



INVESTOR IN PEOPLE



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THE UNITED KINGDOM TYPE APPROVAL AUTHORITY

Date: 11 March 2017

Dear Sir / Madam.

1. The vehicle component described on the attached approval(s) has been tested and meets the requirements of the ECE Regulation displayed on the approval certificate(s). I enclose a set of approval documents, comprising, as appropriate, the approval certificate(s), test report and your documentation duly authenticated.

2. Maintaining Conformity of Production (COP) is a means of evidencing the ability to produce a series of products that exactly match the specification, performance and marking requirements outlined in the type approval documentation. Whether you are a manufacturer, or the agent applying for approvals on behalf of a manufacturer, and whatever your product is, suitable COP arrangements must be made. **Please follow these links to documents that explain COP in more detail:** <http://www.dft.gov.uk/vca/conformity-of-production/conformity-of-production.asp>

3. If you think there are any errors in the enclosed package, please contact Ian Woodruff, ian.woodruff@vca.gov.uk immediately.

Please be aware that from the date of issue we have a three week holding period, any manufacture/applicant document changes within this period may incur an additional time charge to review and re-issue. Any corrections required after this time will need to be corrected via an extension, index revision or correction 1 certificate, as appropriate.

ROAD TRAFFIC ACT 1988 - SECTION 80

3. The Secretary of State for Transport authorises, under section 80 of the Road Traffic Act 1988, the stated manufacturer or accredited agent to apply to the motor vehicle type / part specified, the appropriate mark designated in the Motor Vehicles (Designation of Approval Marks) Regulations 1979, as amended. The conditions attached to this authorisation are set out overleaf.

4. If this approval / extension / index revision results in a change being required to a vehicle information document issued under either a National or European Whole Vehicle approval you should notify the issuing authority to arrange for the approval(s) to be updated.

5. VCA is continually scrutinising the quality of the service it provides to customers, in order to discover more ways in which the standard can be improved. If you have a specific complaint concerning the way this job has been dealt with, please view the VCA complaints procedure for guidance: <http://www.dft.gov.uk/vca/vca-complaints-procedure.asp>

Yours faithfully,

David J Clements

VCA Operations Branch

1. CONDITIONS

1.1 This Approval may be withdrawn at any time and while held is subject to the following conditions.

2. CONDITIONS OF MOTOR VEHICLE PARTS

2.1 The holder of this approval shall put the approval mark described in the Motor Vehicles (Designation of Approval Marks) Regulations 1979 as amended only on Motor Vehicle Parts that:

- a. Have been manufactured, assembled or completed in factories under his control and
- b. Conform in all material respects with the samples, which were tested before this approval was issued.

2.2 The holder of this approval shall mark his products in the manner set out in the relevant Regulation / Directive as given in the Motor Vehicles (Designation of Approval Marks) Regulations 1979 as amended together with:

- a. The approval number allocated by the Secretary of State for Transport.
- b. His name or trademark
- c. Any other markings specified in the appropriate international Regulation

2.3 The holder of this approval shall be prepared at any time to satisfy Department for Transport officials or agents of the Department, that the quality of the part being produced and marked or intended to be by him with the approval marking conforms in all material respects with that of the samples tested as the International Regulation requires.

2.4 The holder of this approval undertakes to admit duly authorised officials or agents of the Department at all reasonable times to any premises in which parts marked or intended to be marked are being manufactured, assembled or stored and to permit any such official or agent to inspect parts and all records relating to them and their production processes.

2.5 This approval may be suspended or withdrawn by the Secretary of State for Transport at any time without any particular length of notice being given and in the event of that being done the holder will absolve the Secretary of State from any claim for damages or compensation.

3. CONDITIONS FOR MOTOR VEHICLES

3.1 The holder of this approval shall put the approval mark described in the Motor Vehicles (Designation of Approval Marks) Regulation 1979 as amended only on Motor Vehicles fitted with Motor Vehicle parts which Motor Vehicles as fitted with such parts conform with the type of Motor Vehicle approved by as on behalf of the Secretary of State for Transport and only on Motor Vehicles that:

- a. Have been manufactured, assembled or completed in factories under his control and
- b. Conform in all material respects with the type of Motor Vehicle, which was tested before an approval certificate was issued.

3.2 The holder of this approval shall mark motor vehicles of the type approved. In the matter set out in the relevant Regulation / Directive using the authorised approval mark as given in the Motor Vehicles (Designation of Approval Marks) Regulation 1979 as amended together with the approval number allocated by the Secretary of State for Transport.

3.3 The holder of this approval shall mark Motor Vehicles of the type approved in the manner set out in the relevant Regulation annexed to the United Nations agreement of 1958 as amended using the authorised approval mark which comprises a capital letter E followed by the number 11 within a circle together with the approval number allocated by the Secretary of State for Transport.

3.4 The holder of this approval shall be prepared at any time to satisfy Department for Transport officials or agents of the Department that Motor Vehicles of the type approved which have been produced and marked or that are intended to be marked by him conform in all material respects with the type of vehicle approved.

