 20 % of the effective length between the extremities of the illuminating surface.

41.3.4 Class IVA:

41.3.4.1 The shape of the light emitting surfaces must be simple and not easily confused at normal observation distances with a letter, a digit or a triangle. However, a shape resembling the letters and digits of simple form, O, I, U and 8 is permissible.

41.3.4.2 The light-emitting surface of the retro-reflecting device must be at least 25 cm^2.

41.4 Colorimetric specifications:

41.4.1 The definitions of the colour of the light emitted, given in 「The installation of lighting and light-signaling devices」 and its series of amendments in force at the time of application for type approval, shall apply to this Regulation.

41.5 Photometric specifications:

41.5.1 For photometric measurements, only the illuminating surface contained within a circle of 200 mm diameter for Class IA or IB should be considered, and the illuminating surface itself should be limited to 100 cm^2 though the surfaces of the retro-reflecting optical units need not necessarily attain this area.

41.5.2 Coefficient of luminous intensity (CIL):

41.5.2.1 The CIL values for red retro-reflecting devices must be at least equal to those in the Table1 below.

41.5.2.2 CIL values for amber retro-reflecting devices in class IA or IB must be at least equal to those in the Table1 multiplied by the coefficient 2.5.

41.5.2.3 CIL values for colourless retro-reflecting devices in class IA or IB must be at least equal to those in the Table1 multiplied by the coefficient 4.

41.5.2.4 For devices of Class IV A the CIL values must be at least equal to those in the Table2 below.

41.6 The applicant shall submit for approval ten samples which shall be tested in the chronological order indicated in the following table: Depending on the nature of the materials of which the retro-reflecting devices and, in particular, their optical units, are made, the competent authorities may authorize laboratories to omit certain unnecessary tests, subject to the express reservation that such omission must be mentioned under "Remarks" on the form notifying approval.

Category of retro-reflector Test item	I A	I B	III A	IV A
Resistance to heat	□	□	□	□
Water-submersion test	□	---	□	□
Moisture test	---	□	---	---
Dust exposure test	---	□	---	---
Resistance to fuels	□	□	□	□
Resistance to Lube-oil	□	□	□	□
Resistance to corrosion	□	□	□	□
Resistance to impact	---	---	---	□
Resistance of the accessible rear face of mirror-backed retro-reflecting devices	□	□	□	□

41.7 Resistance to heat:

41.7.1 The retro-reflecting device shall be kept for 48 consecutive hours in a dry atmosphere at a temperature of 65 ± 2°C.

41.7.2 After this test, no cracking or appreciable distortion of the retro-reflecting device and, in particular, of its optical component must be visible.

41.7.3 The samples shall be, at least one hour after this test, examined as to their colorimetric characteristics and CIL.

41.8 Water-submersion test:

41.8.1 Retro-reflecting devices shall be immersed for 10 minutes in water at a temperature of 50° ± 5 ℃, the highest point of the upper part of the illuminating surface being 20 mm below the surface of the water. This test shall be repeated after turning the retro-reflecting device through 180°, so that the illuminating surface is at the bottom and the rear face is covered by about 20 mm of water. These optical units shall then be immediately immersed in the same conditions in water at a temperature of 25° ± 5 ℃.

41.8.2 No water shall penetrate to the reflecting surface of the retro-reflecting optical unit. If visual inspection clearly reveals the presence of water, the device shall not be considered to have passed the test. If visual inspection does not reveal the presence of water or in case of doubt, the CIL shall be measured, and shall conform to the relevant requirements.

41.9 Moisture test:

41.9.1 The cabinet shall be equipped with a nozzle(s) which provides a solid cone water spray of sufficient angle to completely cover the sample device. The centerline of the nozzle(s) shall be directed downward at an angle of 45° ± 5° to the vertical axis of a rotating test platform.

41.9.2 The rotating test platform shall have a minimum diameter of 140 mm and rotate about a vertical axis in the center of the cabinet.

41.9.3 The precipitation rate of the water spray at the device shall be 2.5 (+ 1.6/-0) mm/min as measured with a vertical cylindrical collector. The height of the collector shall be 100 mm and the inside diameter shall be a minimum of 140 mm.

41.9.4 All drain holes and other openings shall remain open. Drain wicks, when used, shall be tested in the device.

41.9.5 The device shall be rotated about its vertical axis at a rate of 4.0 ± 0.5 min-1.

41.9.6 If the retro-reflector is reciprocally incorporated or grouped with signaling or lighting functions, these functions shall be operated at design voltage according to a cycle of 5 min ON (in flashing mode, where appropriate), 55 min OFF.

