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**Energy Investment Allowance according to the TM21, LM80
and NEN-EN-IEC 62722-2-1.**

Arnhem, March 14, 2022

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On request of:

Koopman B.V.
Molenvliet 2
3961 MV Wijk bij Duurstede
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A blue ink signature of J Röttjers, written in a cursive style.

Review : L.N.H Huynh

A blue ink signature of L.N.H Huynh, written in a cursive style.

24 pages 4 annexes

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1 APPLICATION FOR TESTING

Koopman B.V., Molenvliet 2, 3961 MV Wijk bij Duurstede, The Netherlands submitted one luminaire marked as IL-P595K4N. The applicant desired an evaluation for the Energy Investment Allowance according to the TM21, LM80 and NEN-EN-IEC 62722-2-1.

The measurement values were recalculated to a TM21 L₉₀B₅₀ test report (details given in Annex 1).

2 EXAMINATION

The examination was carried out in accordance to the relevant paragraphs of the NEN-EN-IEC 62722-2-1 standard.

The ISTMT follows the requirements of ANSI/UL 1598 with the following additions:

- One thermocouple is attached to the highest temperature LED package in the luminaire (designated TMP_{LED} or T_s). The highest temperature of the LED package in the luminaire is found in the LM80 report. One additional thermocouple is attached to the T_c point of the power supply/driver. This point is referred to as TMP_{PS} or T_c .

An AC voltage of 240 V with a frequency of 50 Hz was applied to the luminaire. After an stabilization time of 4 hours the temperatures TMP_{LED} and TMP_{PS} are measured. Also the output current of the driver is measured, this total (DC) output current is divided over the LEDs. The luminaire contains 84 LED's. The LED module consists of 14 parallel LED's and 6 in series. The LED chip current is therefore the output current of the driver divided by 14.

The electrical parameters of the IL-P595K4N are measured by means of a calibrated Yokogawa WT310.

The ambient temperature during the measurement was $25 \pm 1^\circ\text{C}$

Date of measurement: 27-10-2021.

3 RESULTS OF EXAMINATION

Luminaire information and measured LED current

Test date: 27-10-2021

Type Reference:	IL-P595K4N
Lamp controlgear used	Inter Light IL-X3D40
Total current (to LED module)	760 mA
Measured LED current	54,286 mA

ISTMT results

Test date: 27-10-2021

Temperature measurement position	25 °C ambient temperature
	Measured temperature [°C]
Soldering point LED $TMP_{LED} (T_s)$	27,5
PowerSupply $TMP_{PS} (T_c)$	49,6

Luminous Flux and Efficacy

	Value	
Total luminous flux	3944	lm
Total consumed power	30	Watt
Luminous Efficacy	131,5	lm/Watt
Stabilisation time	90	minutes

Electric parameters

	Value	
Applied voltage	230	v
Consumed Power	30	Watt
Power Factor	0,95	-



TM-21 Report

Table 1: Report at each LM-80 Test Condition					
Description of LED Light Source Tested (manufacturer, model, catalog number)		IL-P595K4N			
Test Condition 1 - 85°C Case Temp		Test Condition 2 - 85°C Case Temp		Test Condition 3 - 85°C Case Temp	
Sample size	25	Sample size	25	Sample size	25
Number of failures	0	Number of failures	0	Number of failures	0
DUT drive current used in the test (mA)	100	DUT drive current used in the test (mA)	100	DUT drive current used in the test (mA)	100
Test duration (hours)	9.000	Test duration (hours)	9.000	Test duration (hours)	9.000
Test duration used for projection (hour to hour)	4000,0 - 9000,0	Test duration used for projection (hour to hour)	4000,0 - 9000,0	Test duration used for projection (hour to hour)	4000,0 - 9000,0
Tested case temperature (°C)	85	Tested case temperature (°C)	85	Tested case temperature (°C)	85
α	1,569E-06	α	#DIV/0!	α	#DIV/0!
B	1,001	B	#DIV/0!	B	#DIV/0!
Reported L90(9k) (hours)	>54000	Reported L90(9k) (hours)	#DIV/0!	Reported L90(9k) (hours)	#DIV/0!