3.5 The holder of this approval undertakes to admit duly authorised officials or agents of the Department at all reasonable times to any premises in which the Motor Vehicles of the type approved which have been or are intended to be marked are manufactured, assembled or stored and to permit any such official or agent to inspect the Motor Vehicles and all records relating to them and their production processes.

3.6 This approval may be suspended or withdrawn by the Secretary of State for Transport at any time without any particular length of notice given and in the event of that being done the holder will absolve the Secretary of State from any claim for damages or compensation.



THE UNITED KINGDOM VEHICLE APPROVAL AUTHORITY

COMMUNICATION CONCERNING THE APPROVAL GRANTED ⁽¹⁾/~~APPROVAL EXTENDED ⁽⁴⁾/~~
~~APPROVAL REFUSED ⁽⁴⁾/~~ ~~APPROVAL WITHDRAWN ⁽⁴⁾/~~ ~~PRODUCTION DEFINITELY~~
~~DISCONTINUED ⁽⁴⁾~~ OF A RETRO-REFLECTIVE MARKINGS OF HEAVY AND LONG VEHICLES
AND THEIR TRAILERS, PURSUANT TO REGULATION NO 104



Approval No: 104R-001059

Extension No: Not applicable

1. Trade name mark of the marking material:



2. Class of the marking material: C/D/E ⁽¹⁾

3. Name and address of the manufacturer:



4. If applicable, name and address of manufacturer's representative: Not applicable

5. Date on which the marking material was submitted for approval tests: 22 January 2017

6. Technical service responsible for carrying out the approval test: Vehicle Certification Agency

7. Date of test report issued by the technical service: 26 January 2017

CSS383267



8. Number of test report issued by the technical service: CSS383267

9. Any remarks: Approval to Supplement 8

10. Approval GRANTED/REFUSED/EXTENDED/WITHDRAWN ⁽¹⁾

11. Reason(s) for the extension (if applicable): Not applicable

12. Place: BRISTOL

13. Date: 11 MARCH 2017

14. Signature:  D LAWLOR
Head of Technical Standards & Legislation

15. Annex is a list of documents making up the approval life, deposited with the Competent Authority which granted approval; a copy can be obtained on request.

(1) Strike out what does not apply

December 28, 2016

Dear Sirs,

We would like to apply for the type approval according to ECE.

Function	ECE approval number
Retro-reflective marking	E11-104R-00 XXXX*

Trade name or mark	:	
Manufacturer's name for type of device	:	BLT2000
Name and address of manufacturer	:	

We confirm that the above mentioned application has not been submitted to any other EC member state nor has any other member state granted a corresponding approval.

Sincerely

* XXXX means an approval number, please refer to the certificate.

Information folder No. : BLT2000-00
 First application date : December 28, 2016

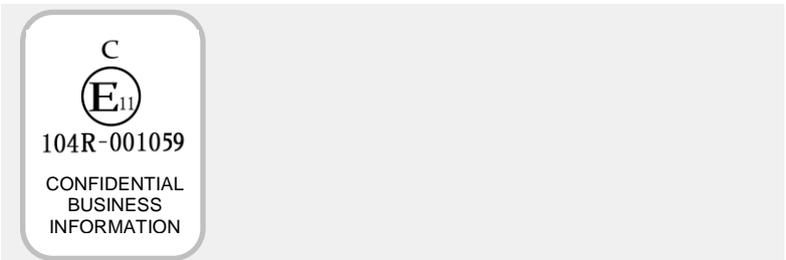
1. Specification data

Type		BLT2000
Function		Retro-reflective marking
Color		Red/Yellow/White
Application Regulation ECE		ECE R104
Location of marking	Trade mark	
		Marked on reflective film
	Approval mark	Marked on reflective film
The method of attachment		Paste on the vehicle body
Version		BLT2020 : Yellow BLT2030 : Red BLT2010: White

