



**VCA Headquarters**  
1 The Eastgate Office Centre  
Eastgate Road  
Bristol, BS5 6XX  
United Kingdom

Switchboard: +44 (0) 117 951 5151  
Direct line: +44 (0) 117 952  
Main Fax: +44 (0) 117 952 4103  
Email: [enquiries@vca.gov.uk](mailto:enquiries@vca.gov.uk)  
Web: [www.vca.gov.uk](http://www.vca.gov.uk)

## THE UNITED KINGDOM VEHICLE APPROVAL AUTHORITY

Rev 1/03



### COMMUNICATION CONCERNING THE APPROVAL GRANTED OF A TYPE OF ADVANCE-WARNING TRIANGLES, PURSUANT TO REGULATION NO 27.03

Approval No: 27R-033910 Extension No: Not applicable

1. Trade name or mark of the advance-warning triangle:



2. Manufacturer's name: NINGBO FUDING INDUSTRIAL AND TRADING CO., LTD.

3. Address: DINGJIASHAN, XIAOGANG, BEILUN DISTRICT, NINGBO CITY, ZHEJIANG PROVINCE, P.R.CHINA

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

5. Address: Not applicable

6. Brief description of the advance-warning triangle: Hard retro-reflective outer strip and fluorescent inner strip with four stems of metal support. Each two stems are crossed.

7. Submitted for approval on: 23 August 2006

8. Technical service responsible for conducting approval tests: Vehicle Certification Agency

9. Date of test report issued by that service: 26 August 2006

10. Number of test report issued by that service: KSG078565(3910)

An executive agency in the UK Department for Transport



11. Approval GRANTED

12. Remarks

13. Place: BRISTOL

14. Date: 7 SEPTEMBER 2006

15. Signature:



M J MULVANEY

16. The following documents, bearing the approval number shown above, are annexed to this communication:

- Dimensioned drawings
- Photographs

KSG078565



## **TEST REPORT: Advance-warning triangles**

**Report/Job Number: KSG078565(3910)**

**Page: 1 of 9**

### **TEST DETAILS**

Subject	Advance-warning triangles
EC Directive	-
ECE Regulation	ECE Regulation 27.03
Location of Test	National Automobile Quality Supervision Test Center (Xiangfan, Hubei)
Date of Test	23 - 26 August 2006
VCA Representative	N.S.CHUN
Manufacturer's Representative	Mr. DING SHIHAI
Reason for Test	New Approval

### **MANUFACTURER DETAILS**

Manufacturer's Name	NINGBO FUDING INDUSTRIAL AND TRADING CO., LTD.
Manufacturer's Address	DINGJIASHAN, XIAOGANG, BEILUN DISTRICT, NINGBO CITY ZHEJIANG PROVINCE, P.R.CHINA
Model Type & description	RT107
Category	Component

### **CONCLUSION**

The above mentioned vehicle was tested in accordance with ECE  
Regulation 27.03 Advanced-warning triangles was found to comply in  
all respects

Signature:



Name: N.S.CHUN

Position: Type Approval Engineer

Date: 26 August 2006



### **LIST OF ANNEXES**

ANNEX	NO OF PAGES	SUBJECT
1	1	Colour test result of fluorescent material

**TEST REPORT: Advance-warning triangles**

Paragraph	Parameter	Complies
<b>TEST SPECIFICATION/ WORST CASE RATIONALE:</b>		
	Two types (RT107 and RT066) applied at the same time and triangular part including Retro-reflective strip and Fluorescent material is exactly same but support is different. Photometric and colorimetric test of RT066 is carried over by RT107.	
Manufacturer's documentation complete (dimensional drawings, brief technical descriptions of material, instructions)		
		Complies
<b>Laboratory</b>		
Retro-reflector measuring equipment		
Make:	KOHZU	Type: ALT-1 (RRM-12M, PTS-M2)
Serial:	95557, 95558	Cal date: 2006.7.5
Colorimeter		
Make:	TOPCON	Type: BM-7
Serial:	00824804	Cal date: 2006.3.30
Temperature test equipment		
Make:	Lec (BOGNOR REGIS ENGLAND)	Type: XMT-7000
Serial:	-	Cal date: 2006.2.26
Colour fastness (ISO 105-B02): Xenon Weather-Ometer		
Make:	ATLAS	Type: Ci4000
Serial:	15730	Cal date: 2005.11.29
Calipers		
Make:	MC	Type: 979653, 03000002
Serial:	-	Cal date: 2005.10.23
Force gauge: Electronic Force Gauge		
Make:	SALTER	Type: FG002
Serial:	-	Cal date: 2005.11.18



