
 TEST REPORT IEC 60529 Degrees of Protection Provided by Enclosures (IP Code)	
Report Reference No.	LCS1510200924S
Tested by (+ signature).....	Fred Zhang
Approved by (+ signature)	Hart Qiu
Date of issue	November 04, 2015
Contents	13 pages
Testing laboratory	
Name	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Testing location	Same as above
Client	
Name	Hi-Line Lighting Ltd.
Address	1 The Keep, Kingston Upon Thames, KT2 5UF, United Kingdom
Manufacturer	
Name	Hi-Line Lighting Ltd.
Address	1 The Keep, Kingston Upon Thames, KT2 5UF, United Kingdom
Test specification Standard	IEC 60529: 1989+A1: 1999+A2: 2013
Test procedure	Compliance with IEC 60529: 1989+A1: 1999+A2: 2013
Non-standard test method	N/A
Test item Description	Nano Waterproof Bendable LED strip
Trademark	
Model and/or type reference.....	HL-BLS2835H-60WW/NW/CW-N-24V
Rating(s).....	DC24V, 60mA, 14.4W/m

Test case verdicts

Test case does not apply to the test object..... : N (A)

Test item does meet the requirement : P(ass)

Test item does not meet the requirement : F(ail)

Testing

Date of receipt of test item : November 02, 2015

Date(s) of performance of test..... : November 02, 2015 – November 04, 2015

General remarks

This test report shall not be reproduced except in full without the written approval of the testing laboratory.

The test results presented in this report relate only to the item tested.

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

IEC 60529: 1989+A1: 1999+A2: 2013																																			
Clause	Requirement – Test	Result - Remark	Verdict																																
	GENERAL CONDITIONS FOR THE TESTS		P																																
13.1	<p>Test means and the main test conditions are given in table 7. Table 7 - Test means for the tests for protection against solid foreign objects</p> <table border="1"> <thead> <tr> <th>First characteristic numeral</th> <th>Test means (object probes and dust chamber)</th> <th>Test force</th> <th>Test conditions, see</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>No test required</td> <td>--</td> <td>--</td> </tr> <tr> <td>1</td> <td>Rigid sphere without handle or guard $50^{+0,05}_0$ mm diameter</td> <td>50 N ± 10 %</td> <td>13.2</td> </tr> <tr> <td>2</td> <td>Rigid sphere without handle or guard $12,5^{+0,2}_0$ mm diameter</td> <td>30 N ± 10 %</td> <td>13.2</td> </tr> <tr> <td>3</td> <td>Rigid steel rod $2,5^{+0,05}_0$ mm diameter with edges free from burrs</td> <td>3 N ± 10 %</td> <td>13.2</td> </tr> <tr> <td>4</td> <td>Rigid steel rod $1,0^{+0,05}_0$ mm diameter with edges free from burrs</td> <td>1 N ± 10 %</td> <td>13.2</td> </tr> <tr> <td>5</td> <td>Dust chamber figure 2, with or without underpressure</td> <td>--</td> <td>13.4 + 13.5</td> </tr> <tr> <td>6</td> <td>Dust chamber figure 2, with under-pressure</td> <td>--</td> <td>13.4 + 13.6</td> </tr> </tbody> </table>	First characteristic numeral	Test means (object probes and dust chamber)	Test force	Test conditions, see	0	No test required	--	--	1	Rigid sphere without handle or guard $50^{+0,05}_0$ mm diameter	50 N ± 10 %	13.2	2	Rigid sphere without handle or guard $12,5^{+0,2}_0$ mm diameter	30 N ± 10 %	13.2	3	Rigid steel rod $2,5^{+0,05}_0$ mm diameter with edges free from burrs	3 N ± 10 %	13.2	4	Rigid steel rod $1,0^{+0,05}_0$ mm diameter with edges free from burrs	1 N ± 10 %	13.2	5	Dust chamber figure 2, with or without underpressure	--	13.4 + 13.5	6	Dust chamber figure 2, with under-pressure	--	13.4 + 13.6		P
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13.2	<p>Test conditions for first characteristic numerals 1, 2, 3, 4 The object probe is pushed against any openings of the enclosure with the force specified in table 7.</p>	IP65	N																																
13.3	<p>Acceptance conditions for first characteristic numerals 1, 2, 3, 4 The protection is satisfactory if the full diameter of the probe specified in table 7 does not pass through any opening. NOTE For the first characteristic numerals 3 and 4 the probes specified in table 7 are intended to simulate foreign objects which may be spherical. Where an enclosure has an indirect or tortuous entry path and there is any doubt about ingress of a spherical object capable of motion, it may be necessary to examine drawings or to provide special access for the object probe to be applied with the specified force to the opening(s) where ingress has to be checked.</p>	IP65	N																																