2. Construction and material

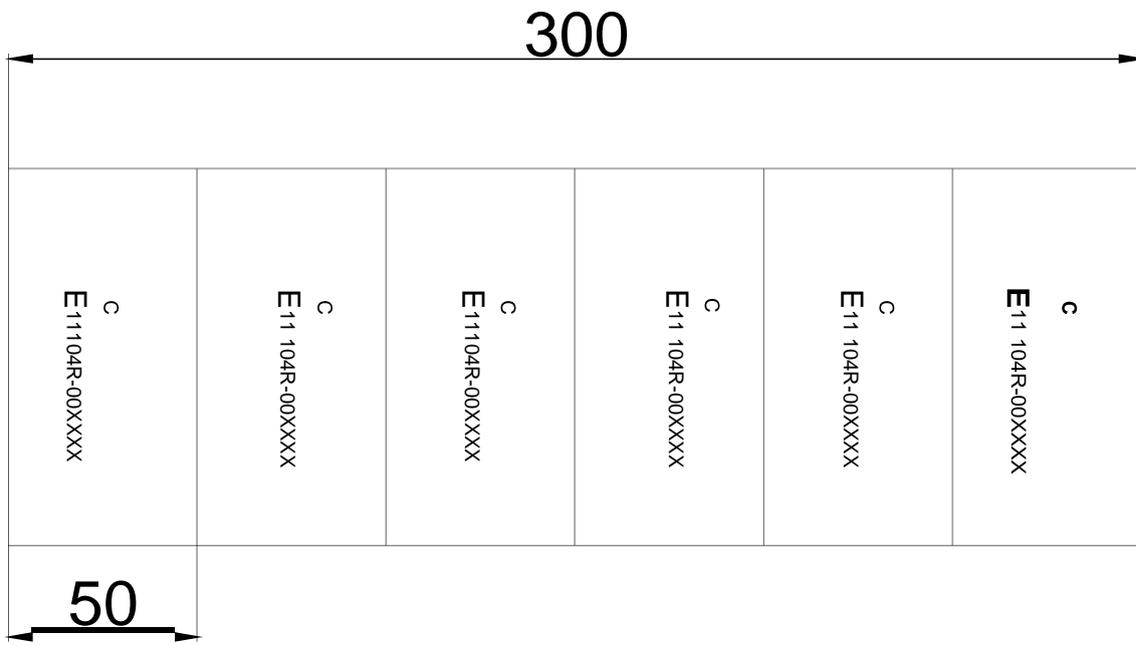
Construction	Material	Remarks
Surface layer	PMMA	
Sealing layer	Acrylic hot melt adhesive	
Adhesive	Acrylic pressure-sensitive adhesive	
Interleaving paper	PE release liner	

3. Name and address of manufacturer :

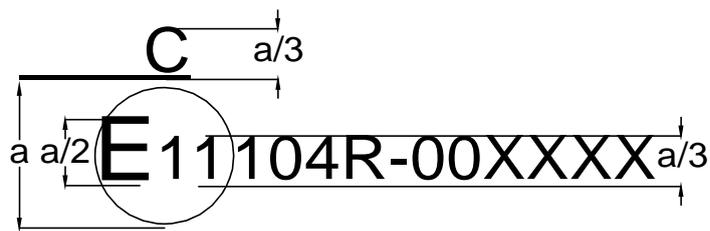


4. Name and address of the manufacturer's representative : N/A

Unit: cm



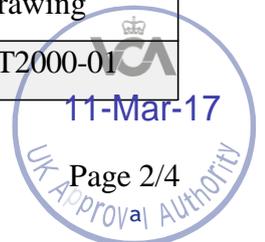
Approval mark



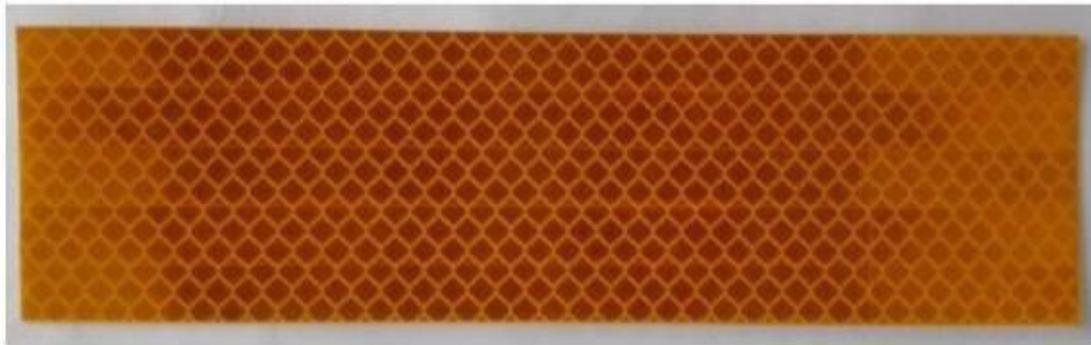
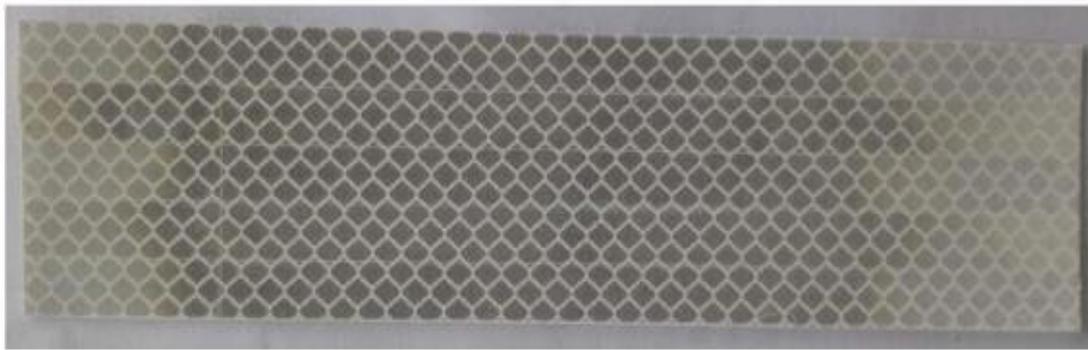
a=12 mm min

XXXX means an approval number, please refer to the certificate.