**TEST REPORT: Advance-warning triangles**

Paragraph	Parameter	Complies
	Test fuel (n-heptane, toluene) Make: SCR Type: -	
	Wind Speed Meter Make: PROVA Instruments Inc Type: AVM-03 Serial: 04261014 Cal date: 2005.10.19	
	<b>GENERAL REQUIREMENTS</b>	
4.1, 4.2	Advanced-warning triangle and protective cover(if any) shall bear <del>Trade name</del> / trade mark* marked clearly and indelibly	Complies
	Sufficient space reserved to incorporate the approval mark, on the product and on the drawing	Complies
6.1 & Annex 3	Advance-warning triangles shall be constitute as, Open at centre, Red border of retro-reflective outer strip, Inner fluorescent strip, Bounded by concentric equilateral triangular contour	Complies
6.2	Advance-warning triangles shall be retaining the performance in normal use (vibrations etc.)	Complies
6.3	Advance-warning triangles shall not be easily disassembled and movable parts shall not be detachable	Complies
6.4	The front face of triangle shall be vertical to ground( within $\pm 5^\circ$ ): <b>+0.82°</b> <b>(arc tangent method used)</b>	Complies
6.5	The front face of advance-warning triangles shall be easily cleaned	Complies
6.6	The advance-warning triangles shall not present sharp edges and corners	Complies
6.7	The advance-warning triangles shall have protective covers(if any), <del>OR other means of protection from external agents:</del>	Complies

**TEST REPORT: Advance-warning triangles**

Paragraph	Parameter	Complies	
6.8	The advance-warning triangles shall be accompanied by instructions of use: Inscribed on the protective cover	Complies	
<b>Shape and dimensions (Annex 3)</b>			
7.1.1.1	Items	Limits	Measured
7.1.1.1	Theoretical side of triangle	$500 \pm 50\text{mm}$	<b>480</b>
7.1.1.2	Width of unvarying retro-reflective strip	25~50mm	<b>31</b>
7.1.1.3	Width of triangle (See Annex 3)	$\geq 50\text{mm}$	<b>81.5</b>
7.1.1.4	Between outer edge and retro-reflective strip	$\leq 5\text{mm}$	<b>4</b>
7.1.1.5	Surface area of red fluorescent material	$\geq 315\text{cm}^2$	<b>372</b>
7.1.1.6	Between retro-reflective strip and fluorescent strip	$\leq 5\text{mm}$	<b>3</b>
7.1.1.7	Side of open centre triangle	$\geq 70\text{mm}$	<b>200</b>
7.1.1.8	Roundness(outer retro-reflective strip)	$15 \pm 5\text{mm}$	<b>19</b>
7.1.1.9	Roundness(inner retro-reflective strip)	$\leq 20\text{mm}$	<b>0(Sharp)</b>
7.1.1.10	Roundness(inner fluorescent strip)	$\leq 5\text{mm}$	<b>0(Sharp)</b>
7.1.2.1	Distance between ground and lower side of advance-warning triangle (Support)	$\leq 300\text{mm}$	<b>72</b>
7.1.2.2	In case of retro-reflecting strip is not contiguous, free area of the supporting material must be red		Complies
7.2.1.1	The fluorescent surface shall be contiguous to the retro-reflecting units		Complies
Annex 5, 1.2	<b>TEST OF HEAT AND LOW-TEMPERATURE RESISTANCE(all samples)</b>		
Annex 5, 7.1	Advance-warning triangle shall be kept dry atmosphere at $60 \pm 2^\circ\text{C}$ for 12 hour (in the protective cover, if provided)		Complies
Annex 5, 7.2	Visual inspection: <b>No crack, distortion and cover have normal operation</b>		Complies
Annex 5, 7.3	After the heat resistance test, device shall be kept $25 \pm 5^\circ\text{C}$ for 12 hour. And kept -		



