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Test report of

In Situ Temperature Measurement and TM-21

Rendered to:

JLS(HUIZHOU)Co.,Ltd

Building A, Jinyu East Jewelry Industrial Qiuchang Town,
Huiyang District Huizhou Guangdong 516221 CHINA

For products:

Eagle Solar Street Light Generation II

Models No.:

J168-04-40-E-40K,J168-04-40-E-50K

Test Date: Feb. 27, 2019

Test Item: TMP_{LED}

Test Lab.: **LCTECH (Zhongshan) Testing Service Co., Ltd**

2/F., Technology and Enterprise Development Center, Guangyuan Road, Xiaolan,
Zhongshan, Guangdong, China

Tel:+86-760-22833366

Fax:+86-760-22833399

E-mail:Service@lccert.com

<http://www.lccert.com>

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Test Note:

Complied by:

Pengkang Liang

Project Engineer

Mar. 7, 2019

Reviewed by:

Henry Li

Technical Manager

Mar. 7, 2019

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Table of Contents

1. General	3
1.1 Product Information	3
1.2 Standards or methods	4
1.3 Equipment list	4
2. Test conducted and method	5
2.1 Ambient Condition	5
2.2 Temperature Stabilization	5
2.3 Thermocouples	5
2.4 Thermocouples contact	5
3. Test Result Summary	6
3.1 Electrical data	6
3.2 Temperature data	6
3.3 Lumen Maintenance Projection (IESNA TM-21 Method)	6
3.4 LM-80 Information	6
3.5 Thermocouple Contact Photo	7
3.6 TM-21 input and output	8
Appendix A Product Photo	9



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1. General

1.1 Product Information

Brand Name	-
Product Type	Eagle Solar Street Light Generation II
Model Number	J168-04-40-E-40K,J168-04-40-E-50K
Rated Inputs	42V DC
Rated Power	40W
Rated Light output	5600lm
Declared CCT	4000K,5000K
Power Supply	Off Grid System
LED Package, Array or Module	Model: 1W 3030 6V 27E, manufacture ShenZhen TongYiFang Optoelectronic Technology Co.,Ltd
Receipt Samples	1 unit
Sample Code of lab.	190221104001
Date of Receipt Samples	Feb. 21, 2019
Note	J168-04-40-E-40K and J168-04-40-E-50K are the same except the colour temperature, J168-04-40-E-40K was selected to the test.

1.2 Standards or methods

The following standards are partly or totally used or referenced for test:

No.	Name
IEC 60598-1:2014 Clause 12.4.1	Luminaires- Part 1: General requirements and tests
IES LM-80:2008*	Solid State Lighting Luminaires – Lumen Maintenance
IES TM-21-11	Projecting Long Term Lumen Maintenance of LED Light Sources
IES LM-84-14 Annex A*	Recommendations for measurement of In-situ conditions LED case Temperature, Ts

Note:

**For reference only, IES LM-80-08 and IES LM-84-14 is not in the scope of CNAS(L3337) recognition.*

1.3 Equipment list

Instrument	ID	Model name	Cal. date	Next cal. Date
AC Power supply	LC-I-923	CHP-500	2019-01-08	2020-01-07
AC Power supply	LC-I-987	APW-120N	2019-01-08	2020-01-07
Power analyzer	LC-I-928	WT210	2019-01-02	2020-01-01
Power analyzer	LC-I-954	WT210	2019-01-08	2020-01-07
Multimeter	LC-I-972	Fluke 17B	2018-08-01	2019-07-31
J thermocouple	LC-I-096	TT-J-30-SLE(200 m/r)	2019-02-28	2020-02-27
Data acquisition/Switch unit	LC-I-098	34970A	2019-02-28	2020-02-27
T&H recorder	LC-I-958	DWRP-B(0)	2018-08-08	2019-08-07

2. Test conducted and method

The luminaire provided by the client was installed to simulate intended usage to record the maximum temperature that can be encountered under the intended use.

2.1 Ambient Condition

Test was conducted in an ambient temperature of 25 ± 5 °C. Ambient temperature variations above or below 25 °C was respectively subtracted from or added to temperatures recorded at points on the luminaire.

The ambient temperature was measured by a thermocouple which was immersed in 15 ml of mineral oil in a glass container which was placed in the horizontal plane passing through the midpoint of the luminaire's vertical axis at a horizontal distance from the luminaire equal to at least 3 times the luminaire diameter

2.2 Temperature Stabilization

Measurements were not taken until the luminaire has stabilized thermally whose temperatures is changing at a rate less than 1 °C per hour.

2.3 Thermocouples

Temperatures recorded at points on LED and/or driver were measured by means of thermocouples. Type J thermocouple was used. The thermocouples have conductors of 0.05mm^2 (30AWG), and complied with the requirements specified in ASTM MNL 12 and limits of error specified in NIST ITS 90 and ISA MC96.1.

2.4 Thermocouples contact

Thermocouples were directly in contact with the TMP_{LED} location described in LM-80 test report. In order to gain the maximum temperature, if appropriate, more than one thermocouple were contact in these locations. For details information, please refer to clause 3.3 for the photo of thermocouple contact..