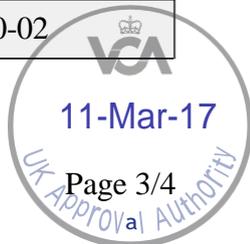
Product Type	BLT2000
General assembly drawing	
Drawing No.	BLT2000-01

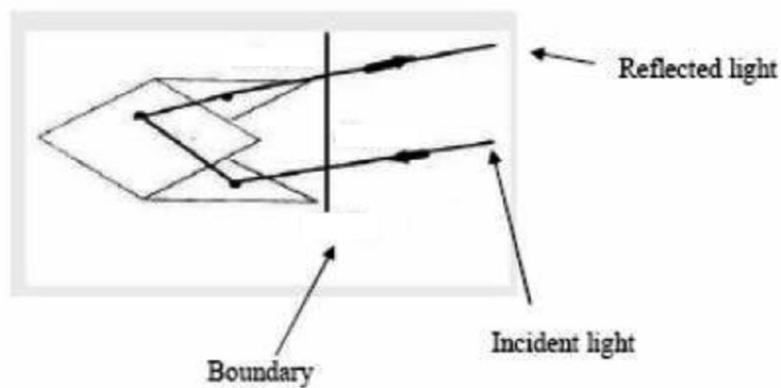
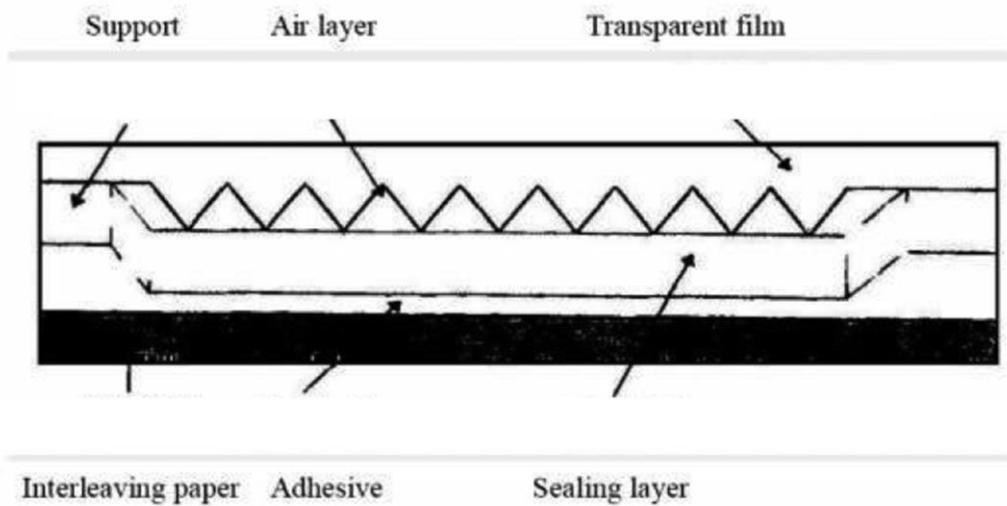


Information folder No. : BLT2000-00
First application date : December 28, 2016



Product Type	BLT2000
General assembly drawing	
Drawing No.	BLT2000-02





Product Type	BLT2000
Structure drawing	
Drawing No.	BLT2000-03



Test Report: Retro-Reflective Markings

Legislation

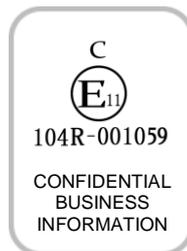
UNECE Regulation 104.00 to Supplement 8

Test Details

Location of Test: Motor Vehicle Inspection Centre
Date of Test: 22 January 2017
VCA Representative(s):
Manufacturer's Representative(s):
Reason for Test Report: New approval / ~~Extension of approval~~ / Test report only

Manufacturer Details

Name and Address:



Type: BLT2000
Commercial Description: See manufacturer's document
Category: C

Conclusion

The above mentioned component was tested in accordance with the above mentioned legislation and was found to comply in all respects.

Signature:

Name:
Position: Type Approval Engineer
Date: 26 January 2017

List of Annexes

Annex	No of Pages	Subject
I	1	Photos
II		





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Worst Case Rationale

There are red, yellow, white retro-reflective marking, tested with every colour.

Note: Include information on variants and versions this report covers, as applicable

Tests Required

Yes, NA, See Report ... / Approval ... / Annex ...

Resistance to heat test	Yes
CIL Test	Yes
Colorimetric test	Yes
Resistance to weathering test	Yes
Resistance to corrosion test	Yes
Resistance to fuels tests	Yes
Resistance to cleaning test	Yes
Water submersion test	Yes
Bonding strength test	Yes
Flexing test	Yes

Component Specification

Trade name or mark	See manufacturer's document
Brief description giving the technical specifications of the retro-reflective marking materials	See manufacturer's document

Manufacturer's Documentation

Manufacturer's documentation is complete and reflects the agreed specification for the component tested and covers all variants and versions agreed in the worst case rationale.