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13.4	Dust test for first characteristic numerals 5 and 6	IP65	P
	The test is made using a dust chamber incorporating the basic principles shown in figure 2 whereby the powder circulation pump may be replaced by other means suitable to maintain the talcum powder in suspension in a closed test chamber. The talcum powder used shall be able to pass through a square-meshed sieve the nominal wire diameter of which is 50 μ m and the nominal width of a gap between wires 75 μ m. The amount of talcum powder to be used is 2 kg per cubic metre of the test chamber volume. It shall not have been used for more than 20 tests. NOTE Health and safety regulations should be observed in selecting the type of talcum powder and its use.		P
	Category 1: Enclosures where the normal working cycle of the equipment causes reductions in air pressure within the enclosure below that of the surrounding air, for example, due to thermal cycling effects.		P
	Category 2: Enclosures where no pressure difference relative to the surrounding air is present.		N
13.5	Special conditions for first characteristic numeral 5		N
13.5.1	Test conditions for first characteristic numeral 5		N
	The enclosure shall be deemed category 1 unless the relevant product standard for the equipment specifies that the enclosure is category 2.		N
13.5.2	Acceptance conditions for first characteristic numeral 5 The protection is satisfactory if, on inspection, talcum powder has not accumulated in a quantity or location such that, as with any other kind of dust, it could interfere with the correct operation of the equipment or impair safety. Except for special cases to be clearly specified in the relevant product standard, no dust shall deposit where it could lead to tracking along the creepage distances.		N
13.6	Special conditions for first characteristic numeral 6		P

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Clause	Requirement – Test	Result - Remark	Verdict
13.6.1	Test conditions for first characteristic numeral 6 The enclosure shall be deemed category 1, whether reductions in pressure below the atmospheric pressure are present or not.		P
13.6.2	Acceptance conditions for first characteristic numeral 6		P
	The protection is satisfactory if no deposit of dust is observable inside the enclosure at the end of the test.		P
14	Tests for protection against water indicated by the second characteristic numeral		P
14.1	Test means The test means and the main test conditions are given in table 8.		P
14.2.1	Test for second characteristic numeral 1 with the drip box The test is made with a device which produces a uniform flow of water drops over the whole area of the enclosure. An example of such a device is shown in figure 3a). The turntable on which the enclosure is placed has a rotation speed of 1 r/min and the eccentricity (distance between turntable axis and specimen axis) is approximately 100 mm. The enclosure under test is placed in its normal operating position under the drip box, the base of which is larger than that of the enclosure. Except for enclosures designed for wall or ceiling mounting, the support for the enclosure under test should be smaller than the base of the enclosure. An enclosure normally fixed to a wall or ceiling is fixed in its normal position of use to a wooden board having dimensions which are equal to those of that surface of the enclosure which is in contact with the wall or ceiling when the enclosure is mounted as in normal use. The duration of test is 10 min.	IP65	N
14.2.2	Test for second characteristic numeral 2 with the drip box	IP65	N