3. Test Result Summary

3.1 Electrical data

Criteria Item	Result
Input Voltage & Frequency	36.11V
Input Current(A)	1.109
Total Power(W)	40.02
Power Factor	1.000
Current on each LED(mA)	110

3.2 Temperature data

Criteria Item	Result
Total operated period(hours)	3.6
Ambient temperature(°C)	23.6
Measured Temperature @TMP _{LED} (°C)	45.3
Maximum Temperature @TMP _{LED} (Normalized to 25°C) (°C)	46.7

3.3 Lumen Maintenance Projection (IESNA TM-21 Method)

Criteria Item	Result
6000 hours lumen maintenance of LED light source	98.99%
forward current on each LED light source	110 mA
Projected L ₇₀ lumen maintenance life	<u>156000 hours</u>
Reported L ₇₀ lumen maintenance life	<u>>54000 hours</u>

Note: 1. Please refer to section 3.6 for details of TM-21 inputs and results.

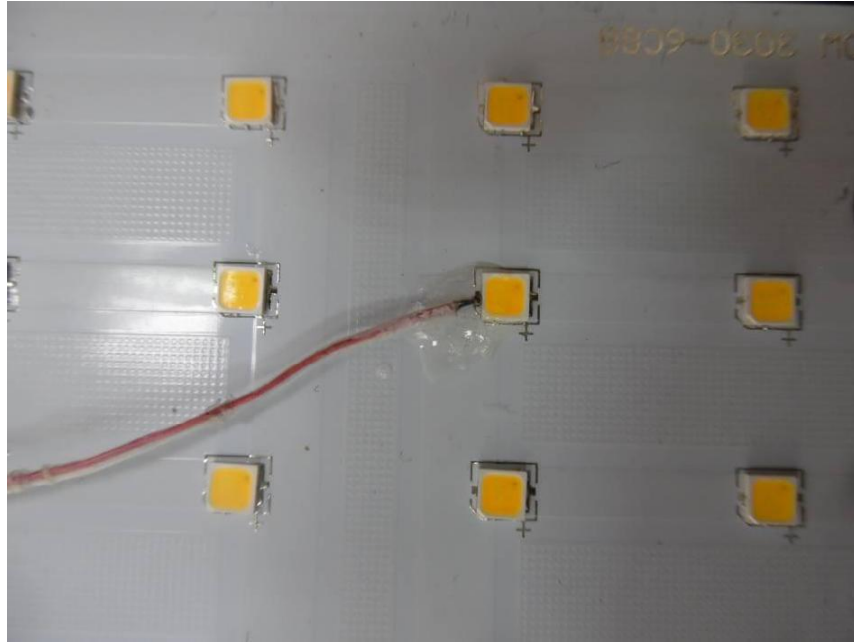
3.4 LM-80 Information

Report originated by	Bay Area Compliance Laboratories Corp. (Dongguan).		
Manufactured by	ShenZhen TongYiFang Optoelectronic Technology Co.,Ltd		
LM-80 report No.	R2DG160610072-10-9000		
LED Model	1W 3030 6V 27E		
LED Part Number	1W 3030 6V 27E		
Number of LED light source tested	25 pcs per case temperature		
Drive Current	150mA		
Case temperature	85°C	105°C	-
lumen maintenance during 6000 hours test	99.01%	98.45%	-
Color maintenance(Δu'v') during 6000 hours test	0.0015	0.0017	-

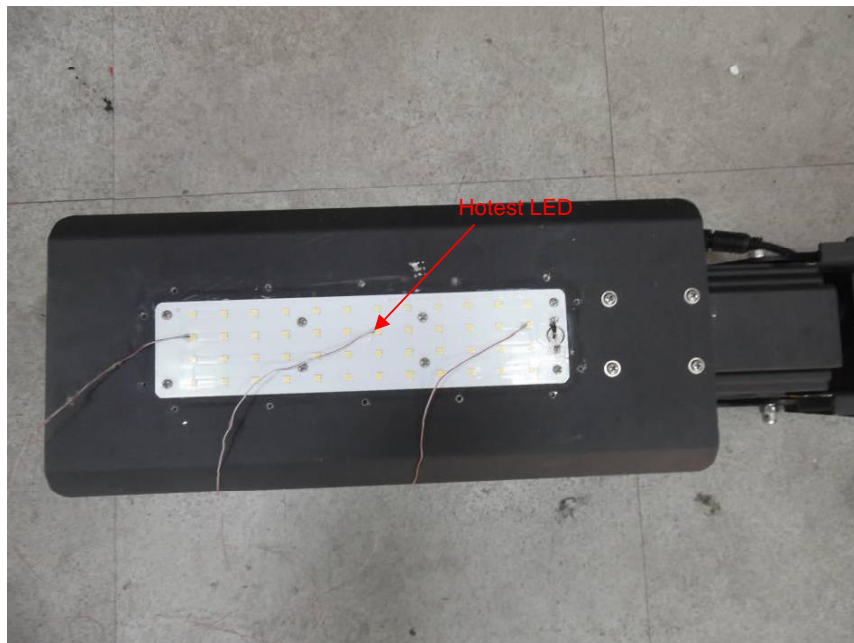


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3.5 Thermocouple Contact Photo



Part View



Over View



3.6 TM-21 input and output

TM-21 Inputs

Instructions

Yellow fields are completed by the user. Fields not used should be left blank. Cyan fields are calculated based on user entries.