Yes

Facility and Equipment Checks

Calibration certificates checked and valid, recorded in the following table:

Yes

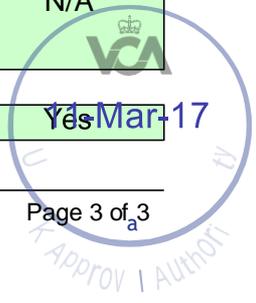
Equipment	Serial / Certificate No.	Calibration due*
Photometry Measuring Equipment	'JMG-002-6/577-033	15 February 2017
Colorimetric Test Equipment	'JMG-002-5/577-033	15 February 2017

*Specify calibrated date + (interval) or calibration due date.





Test Requirements		Complies Yes / NA
4	Trade names and other marks	
4.1	Every marking material submitted for approval shall bear:	
4.1.1	The trade name or trade mark of the applicant <i>Note: Just the "DM" label on each sample</i>	Yes
4.1.2	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 ² . <i>Note: After approval tests, the manufacture will put all the marking on the products.</i>	N/A
4.2	The marks shall be clearly legible on the outside of the marking material and shall be indelible.	Yes
5	Approval	
5.4	Every marking material conforming to a type approved under this Regulation shall bear, in addition to the marks prescribed in paragraph 4.1., a clearly legible and indelible international approval mark consisting of: A circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval. The number of this Regulation followed by the letter "R", a dash and the approval number according to paragraph 5.2.	Yes
5.4.3	The following additional symbols indicating the class of material:	
5.4.3.1	"C" for material for contour / strip marking;	Yes
5.4.3.2	"D" for material for distinctive markings / graphics intended for a limited area	N/A
5.4.3.3	"E" for material for distinctive markings / graphics for extended area	N/A
5.4.3.4	"D/E" for 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.	N/A
5.5	The approval mark shall be visible and clearly legible on the	Yes

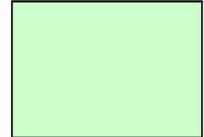




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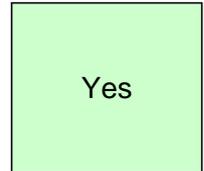
outside of the marking material and shall be indelible and positioned at least once

- (a) at 0.5 m intervals on strips,
- (b) ~~on areas within 100 x 100 mm².~~

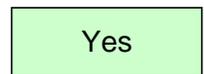


General specifications

6.1 Retro-reflective marking materials shall be that way constructed that they function satisfactorily and will continue to do so in normal use. In addition, they shall not have any defect in design or manufacture that is detrimental to their efficient operation or to their maintenance in good condition.



6.2 Retro-reflective marking materials or parts thereof shall not be capable of being easily dismantled.



6.3 The means of attachment of the marking materials shall be durable and stable.

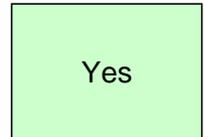


6.4 The outer surface of the retro-reflective marking materials shall be easy to be cleaned. The surface shall therefore not be rough and any protuberances they may exhibit shall not prevent easy cleaning.

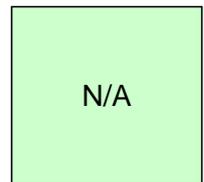


Special specification

7.1 Retro-reflective marking materials shall also satisfy the conditions as to shape and dimensions, and the colorimetric, photometric, physical and mechanical requirements set forth in Annexes 5 to 8 to this Regulation.



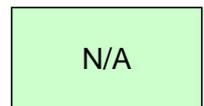
7.2 Advertising, consisting of retro-reflective logos, distinctive markings or letters/characters has to be decent. It may consist of marking materials of class "D" if the total retro-reflective area is less than 2m²; if the total retro-reflective area is at least 2 m² class "E" shall be used.³



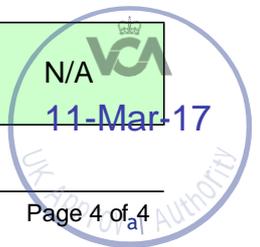
7.2.1 For class "D" marking materials the maximum values of the coefficient of retro-reflection are less or equal to the value defined in Annex 7, table 2, and are intended to be used in distinctive markings, graphics.



7.2.2 For class "E" marking materials the maximum values of the coefficient of retro-reflection are less or equal to 33 per cent of the values defined in Annex 7, table 2.



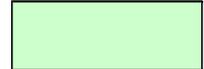
7.2.3 White retro-reflective marking materials intended as base or background in printing processes for fully coloured logos and markings of class "E" in use, without unprinted blank areas, may





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fulfil the requirements in Annex 7, table 2, for class "D" materials and must be marked as class "D/E".