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Clause	Requirement – Test	Result - Remark	Verdict
	<p>The dripping device is the same as specified in 14.2.1 adjusted to provide the water flow rate specified in table 8.</p> <p>The table on which the enclosure is placed does not turn as in the case of the test for the second characteristic numeral 1.</p> <p>The enclosure is tested for 2,5 min in each of four fixed positions of tilt.</p> <p>These positions are 15° on either side of the vertical in two mutually perpendicular planes (see figure 3b)).</p> <p>The total duration of the test is 10 min.</p>		N
14.2.3	Test for second characteristic numeral 3 with oscillating tube or spray nozzle	IP65	N
	The test is made using one of the two test devices described in figure 4 and in figure 5 in accordance with the relevant product standard.		N
	<p>a) Conditions when using the test device as in figure 4 (oscillating tube): The total flow rate is adjusted as specified in table 9 and is measured with a flow meter. The oscillating tube is provided with spray holes over an arc of 60° either side of the centre point. The support is not perforated. The enclosure to be tested is placed at the centre point of the semicircle. The tube is caused to oscillate through an angle of 120°, 60° on either side of the vertical, the time for one complete oscillation (2 × 120°) being about 4 s and the test duration being 5 min.</p> <p>The enclosure is then turned through an horizontal angle of 90° and the test is continued for a further 5 min. The maximum acceptable radius of the oscillating tube is 1 600 mm. If for certain types of apparatus it is not possible to wet all parts of the enclosure under test, the support of the enclosure may be moved up or down. The hand-held test device as in figure 5 (spray nozzle) should be used as a preference in such cases.</p>		N

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Clause	Requirement – Test	Result - Remark	Verdict
	b) Conditions when using the test device as in figure 5 (spray nozzle): The counterbalanced shield is in place for this test. The water pressure is adjusted to give the specified delivery rate. The pressure to achieve this delivery rate will be in the range of 50 kPa to 150 kPa. It should be kept constant during the test. The test duration is 1 min/m ² of the calculated surface area of the enclosure (excluding any mounting surface), with a minimum duration of 5 min.		N
14.2.4	Test for second characteristic numeral 4 with oscillating tube or spray nozzle	IP65	N
	The test is made using one of the two test devices described in figure 4 and in figure 5 in accordance with the relevant product standard.		N
	a) Conditions when using the test device as in figure 4 (oscillating tube): The oscillating tube has spray holes over the whole 180° of the semicircle. The total flow rate is adjusted as specified in table 9 and is measured with a flow meter. The tube is caused to oscillate through an angle of almost 360°, 180° on either side of the vertical, the time for one complete oscillation (2 × 360°) being about 12 s. The duration of the test is 10 min. If not specified otherwise in the relevant product standard, the support for the enclosure under test is perforated so as to avoid acting as a baffle and the enclosure is sprayed from every direction by oscillating the tube to the limit of its travel in each direction.		N
	b) Conditions when using the test device as in figure 5 (spray nozzle): The counterbalanced shield is removed from the spray nozzle and the enclosure is sprayed from all practicable directions. The rate of water flow and the spraying time per unit area are as specified in 14.2.3.		N
14.2.5	Test for second characteristic numeral 5 with the 6,3 mm nozzle	IP65	P
	The test is made by spraying the enclosure from all practicable directions with a stream of water from a standard test nozzle as shown in figure 6.		P

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Clause	Requirement – Test	Result - Remark	Verdict
	The conditions to be observed are as follows: – internal diameter of the nozzle: 6,3 mm; – delivery rate: 12,5 l/min \pm 5 %; – water pressure: to be adjusted to achieve the specified delivery rate; – core of the substantial stream: circle of approximately 40 mm diameter at 2,5 m distance from nozzle; – test duration per square metre of enclosure surface area likely to be sprayed: 1 min; – minimum test duration: 3 min; – distance from nozzle to enclosure surface: between 2,5 m and 3 m.		P
14.2.6	Test for second characteristic numeral 6 with the 12,5 mm nozzle	IP65	N
	The test is made by spraying the enclosure from all practicable directions with a stream of water from a standard test nozzle as shown in figure 6.		N
	The conditions to be observed are as follows: – internal diameter of the nozzle: 12,5 mm; – delivery rate: 100 l/min \pm 5 %; – water pressure: to be adjusted to achieve the specified delivery rate; – core of the substantial stream: circle of approximately 120 mm diameter at 2,5 m distance from nozzle; – test duration per square metre of enclosure surface area likely to be sprayed: 1 min; – minimum test duration: 3 min; – distance from nozzle to enclosure surface: between 2,5 m and 3 m.		N
14.2.7	Test for second characteristic numeral 7: temporary immersion between 0,15 m and 1 m		N
	The test is made by completely immersing the enclosure in water in its service position as specified by the manufacturer so that the following conditions are satisfied:		N