**TEST REPORT: Advance-warning triangles**

Paragraph	Parameter	Complies
Annex 5, 7.4	40±2°C for 12 hour	Complies
Annex 5, 1.3	Immediately cold resistance test no crack, distortion, cover shall have normal operation	Complies

**CIL MEASUREMENT OF RETRO-REFLECTING DEVICES**

- Annex 5, 4. CIL values for four samples (measurement shall be taken at least after one hour after the heat resistance test)

Divergence angle	Illuminating angle		Limit (mcd/lx)	# 1	# 2	# 3	# 4
	H	V					
20'	+5°	0°	≥ 8000	11478	11952	13160	12853
	-5°	0°		11645	11571	12779	12388

- Annex 5,1.4 Two triangles shows minimum and maximum CIL values shall be visibly compared with 100mm x 100mm fluorescent material at a distance of 30m and daylight. No noticeable difference of colour or luminance shall be permitted

Complies

- Annex 5,1.5 Two triangles shows **minimum** and **maximum CIL** values shall be tested as next procedure

**PHOTOMETRIC SPECIFICATIONS**

## 7.3.1.1 Retro-reflective devices

Divergence angle	Illuminating angle		Limit (mcd/lx)	Min CIL	Max CIL
	H	V		Sample	Sample
20'	+40°	0°	≥ 600	604	1035
	+30°	0°	≥ 1750	1811	2695
	+5°	0°	≥ 8000	11478	13160
	0°	0°	≥ 8000	11896	13309
	0°	+20°	≥ 4000	6952	7249
	0°	-20°	≥ 4000	4703	5948
	-5°	0°	≥ 8000	11645	12779
	-30°	0°	≥ 1750	2658	1961
	-40°	0°	≥ 600	1015	698



**TEST REPORT: Advance-warning triangles**

Paragraph	Parameter				Complies
1°30'	+40°	0°	≥ 50	<b>51</b>	<b>77</b>
	+30°	0°	≥ 100	<b>140</b>	<b>235</b>
	+5°	0°	≥ 600	<b>1030</b>	<b>999</b>
	0°	0°	≥ 600	<b>1072</b>	<b>983</b>
	0°	+20°	≥ 200	<b>554</b>	<b>525</b>
	0°	-20°	≥ 200	<b>347</b>	<b>387</b>
	-5°	0°	≥ 600	<b>968</b>	<b>880</b>
	-30°	0°	≥ 100	<b>225</b>	<b>155</b>
	-40°	0°	≥ 50	<b>83</b>	<b>55</b>

7.3.1.2 CIL measured on random slices of 50mm length, **ratio** between **extremes** shall  
not exceed 3

Divergence angle	Illuminating angle		min	max	ratio	Complies
	H	V				
20'	+5°	0°	<b>571</b>	<b>845</b>	<b>1.48</b>	
	0°	+20°	<b>320</b>	<b>513</b>	<b>1.60</b>	
	0°	-20°	<b>363</b>	<b>518</b>	<b>1.43</b>	
	0°	0°	<b>582</b>	<b>820</b>	<b>1.41</b>	
	-5°	0°	<b>580</b>	<b>842</b>	<b>1.45</b>	

7.3.1.3, Triangular shape shall be clearly recognized for an angle of divergence 20' and  
7.3.1.4 illumination of 1 lux at

Divergence angle	Illuminating angle		Min CIL Sample	Max CIL Sample	Visibility	Complies
	H	V				
20'	+40°	0°			<b>OK*</b>	
	+30°	0°			<b>OK*</b>	
	-30°	0°			<b>OK*</b>	
	-40°	0°			<b>OK*</b>	

\*Note: If visibility are met then photometric divergence shall be allowed, and min CIL sample is tested for visibility.