Table 2: Interpolation Report (projection based on <i>in-situ</i> temperature entered)	
$T_{s,1}$ (°C)	85,00
$T_{s,1}$ (K)	358,15
α_1	1,569E-06
B_1	1,001
$T_{s,2}$ (°C)	-
$T_{s,2}$ (K)	-
α_2	-
B_2	-
E_d/K_b	-
A	-
B_0	1,001
$T_{s,i}$ (°C)	27,50
$T_{s,i}$ (K)	300,65
α_i	1,569E-06
Reported L90(9k) at 27,5°C (hours)	>54000

Report Generated By: J. Röttjers	Notes:
Company: DEKRA Certification B.V.	
Date: 09-11-2021	



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". If the in-situ values falls between two cases temperatures, enter only those two case temperature data sets in Tested case temperature 1 and 2 in ascending temperature order.

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 (manufacturer, model, catalog number)	
IL-P595K4N	

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):	100
Tested case temperature 1 (T _c , °C):	85
Tested case temperature 2 (T _c , °C):	85
Tested case temperature 3 (T _c , °C):	85

LM-80 Test Inputs		Test Data for 85°C Case Temperature		Test Data for 85°C Case Temperature		Test Data for 85°C Case Temperature	
Time (hours)	Lumen Maintenance (%)	Time (hours)	Lumen Maintenance (%)	Time (hours)	Lumen Maintenance (%)	Time (hours)	Lumen Maintenance (%)
1000	99,86%						
2000	99,74%						
3000	99,57%						
4000	99,42%						
5000	99,28%						
6000	99,13%						
7000	98,97%						
8000	98,82%						
9000	98,64%						

In-Situ Inputs	
Drive current for each LED package/array/module (mA):	54,28
In-situ case temperature (T _c , °C):	27,5
Percentage of initial lumens to project to (e.g. for L ₇₀ , enter 70):	90

Results	
Time (t) at which to estimate lumen maintenance (hours):	50.000
Lumen maintenance at time (t) (%):	92,51%
Reported L90 (hours):	>54000

5 ANNEX 2: LM80 TEST REPORT




TEST REPORT

According to ANSI/IES LM-80-15
For

Shenzhen Runlite Technology Co.,Ltd

Building A15, Tantou the 4th Industrial Estate, SongGang Town, BaoAn District, ShenZhen, China

#Model: P28351-W27SJ2K0FE8F0-LX00

Report Type: 9000 Hours Test Report	Product Type: LED Package
Test Engineer: Pote Wang	<i>Pote Wang</i>
Report Number: RSZ180905531-10-M3	
Test Date: 2018-09-06 to 2019-09-16	
Report Date: 2020-11-12	
Reviewed By: Bill Xiong / EE Engineer	<i>Bill Xiong</i>
Revised Note:	The previous report RSZ180905531-10-M2 is replaced by this report on 2020-11-12
Test Facility:	Test facility was located at No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China.
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No 69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax: +86-0769-86858588
Accreditation:	The IAS Accreditation Number TL-460.


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1 - General Information
1.1 Description of LED Light Sources
Sample Size:

50 PCS test samples were in good condition and received on 2018-09-05. The samples were numbered from 1 to 25 and 26 to 50.

#Manufacturer:	Shenzhen Runlite Technology Co.,Ltd
#Part Number:	P28351-W27SJ2K0FE8F0-LX00
#Part Type:	LED Package
#Drive Level:	DC 100mA
#Nominal CCT:	2700K
#Power:	1W
#Average Current Density per LED die:	553.57mA/mm ²
#Average Power Density per LED die:	1.66W/ mm ²
#CRI:	80
#Die Spacing:	0.15mm

Sampling Method:

LED samples for IESNA LM-80 testing consist of units built from a minimum of three manufacturing lots with each manufacturing lot built from different wafer lots built on non-consecutive days.