7.3

Depending on the nature of retro-reflective marking material, the competent authorities may authorize laboratories to omit certain unnecessary tests, provided that such omission is mentioned under "Remarks" on the form notifying approval.



Test procedure

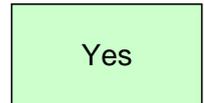
Ann 4, 1

Five test samples representing either strips or planes of retro-reflective marking materials have to be submitted to the test laboratory. In the case of strips, at least a length of 3 meters shall be provided; in the case of planes, at least a surface of 500 mm x 500 mm shall be provided.



Ann 4, 2

The test samples shall be representative of current production, manufactured in accordance with the recommendation of the manufacturer(s) of the retro-reflective marking materials



Ann 4, 3

After verification of the general specifications (paragraph 6 of the Regulation) and the specifications of shape and dimensions (Annex 5), the samples shall be subjected to the heat resistance test described in Annex 8 to this Regulation, prior to the tests described in Annexes 6 and 7.



Ann 4, 4

The photometric and colorimetric measurements may be made on five samples. The mean values should be taken.



Ann 4, 5

For the other tests, samples which have not undergone any testing should be used.

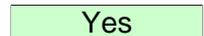


Specification of marking dimensions

Ann 5, 1.1

General

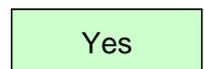
The markings shall be made of strips of retro-reflective material.



Ann 5, 1.2.1

Dimensions

The width of a side and /or rear marking material shall be 50 mm +10/-0 mm.



Ann 5, 1.2.2

The minimum length of an element of a retro-reflective marking material shall be such that at least one approval mark is visible.



Colorimetric specifications

Ann 6, 1

Retro-reflective marking materials (class C) shall be white yellow or red. Retro-reflective distinctive markings and/or graphics (classes D and E) may be of any colour.





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Ann 6, 2

When illuminated by the CIE Standard Illuminant A at an entrance angle $\beta^1 = \beta^2 = 0^\circ$ or, if this produces a colourless surface reflection, an angle $\beta^1 = \pm 5^\circ$, $\beta^2 = 0^\circ$, and measured at an observation angle of $\alpha = 20^\circ$, the colour of the material in new condition shall be within the limits according to paragraph 2.30 of Regulation No.48.

		#1	#2	#3	#4	#5	Complies
White Marking	x [1]	0.4567	0.4578	0.4607	0.4621	0.4608	Yes
	y [1]	0.4342	0.4393	0.4290	0.4319	0.4402	
Red Marking	x [1]	0.6876	0.6843	0.6903	0.6897	0.6845	Yes
	y [1]	0.3054	0.3105	0.3031	0.3042	0.3083	
Yellow Marking	x [1]	0.5543	0.5603	0.5456	0.5476	0.5515	Yes
	y [1]	0.4304	0.4315	0.4402	0.4412	0.4376	

Photometric specifications

Ann 7, 1

When illuminated with a CIE Standard illuminant A and measured as recommended by CIE publication No. 54, 1982, the coefficient of retro-reflection R' in candelas per m² per lux (cd/m²/lux) of the retro-reflective areas in new condition shall be at least as indicated in table 1 for yellow, white and red materials.

Note: If the sample is provided with an orientation mark, the specified values must only be observed for this orientation. Test samples without an orientation mark must be observed for values at 0° and 90° orientations as well.



White Retro-reflective Marking									
	Illumination Angle degree	Limits	1#	2#	3#	4#	5#	Average	Complies Yes/NA
20'	5L, V	450	600.0	548.0	562.0	606.0	598.0	582.8	Yes
	5R, V	450	580.0	570.0	584.0	518.0	632.0	576.8	Yes
	30L, V	200	244.2	209.2	215.4	249.6	231.8	230.0	Yes
	30R, V	200	214.0	228.4	220.3	222.6	286.8	234.4	Yes
	40L, V	90	126.4	109.4	105.7	135.6	126.2	120.6	Yes
	40R, V	90	110.0	113.6	116.9	107.0	164.6	122.4	Yes
	60L, V	16	19.5	19.1	21.3	17.8	21.5	19.8	Yes
	60R, V	16	19.3	20.2	19.8	18.8	18.4	19.3	Yes





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Red Retro-reflective Marking									
	Illumination Angle degree	Limits	1#	2#	3#	4#	5#	Average	Complies Yes/NA
20'	5L, V	120	151.4	155.4	124.8	131.8	145.0	141.7	Yes
	5R, V	120	154.2	159.6	148.6	153.2	134.0	149.9	Yes
	30L, V	60	63.2	97.8	76.0	78.0	91.4	81.3	Yes
	30R, V	60	115.4	112.4	98.0	102.0	87.8	103.1	Yes
	40L, V	30	37.4	41.6	44.8	47.2	60.8	46.4	Yes
	40R, V	30	84.6	77.0	65.4	67.8	52.0	69.4	Yes
	60L, V	10	14.1	18.4	19.8	22.4	31.8	21.3	Yes
	60R, V	10	19.6	23.4	20.2	20.7	16.6	20.1	Yes