Annex5, 1.5.2 **COLORIMETRIC SPECIFICATION**

7.2.1 Colour of retro-reflective devices

7.2.1.2, Visual comparison test with standard illuminant A, all samples comply with limit

7.2.1.3



N/A

# TEST REPORT: Advance-warning triangles

Paragraph	Parameter	Complies
OR trichromatic coordinate was measured for most doubtful sample		
Divergence angle	Illuminating angle	Trichromatic coordinate
1/3°	0°	$y \leq 0.335$ $y = 0.3234, z = 0.0054$
1/3° <sup>1)</sup>	0°	$z \leq 0.008$ $y = 0.3245, z = 0.0052$

1) in case of colourless surface reflection

### Annex5, 1.5.3 TEST OF CLEARANCE TO GROUND

5. 1) The apparatus on Annex 3, Figure 2 is inverted on a horizontal plane

Outer rectangle= 320mm, Inner rectangle=50mm, Inner height=15.9mm

- 2) Individual support shall be placed one after another

All supports are resting simultaneously on the base plane:

The distance between support and test apparatus base plane is at least 50mm:

Warning triangle supports do not touch the test apparatus, i.e. the distance between base plane and illuminating surface is same as quoted in 7.1.2.1

## Complies

## Complies

## Annex5, 1.5.4 MECHANICAL SOLIDITY TEST

6. 1) Set up a warning triangle as manufacturer's specification

- 2) apply a force 2N at the apex of triangle (highest point), parallel to the ground

The apex of triangle shall not move more than 5cm, when the force is applied:

Forward = 3.7 cm, Backward = 3.5 cm

After the test the position of device shall not significantly different from origin

## Complies

## Complies

## Annex 5, 1.6 TEST OF RESISTANCE TO PENETRATION OF WATER

- 11.1 (One sample other than tested in 1.5)

- 1) The retro-reflecting device assembled as triangle and

- 2) immersed apex of illuminating surface of triangle to 20mm for 10 minute at

50±5°C water

- 3) immersed apex of illuminating surface of triangle to 20mm for 10 minute at  $25\pm5^{\circ}\text{C}$  water