These manufacturing lots are picked to represent a wide parametric distribution.

#Family products covered by this report:

According to ENERGY STAR® Requirements for the Use of LM-80 Data, the following products can be covered by this report base on the information and declaration provided by manufacturer. The information of these models shows that the covered products meet all section 4 requirements of ENERGY STAR® Requirements for the Use of LM-80 Data (September 28, 2017)

This report covers the following models:

Model Name	CCT (typ.)	Series	Parallel	Power intensity PCB (W/mm ²)	Current density per LED die (mA/mm ²)	Current per die (mA)	Distance between of dies(mm)	Current (mA)
P28351-W27SJ2K0FE8F0-LX00	2700	3	1	0.102	553.57	100	0.15	100
2835-W*****-****-AA	≥2200	3	1	0.102	553.57	100	0.15	100
2835-W*****-****-AB	≥2200	1	3	0.102	533.57	100	0.15	300
2835-W*****-****-AC	≥2200	1	2	0.018	166.07	30	0.15	60
2835-W*****-****-AD	≥2200	2	1	0.018	166.07	30	0.15	30
2835-W*****-****-AE	≥2200	3	1	0.102	344.45	100	0.15	100
2835-W*****-****-AF	≥2200	3	1	0.102	268.17	100	0.15	100
2835-W*****-****-AG	≥2200	3	1	0.102	416.67	100	0.15	100

Note:

Table** means internal code number, it can be Numbers or letters.

AA~AG is not the part of our products code rules, we only use it to distinguish different size and different series-parallel modes of chips.



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1.2 Standards and Reference Documentations

- ANSI/IES LM-80-15: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- CIE 127:2007: Measurement of LEDs
- ENERGY STAR® Requirements for the Use of LM-80 Data (This standard was not accredited by IAS)

1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
0.3m integrating sphere	EVERFINE	Diameter 0.3m	1011119	2019-03-08	2020-03-07
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	2019-03-08	2020-03-07
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	2019-03-08	2020-03-07
Standard Light Source	EVERFINE	D062	G100278CJ7351206	2018-12-24	2019-12-24
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	2019-03-08	2020-03-07
Multilayer aging machine	BACL	B2-270	20023	2019-03-10	2020-03-09
DC Power Supply	BACL	B12001-12	90023	2019-01-07	2020-01-07

1.4 Drive Level

Samples are driven with a constant direct current (DC) during maintenance test, photometric and electrical measurement. The current value was regulated to within $\pm 3\%$ of the specified value of the manufacturer during maintenance test, and was within $\pm 0.5\%$ during photometric and electrical measurement test.

1.5 Ambient Conditions for Maintenance Test

For lumen maintenance test, samples within one data set, were installed on cooling boards in thermal chambers with minimal ambient airflow. The case temperature and ambient temperature was monitored by thermocouples which one was soldered to the coldest DUTs' case (TMP_{LED}) location, while the other is mounted at a distance of 5 mm above the TMP location.

During life testing, TMP_{LED} of the coldest LEDs were maintained at a temperature that was greater than or equal to 2°C below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to 5°C below the corresponding nominal case temperature. Thermocouples were shielded from direct DUT optical radiation and comply with ASTM E230 Table 1 "Special Limits".

Samples were connected to DC power supply in series circuits with a constant current. The forward current was regulated to within $\pm 3\%$ of the specified value of the manufacturer.

The relative humidity within chamber was kept less than 65% during test.

For photometry measurement, the ambient temperature during test was set to 25°C \pm 2°C, RH <65%.