First, enter a description of the LED light source tested. Then complete the fields labeled "LM-80 Testing Details". Test duration must be at least 6,000 hours. If only one case temperature data set is to be used (no interpolation), complete only "Tested case temperature 1". For only two case temperature data sets, complete 1 and 2.

Next, further to the right, in the corresponding box(es) for each tested case temperature, enter the test data along with the time (in hours) at which each measurement was taken. Data entered must be normalized then averaged measured data (per TM-21 sections 5.2.1 and 5.2.2).

Enter drive current, *in-situ* temperature data and the percentage of initial lumens to project to in the fields labeled "In-Situ Inputs".

Results can be tailored to estimate lumen maintenance at a specific time by entering a value (t) in the yellow field.

A complete TM-21 report will appear on the next tab labeled "Report".

Description of LED Light Source Tested <small>(manufacturer, model, catalog number)</small>			LM-80 Test Inputs					
Model: 1W 3030 6V 27E, manufactured by ShenZhen TongYiFang Optoelectronic Technology Co., Ltd.			Test Data for 85°C Case Temperature		Test Data for 105°C Case Temperature		Tested Case Temperature 3	
Time (hours)	Lumen (%)	Maintenance (%)	Time (hours)	Lumen (%)	Maintenance (%)	Time (hours)	Lumen (%)	Maintenance (%)
0	100.00%	0	0	100.00%	0			
1000	100.11%	1000	1000	99.97%	1000			
2000	99.92%	2000	2000	99.69%	2000			
3000	99.67%	3000	3000	99.35%	3000			
4000	99.43%	4000	4000	99.02%	4000			
5000	99.24%	5000	5000	98.76%	5000			
6000	99.01%	6000	6000	98.45%	6000			
7000	98.73%	7000	7000	98.15%	7000			
8000	98.53%	8000	8000	97.83%	8000			
9000	98.31%	9000	9000	97.54%	9000			

LM-80 Testing Details	
Total number of units tested per case temperature:	25
Number of failures:	0
Number of units measured:	25
Test duration (hours):	9000
Tested drive current (mA):	150
Tested case temperature 1 (T ₁ , °C):	85
Tested case temperature 2 (T ₂ , °C):	105
Tested case temperature 3 (T ₃ , °C):	

In-Situ Inputs	
Drive current for each LED package/array/module (mA):	110
In-situ case temperature (T _{in-situ} , °C):	46.7
Percentage of initial lumens to project to (e.g. for L ₇₀ , enter 70):	70

Results	
Time (t) at which to estimate lumen maintenance (hours):	6,000
Lumen maintenance at time (t) (%):	98.99%
Calculated L70 (hours):	156,000
Reported L70 (hours):	>54000

TM-21 Input

TM-21 Report

Table 1: Report at each LM-80 Test Condition			Table 2: Interpolation Report <small>(projection based on in-situ temperature entered)</small>		
Description of LED Light Source Tested <small>(manufacturer, model, catalog number)</small>			Model: 1W 3030 6V 27E, manufactured by ShenZhen TongYiFang Optoelectronic Technology		
Test Condition 1 - 85°C Case Temp		Test Condition 2 - 105°C Case Temp			
Sample size	25	Sample size	25	T _{1,1} (°C)	85.00
Number of failures	0	Number of failures	0	T _{1,1} (K)	358.15
DUT drive current used in the test (mA)	150	DUT drive current used in the test (mA)	150	σ ₁	2.315E-06
Test duration (hours)	9,000	Test duration (hours)	9,000	B ₁	1.004
Test duration used for projection (hour to hour)	4,000 - 9,000	Test duration used for projection (hour to hour)	4,000 - 9,000	T _{1,2} (°C)	-
Tested case temperature (°C)	85	Tested case temperature (°C)	105	T _{1,2} (K)	-
σ	2.315E-06	σ	3.050E-06	σ ₂	-
B	1.004	B	1.003	R ₂	-
Calculated L70(9k) (hours)	156,000	Calculated L70(9k) (hours)	118,000	E ₉₀ k ₀	-
Reported L70(9k) (hours)	>54000	Reported L70(9k) (hours)	>54000	A	-
				B ₀	1.004
				T _{1,1} (°C)	46.70
				T _{1,1} (K)	319.85
				σ ₁	2.315E-06
				Projected L70(9k) at 48.7°C (hours)	156,000
				Reported L70(9k) at 48.7°C (hours)	>54000

Report Generated By: Pengkang Liang	Notes: NA
Company: LCTECH (Zhongshan) Testing Service Co., Ltd.	
Date: Mar. 7, 2019	

TM-21 Output

Appendix A Product Photo



Picture 1



Picture 2

****End of test report****