#### Visual inspection: **No presence of water**



## Complies

**TEST REPORT: Advance-warning triangles**

Paragraph	Parameter	Complies												
Annex5, 1.7.1 <b>WATER TEST</b>														
8.	<p>(One sample other than tested in 1.5, or 1.6)</p> <ol style="list-style-type: none"> <li>1) The retro-reflecting device assembled as triangle and</li> <li>2) immersed as flat, reflective surface is upward, under 5cm of surface of water, for 2 hour at <math>25\pm5^{\circ}\text{C}</math> water</li> <li>3) dry the triangle</li> </ol> <p>Visual inspection: <b>No presence of water</b></p>	<b>Complies</b>												
Annex5, 1.7.2 <b>TEST OF RESISTANCE TO FUELS</b>														
9.	<ol style="list-style-type: none"> <li>1) triangle and protective cover immersed separately in a tank containing mixture of 70% n-heptane and 30% toluene for 60 second</li> <li>2) place the triangle into the protective cover and laid it flat area</li> <li>3) wait until completely dried</li> </ol> <p>Visual inspection: <b>No visually noticeable change</b></p>	<b>Complies</b>												
Annex5, 1.7.3 <b>TEST OF STABILITY AGAINST WIND</b>														
10.	<ol style="list-style-type: none"> <li>1) advance triangle shall be placed in a wind tunnel, on base <math>1.50\text{m}\times1.2\text{m}</math></li> <li>2) Geometric roughness (According to Annex 4.) <math>\text{HS}=0.5\text{mm}\pm0.05\text{mm}</math></li> <li>3) 3 min at 180Pa dynamic air pressure (about 60km/h under normal condition), wind will be applied for <b>forward/backward</b> direction</li> </ol> <p>Visual inspection:</p> <p><b>No overturn,</b></p> <p><b>Shift (<math>\leq 5\text{cm}</math> on ground): No move,</b></p> <p><b>Rotation(<math>\leq 10^{\circ}</math>): No rotation.</b></p>	 <b>Complies</b>												
Annex5, 1.8.1 <b>COLOUR TEST OF FLUORESCENT MATERIAL</b>														
	(Two samples of fluorescent material $100\text{mm} \times 100\text{mm}$ , submitted acc. to 3.5)													
7.2.2.2	<p>Visual comparison test with standard illuminant C, all samples comply with limit</p> <p>OR trichromatic coordinate was measured for most doubtful /highest CIE* sample</p>	<b>N/A</b>												
		<b>Complies</b>												
	<table border="1"> <thead> <tr> <th rowspan="2">Divergence angle</th> <th colspan="2">Illuminating angle</th> <th rowspan="2">Limit</th> <th rowspan="2">Trichromatic coordinate</th> </tr> <tr> <th>H</th> <th>V</th> </tr> </thead> <tbody> <tr> <td><math>1/3^{\circ}</math></td> <td><math>0^{\circ}</math></td> <td><math>0^{\circ}</math></td> <td>*</td> <td><math>x= 0.6305, y= 0.3350</math></td> </tr> </tbody> </table>	Divergence angle	Illuminating angle		Limit	Trichromatic coordinate	H	V	$1/3^{\circ}$	$0^{\circ}$	$0^{\circ}$	*	$x= 0.6305, y= 0.3350$	
Divergence angle	Illuminating angle		Limit	Trichromatic coordinate										
	H	V												
$1/3^{\circ}$	$0^{\circ}$	$0^{\circ}$	*	$x= 0.6305, y= 0.3350$										

\*note: trichromatic limit is bounded by following four points quadrangle,

**TEST REPORT: Advance-warning triangles**

Paragraph	Parameter				Complies
Point	1	2	3	4	
x	0.690	0.595	0.569	0.655	
y	0.310	0.315	0.341	0.345	

Annex5, 1.8.2 **DETERMINATION OF LUMINANCE FACTOR OF THE FLUORESCENT MATERIAL**

7.3.2.1, With CIE illuminant C and incidence angle of 45° and observed at an angle of 45°,  
 Annex5, 3. tristimulus value Y shall not be less than 30%

**$\beta = 32.0 \%$**

**$\beta_0 = 1.011$**

Annex5, 1.8.3 **TEST OF WEATHER RESISTANCE OF FLUORESCENT MATERIAL**

12. 1) One of fluorescent material 100mm x 100mm shall be subjected to a temperature and irradiation test described ISO 105 of 1978 until contrast No. 4 of the grey scale has been reached for the reference sample No.5

2) After the test colour coordinate

Complies

Divergence angle	Illuminating angle		Limit	Trichromatic coordinate
	H	V		
1/3°	0°	0°	*	<b>x = 0.6231 , y = 0.3383</b>

\*note: trichromatic limit is bounded as shown 7.2.2.2 quadrangle

3) The luminance factor shall be at least 30%:

**$\beta = 31.4\%$**

Complies

And not increased by more than 5% compared to before weather resistance test

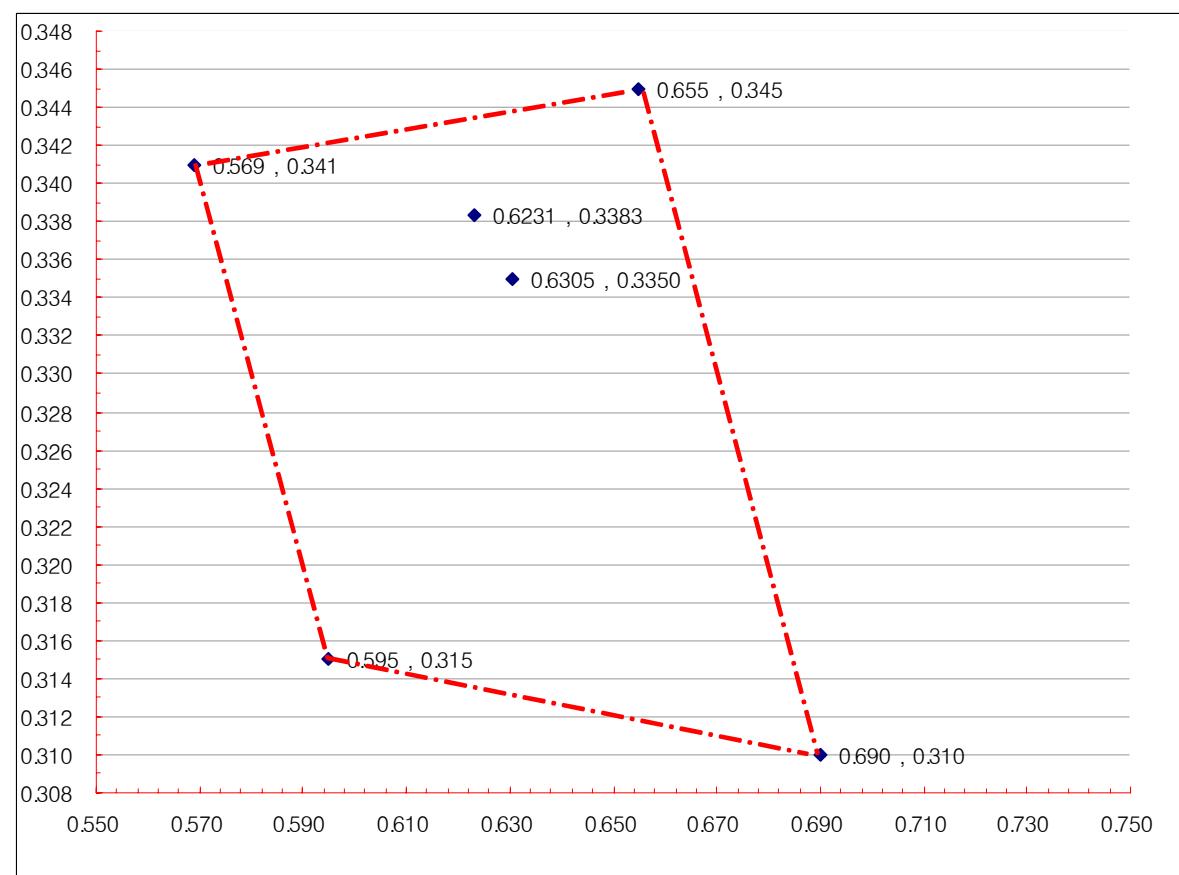
result: **0.6% decreased**

Complies



## Annex 1, Colour test result of fluorescent material

	x	y
1	0.690	0.310
2	0.595	0.315
3	0.569	0.341
4	0.655	0.345
before weather test	0.6305	0.33850
after weather test	0.6231	0.33883



First application date: 28 JULY 2006

1. Specification data

Type	RT107	
Function	Advance-warning triangle	
Emitted colour	Red	
Applicable Regulation (ECE)	R27.03	
Location of marking	Rated voltage & wattage	-
		-
Trade mark		
	Marked on rear housing	
Approval Mark	Marked on rear housing	

2. Construction and material

Construction	Material	Remarks
Lens	PMMA POLYESTER	-
Housing	ABS POLYESTER	-
Reflector	PMMA POLYESTER	-
Fluorescent	PVC POLYESTER	-
Protective cover	PP POLYESTER	INSTRUCTIONS OF USE INSCRIBED ON THE COVER

3. Name and address of manufacturer

: NINGBO FUDING INDUSTRIAL AND TRADING CO., LTD.

DINGJIASHAN, XIAOGANG, BEILUN DISTRICT, NINGBO CITY ZHEJIANG PROVINCE, P.R. CHINA

4. Name and address of representative of manufacturer : Not applicable

This information document consists of 5 pages.