1.6 Photometric Measurement Method and Uncertainty

Integrating sphere and spectroradiometer is used to measure luminous flux and chromaticity coordinate u'v'. 2 π measurement was used and sample was driven by DC power supply. The forward current was regulated to within $\pm 0.5\%$ of the nominal value. The test system was calibrated by halogen reference lamp. The ambient temperature during test was set to 25°C \pm 2°C, RH <65%. The temperature measurement point was located in the sphere and the temperature was detected by a temperature probe.

The uncertainty of the light output (luminous flux) measurements is U=2.5% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=20K (K=2), at the 95% confidence level. The uncertainty of the CRI is U=2.5 (K=2), at the 95% confidence level.

The uncertainty of the temperature is U=0.8671°C (K=2), at the 95% confidence level.

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1.7 Statement of Traceability

Bay Area Compliance Laboratories Corp. (Dongguan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

1.8 Sample Set**Data Set 1: 85°C, 100mA**

Part Number: P28351-W27SJ2K0FE8F0-LX00
Number of Units: 25
Case Temperature: >83°C
Ambient Temperature: >80°C
Life Test Drive Current: 100mA
Measurement Current: 100mA

Data Set 2: 105°C, 100mA

Part Number: P28351-W27SJ2K0FE8F0-LX00
Number of Units: 25
Case Temperature: >103°C
Ambient Temperature: >100°C
Life Test Drive Current: 100mA
Measurement Current: 100mA


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2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	α	β	Reported TM-21 L ₇₀ Lifetime	Reported TM-21 L ₉₀ Lifetime
1	25	0	1000hrs	9000hrs	1.569E-06	1.001	>54000 hours	>54000 hours
2	25	0	1000hrs	9000hrs	2.216E-06	1.001	>54000 hours	48000 hours

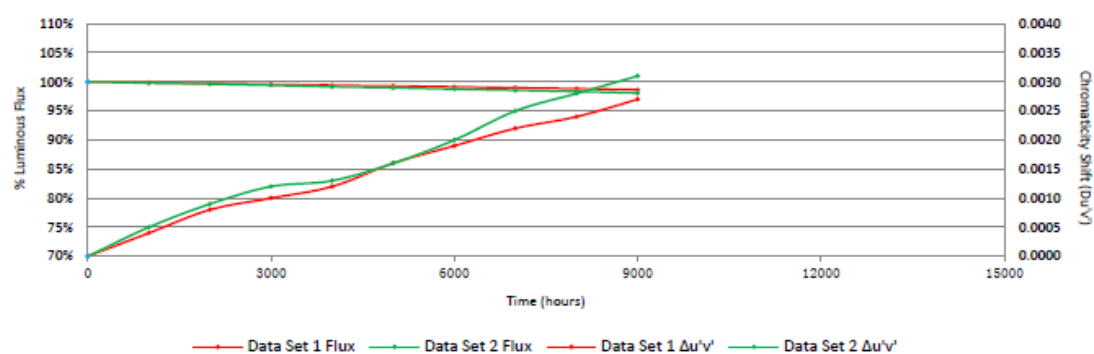
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	99.86%	99.74%	99.57%	99.42%	99.28%	99.13%	98.97%	98.82%	98.64%
2	99.80%	99.63%	99.41%	99.17%	98.99%	98.76%	98.56%	98.34%	98.07%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.0004	0.0008	0.0010	0.0012	0.0016	0.0019	0.0022	0.0024	0.0027
2	0.0005	0.0009	0.0012	0.0013	0.0016	0.0020	0.0025	0.0028	0.0031