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Clause	Requirement – Test	Result - Remark	Verdict
	<p>a) the lowest point of enclosures with a height less than 850 mm is located 1 000 mm below the surface of the water;</p> <p>b) the highest point of enclosures with a height equal to or greater than 850 mm is located 150 mm below the surface of the water;</p> <p>c) the duration of the test is 30 min;</p> <p>d) the water temperature does not differ from that of the equipment by more than 5 K. However, a modified requirement may be specified in the relevant product standard if the tests are to be made when the equipment is energized and/or its parts in motion.</p>		N
14.2.8	Test for second characteristic numeral 8: continuous immersion subject to agreement		N
	Unless there is a relevant product standard, the test conditions are subject to agreement between manufacturer and user, but they shall be more severe than those prescribed in 14.2.7 and they shall take account of the condition that the enclosure will be continuously immersed in actual use.		N
14.2.9	Test for second characteristic numeral 9 by high pressure and temperature water jetting		N
	The test is made by spraying the enclosure with a stream of water from a standard test nozzle as shown in Figures 7, 8 and 9.		N
	The set-up for measuring the impact force of the water jet is given in Figure 10.		N
	The distribution force shall be verified at upper and lower limits of distance tolerance range (see Figure 11).		N

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Clause	Requirement – Test	Result - Remark	Verdict
	<p>a) For small enclosures (largest dimension less than 250 mm), the enclosure shall be mounted on the test device shown in Figure 12. – turntable speed: 5 r/min \pm 1 r/min – spray positions: 0°, 30°, 60°, 90° The test duration is 30 s per position.</p> <p>b) For large enclosures (largest dimension greater than or equal to 250 mm), the enclosure shall be mounted as per intended use. The entire exposed surface area of the enclosure shall be subjected to the spray at some point during the test procedure. – spray positions: the enclosure shall be sprayed from all practical directions covering the entire surface area and the spray shall be, as far as possible, perpendicular to the sprayed surface. – distance between nozzle and sample under test shall be 175 \pm 25 mm. The test duration is 1 min/m² of the calculated surface area of the enclosure (excluding any mounting surface), with a minimum duration of 3 min.</p>		N