Yellow Retro-reflective Marking									
	Illumination Angle degree	Limits	1#	2#	3#	4#	5#	Average	Complies Yes/NA
20'	5L, V	300	434.0	502.0	448.0	410.0	476.0	454	Yes
	5R, V	300	444.0	404.0	412.0	460.0	452.0	434.4	Yes
	30L, V	130	196.2	241.0	186.9	160.2	195.8	196.0	Yes
	30R, V	130	225.2	145.4	168.2	186.8	182.8	181.7	Yes
	40L, V	75	115.2	137.6	102.6	132.8	104.6	118.6	Yes
	40R, V	75	132.0	84.0	90.0	100.8	87.8	98.9	Yes
	60L, V	10	12.7	11.7	19.8	12.0	15.0	14.2	Yes
	60R, V	10	12.8	13.4	13.7	12.0	10.3	12.4	Yes

Resistance to external agents

Ann 8, 1

Resistance to weathering

Procedure - For each test, two specimens of a sample unit (see paragraph 2.1.4 of this Regulation) are taken. One specimen shall be stored in a dark and dry container for subsequent use as "reference unexposed specimen".

Ann 8, 1.1

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. 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 1.2. to 1.4.

Yes

Ann 8, 1.2

No area of the exposed specimen shall show any evidence of cracking, scaling, splitting, blistering, delamination, distortion, chalking, staining or corrosion.

Yes

Ann 8, 1.3

Colour fastness - the colours of the exposed specimen shall still meet the requirements specified in Annex 6.

Yes





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			Complies
White Retro-reflective Marking 1#	x [1]	0.4612	Yes
	y [1]	0.4302	
Red Retro-reflective Marking 1#	x [1]	0.6816	Yes
	y [1]	0.3012	
Yellow Retro-reflective Marking 2#	x [1]	0.5489	Yes
	y [1]	0.4396	

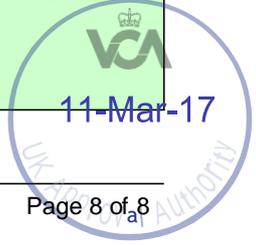
Effect on the coefficient of retro-reflection of the retro-reflective Material

<i>Ann 8, 1.4.1</i>	For this check, measurements shall be made only at an observation angle of $\alpha = 20'$ and an entrance angle of $\beta_2 = 5^\circ$ by the method given in Annex 7.	Yes
<i>Ann 8, 1.4.2</i>	The coefficient of retro-reflection of the exposed specimen when dry shall be not less than 80 per cent of the value in Annex 7, tables 1 and 2.	Yes

	Illumination Angle degree	Limits	Sample		Complies	
White Retro-reflective Marking 1# 2#	20'	5L, V	450	586.0	532.0	Yes
		5R, V	450	571.0	553.0	
Red Retro-reflective Marking 1# 2#	20'	5L, V	120	142.6	146.7	Yes
		5R, V	120	146.8	149.2	
Yellow Retro-reflective Marking 1# 2#	20'	5L, V	300	420.0	489.0	Yes
		5R, V	300	428.0	395.0	

Resistance to corrosion

<i>Ann 8, 2.1</i>	A specimen of the sample unit shall be subjected to the action of a saline mist for 48 hours comprising two periods of exposure of 24 hours each, separated by an interval of 2 hours during which the specimen is allowed to dry.	Yes
<i>Ann 8, 2.1</i>	The saline mist shall be produced by atomizing at a temperature of 35 ± 2 C a saline solution obtained by dissolving 5 parts by weight of sodium chloride in 95 parts of distilled water containing not more than 0.02 per cent of impurities.	Yes
<i>Ann 8,2.2.1</i>	The coefficient of retro-reflection R' of the retro-reflective areas, when measured after a recovery period of 48 hours as specified in paragraph 1 of Annex 7, at an entrance angle of $\beta_2 = 5$ and an observation angle of $\alpha = 20'$, shall be not less than the value in Annex 7, table 1 or more than the value in table 2 respectively. Before measuring, the surface shall be cleaned to remove salt deposits from the saline mist.	Yes





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	Illumination Angle degree	Limits	Sample	Complies
White Retro-reflective Marking 4#	20'	5L, V	450	Yes
		5R, V	450	
Red Retro-reflective Marking 4#	20'	5L, V	120	Yes
		5R, V	120	
Yellow Retro-reflective Marking 4#	20'	5L, V	300	Yes
		5R, V	300	

Resistance to fuels

A section of a sample unit not less than 300 mm long shall be immersed in a mixture of n-heptane and toluol, 70 per cent and 30 per cent by volume, for one minute.

Note: After removal, the surface shall be wiped dry with a soft cloth and shall not show any visible change which would reduce its effective performance.