41.9.7 The water spray test shall last 12 hours.

41.9.8 The rotation and the water spray shall be turned OFF and the device allowed to drain for 1 hour with the cabinet door closed.

41.9.9 Upon completion of the drain period. The interior of the device shall be observed for moisture accumulation. No standing pool of water shall be allowed to be formed, or which can be formed by tapping or tilting the device. The CIL shall be measured after having dried the exterior of the device with a dry cotton cloth. And the testing result shall conform to the relevant requirements.

41.10 Dust exposure test:

41.10.1 The mounted device shall be placed in the dust chamber no closer than 150 mm from a wall. 3-5 kg of the test dust (ASTM C150-84), shall be agitated as completely as possible by means of compressed air or blower fans at intervals of 15 min for a period of 2 to 15 s for the duration of 5 hours. The dust shall be allowed to settle between the agitation periods.

41.10.2 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. And the testing result shall conform to the relevant requirements.

41.11 Resistance to fuels:

41.11.1 Before performing this test, the testing sample should perform the photometric measurements, CIL and water-submersion tests and proven the conformity therewith. The outer surface of the retro-reflecting device and, in particular, of the illuminating surface, shall be lightly wiped with a cotton cloth soaked in a mixture of 70 vol. % of n-heptane and 30 vol. % of toluol. After about five minutes, the surface should be inspected visually.

41.11.2 It must not show any apparent surface changes, except that slight surface cracks will not be objected to.

41.12 Resistance to lubricating oils:

41.12.1 The outer surface of the retro-reflecting device and, in particular, the illuminating surface, shall be lightly wiped with a cotton cloth

soaked in a detergent lubricating oil.

41.12.2 After about 5 minutes, the surface shall be cleaned. The CIL shall then be measured. And the testing result shall conform to the relevant requirements.

41.13 Resistance to corrosion:

41.13.1 Retro-reflecting devices must be so designed that they retain the prescribed photometric and colorimetric characteristics despite the humidity and corrosive influences to which they are normally exposed.

41.13.2 The saline mist shall be produced by atomizing, at a temperature of 35° ± 2°C, a saline solution obtained by dissolving 20 ± 2 parts by weight of sodium chloride in 80 parts of distilled water containing not more than 0.02 % of impurities. The retro-reflecting device shall be subjected to the action of a saline mist, for a period of 50 hours, comprising two periods of exposure of 24 hours each, separated by an interval of two hours during which the sample is allowed to dry.

41.13.3 Immediately after completion of the test, the sample must not show signs of excessive corrosion liable to impair the efficiency of the device. The CIL shall then be measured. And the testing result shall conform to the relevant requirements.

41.14 Resistance to impact:

41.14.1 Drop a 13mm diameter polished solid steel ball, once, vertically onto the central part of the lens from a height of 0.76m. The ball may be guided but not restricted in free fall.

41.14.2 When a retro-reflecting device is tested at room temperature with this method, the lens shall not crack. The CIL shall then be measured. And the testing result shall conform to the relevant requirements.

41.15 Resistance of the accessible rear face of mirror-backed retro-reflecting devices:

41.15.1 After having brushed the rear face of the retro-reflecting device with a hard nylon brush, a cotton cloth soaked in the mixture, defined in paragraph 41.11 shall be applied to the said rear face for one minute. The cotton cloth is then removed and the retro-reflecting device left to dry.

41.15.2 As soon as evaporation is completed, an abrasion test shall be made by brushing the rear face with the same nylon brush as before.

41.15.3 The CIL shall then be measured. And the testing result shall conform to the relevant requirements.

Table 1. For Class IA, Class IB and Class IIIA, the CIL values for red retro-reflecting devices must be at least equal to those in the table below unit: mcd/lux

		Illumination angles (in degrees)

Category	Angle of divergence α	Vertical V Horizontal H	0° 0°	±10° 0°	±5° ±20°
IA/IB	20’ 1°30’	CIL	300 5	200 2.8	100 2.5
IIIA	20’ 1°30’		450 12	200 8	150 8

Table 2. For devices of Class IVA the CIL values must be at least equal to those in the table below
unit: mcd/lux

Color	Angle of divergenceα	Illumination angles (in degrees)						
		Vertical V Horizontal H	0 0	±10 0	0 ±20	0 ±30	0 ±40	0 ±50
White	20’ 1°30’	CIL	1800 34	1200 24	610 15	540 15	470 15	400 15
Amber	20’ 1°30’		1125 21	750 15	380 10	335 10	290 10	250 10
Red	20’ 1°30’		450 9	300 6	150 4	135 4	115 4	100 4