Attachment – Photos

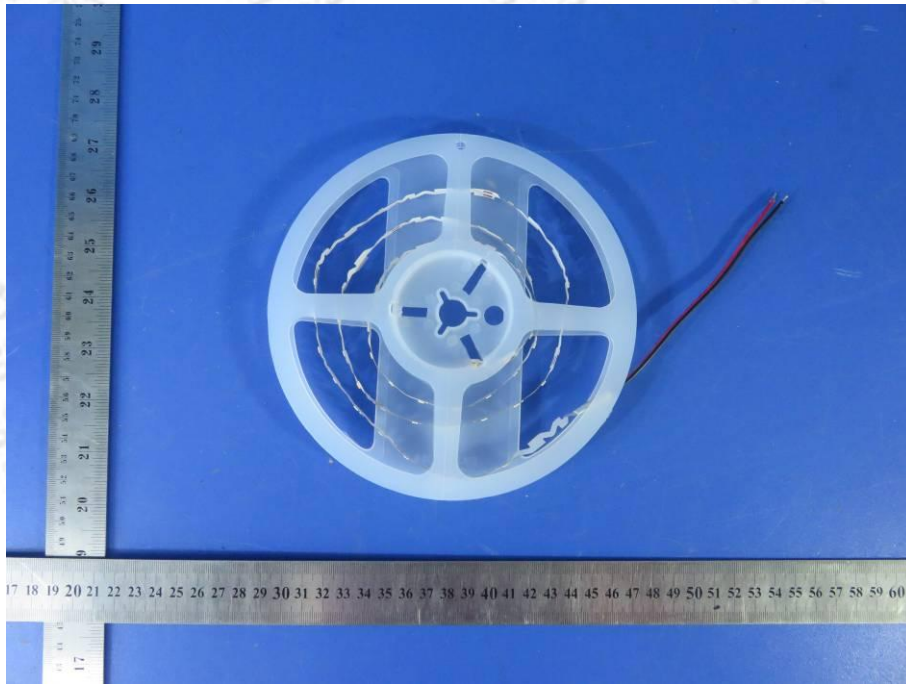


Fig.1 Product Image



Fig.2 Product Image

Attachment – Photos



Fig.3 Dust-proof test photo

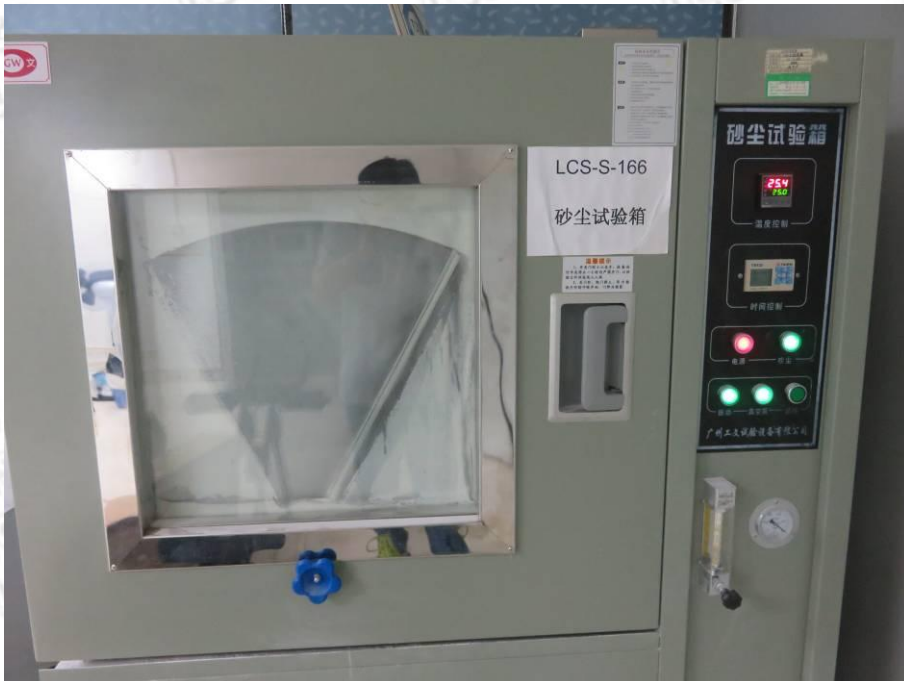


Fig.4 Dust-proof test photo

Attachment – Photos

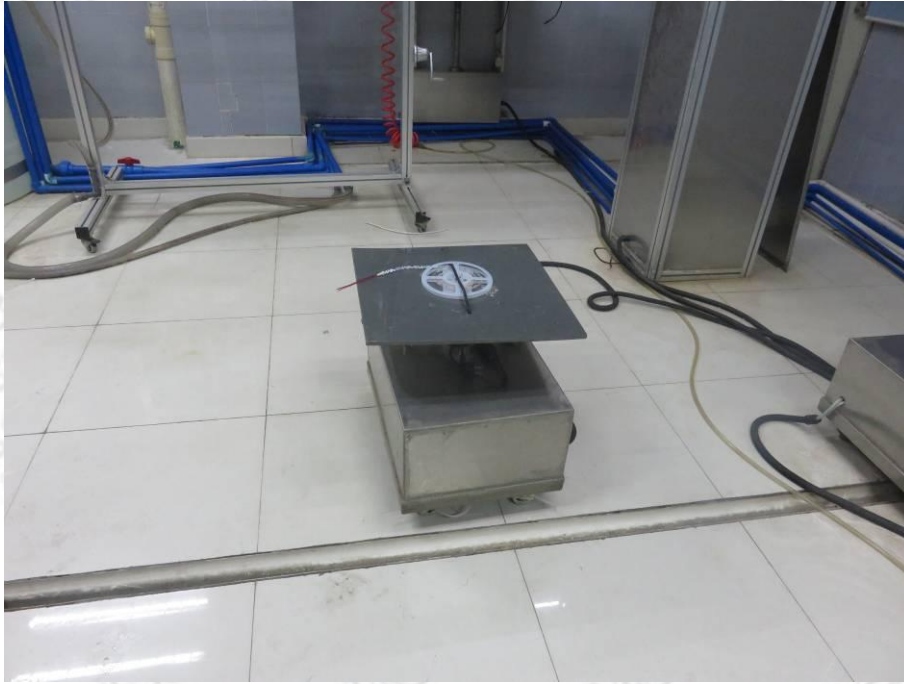


Fig.5 Waterproof test photo



Fig.6 Waterproof test photo