Yes

Resistance to heat

Ann 8, 4.1

A section of a sample unit not less than 300 mm long shall be kept for 12 hours (in the case of moulded plastics reflectors this time shall be 48 hours) in a dry atmosphere at a temperature of $65 \pm 2^{\circ}\text{C}$ after which the sample shall be allowed to cool for 1 hour at $23 \pm 2^{\circ}\text{C}$. It shall then be kept for 12 hours at a temperature of $-20 \pm 2^{\circ}\text{C}$.

Yes

Ann 8, 4.2

The sample shall be examined after a recovery time of 4 hours under normal laboratory conditions

Yes

Ann 8, 4.3

After this test, no cracking or appreciable distortion of the surface particularly of the optical units, shall be evident.

Yes

Resistance to cleaning

Ann 8, 5.1

Manual Cleaning

Ann 8, 5.1.1

A test sample smeared with a mixture of detergent lubricating oil and graphite shall be easily cleaned without damage to the retro-reflective surface when wiped with a mild aliphatic solvent such as n-heptane, followed by washing with a neutral detergent.

Yes

Ann 8, 5.2

Power Cleaning

Ann 8, 5.2.1

When subjected to a continuous spraying action for 60 seconds on the test component in its normal mounting conditions, a test sample shall show no damage to the retro-reflective surface or delamination from the substrate or separation from the sample mounting surface under the following set-up parameters:

Yes





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- (a) Water/wash solution pressure 8 ± 0.2 MPa
- (b) Water/wash solution temperature $60^{\circ} - 5^{\circ}\text{C}$
- (c) Water/wash solution flow rate 7 ± 1 l/min
- (d) The tip of the cleaning wand to be positioned at distance of 600 ± 20 mm away from the retro-reflective surface
- (e) Cleaning wand to be held at no greater angle than 45 degrees from perpendicular to the retro-reflective surface
- (f) 40 degree nozzle creating wide fan pattern

Ann 8, 6.

Stability of photometric properties

Ann 8, 6.1

The approval granting authority has the right to test the optical properties stability of a retro-reflecting material in use (when used for marking or as distinctive markings / graphics).

N/A

Ann 8, 6.2

The Administrative Departments of Contracting Parties, in which the approval was granted, may undertake the same tests. If "systematic failures in use" occur for a type of retro-reflective material, the tested material samples shall be transferred for appraisal to the authority which granted approval.

N/A

Ann 8, 6.3

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 6 of this Regulation.

N/A

Resistance to penetration of water

Ann 8, 7.1

Sample unit of retro-reflective marking shall be immersed for 10 minutes in water at a temperature of $50 \pm 5^{\circ}\text{C}$, the highest point of the upper part of the retro-reflective surface being 20 mm below the surface of the water. This test shall be repeated after turning the sample unit through 180° , so that the retro-reflecting surface is at the bottom and the rear face is covered by about 20 mm of water. The sample unit(s) shall then be immediately immersed in the same conditions in water at a temperature of $25 \pm 5^{\circ}\text{C}$.

Yes

Ann 8, 7.2

No water must penetrate to the reflecting surface of the sample unit. If visual inspection clearly reveals the presence of water, the retro-reflective marking shall not be considered to have passed the test.

Yes

Ann 8, 7.3

If visual inspection does not reveal the presence of water or in case of doubt, the coefficient of retro-reflection R' shall be measured in conformity with Annex 7, the sample unit being first lightly shaken to remove excess water from the outside.

N/A





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	Illumination Angle degree	Limits	Sample	Complies
White Retro-reflective Marking 5#	20'	5L, V	450	Yes
		5R, V	450	
Red Retro-reflective Marking 1#	20'	5L, V	120	Yes
		5R, V	120	
Yellow Retro-reflective Marking 2#	20'	5L, V	300	Yes
		5R, V	300	

Bonding strength (in the case of adhesive materials of Class C)

Ann 8, 8.1	The adhesion of retro-reflective materials shall be determined after 24 hours curing time by utilising a 90 degree peel on a tensile strength testing machine.	Yes
Ann 8, 8.2	The retro-reflective materials shall not be easily removable without damaging the material.	Yes
Ann 8, 8.3	The retro-reflective materials shall need a force of at least 10 N per 25 mm width at a constant speed of 300 mm per minute to be removed from their substrate. White 3#: 22.0N Red 3#: 20.8N Yellow 3#: 21.4N	Yes

Flexing

Ann 8, 9.1	For samples that are to be adhered to a flexible substrate, i.e. tarpaulin, the following shall apply:	
Ann 8, 9.1.1	A specimen of the sample unit that measures 50 mm by 300 mm shall be bent once lengthwise, around a 3.2 mm mandrel with adhesive contacting the mandrel for a period of 1 second.	Yes
	The test temperature shall be 23°C ± 2°C <i>Note: For ease of testing, spread talcum powder on the adhesive to prevent sticking to the mandrel.</i>	Yes
Ann 8, 9.1.2	After this test, specimen shall not have cracking of the surface and shall not show any visible change that would reduce its effective performance.	Yes

Remarks

None

Note: VCA apply measurement uncertainty to calibrated items but not test results.





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