Average Lumen Maintenance and Chromaticity Shift VS. Time




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3 - Test Data
3.1 Data Set 1, 85°C, 100mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
		Dhr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
1	138.7	99.93	99.93	99.78	99.50	99.35	99.35	99.28	99.13	98.99
2	137.7	99.85	99.78	99.42	99.27	99.06	98.98	98.77	98.69	98.77
3	138.5	100.00	99.93	99.71	99.56	99.49	99.12	98.97	98.68	98.39
4	135.8	99.85	99.78	99.56	99.56	99.56	99.12	98.82	98.82	98.82
5	137.8	99.78	99.71	99.64	99.49	99.42	99.27	98.91	98.62	98.47
6	138.8	99.86	99.71	99.28	98.99	98.85	98.63	98.63	98.70	98.56
7	138.7	99.93	99.57	99.35	99.28	99.13	98.77	98.63	98.70	98.27
8	138.5	99.78	99.42	99.42	99.49	99.28	99.13	98.92	98.84	98.70
9	137.3	100.00	99.78	99.71	99.64	99.42	99.42	99.20	99.05	98.83
10	138.2	99.86	99.64	99.49	99.42	99.20	98.99	98.91	98.84	98.48
11	137.5	99.85	99.64	99.49	99.42	99.13	98.98	98.91	98.76	98.62
12	137.9	99.93	99.78	99.49	99.13	99.20	99.06	98.77	98.69	98.26
13	136.3	99.93	99.93	99.71	99.56	99.27	99.19	99.05	98.90	98.75
14	134.7	99.93	99.85	99.78	99.48	99.41	99.33	99.03	98.74	98.44
15	137.2	99.85	99.85	99.85	99.93	99.64	99.49	99.56	99.34	99.20
16	135.4	99.85	99.78	99.63	99.56	99.41	99.34	99.19	98.82	98.82
17	138.8	99.78	99.71	99.64	99.57	99.42	99.35	99.21	98.92	98.85
18	138.0	99.78	99.63	99.41	99.26	98.90	98.68	98.53	98.46	98.38
19	135.2	99.93	99.70	99.56	99.33	99.41	99.19	98.89	98.52	98.15
20	134.9	99.78	99.70	99.48	99.26	99.18	99.11	99.11	98.96	98.81
21	137.2	99.85	99.85	99.64	99.34	99.05	99.05	98.69	98.54	98.54
22	137.0	99.93	99.78	99.71	99.49	99.56	99.34	99.20	98.91	98.83
23	136.9	99.78	99.78	99.71	99.42	99.34	99.27	99.27	99.12	98.83
24	137.2	99.85	99.71	99.34	99.27	99.27	98.98	98.76	98.76	98.47
25	137.3	99.71	99.49	99.49	99.27	99.13	99.05	99.13	98.91	98.83
Avg.	137.1	99.86	99.74	99.57	99.42	99.28	99.13	98.97	98.82	98.64
Med.	137.2	99.85	99.78	99.56	99.42	99.28	99.12	98.92	98.82	98.70
st dev	1.2	0.07	0.13	0.15	0.19	0.20	0.22	0.25	0.20	0.25
Min.	134.7	99.71	99.42	99.28	98.99	98.85	98.63	98.53	98.46	98.15
Max.	138.7	100.00	99.93	99.85	99.93	99.64	99.49	99.56	99.34	99.20


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3.2 Data Set 1, 85°C, 100mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	9.095	9.034	9.030	9.047	9.035	9.039	9.038	9.037	9.039	9.041
2	9.031	8.946	8.949	8.961	8.952	8.954	8.953	8.955	8.957	8.956
3	9.121	8.996	8.998	9.011	9.001	9.006	9.004	9.004	9.008	9.010
4	9.077	9.005	9.011	9.012	9.004	9.006	9.008	9.013	9.014	9.013
5	9.024	8.944	8.946	8.957	8.953	8.955	8.953	8.955	8.956	8.955
6	9.074	9.003	9.002	9.014	9.010	9.010	9.010	9.009	9.011	9.010
7	9.070	8.999	8.999	9.009	9.000	9.006	9.005	9.005	9.006	9.008
8	9.045	8.969	8.969	8.980	8.973	8.975	8.976	8.976	8.976	8.977
9	9.047	8.980	8.981	8.992	8.984	8.988	8.988	8.989	8.990	8.989
10	9.099	9.009	9.014	9.025	9.016	9.021	9.020	9.020	9.022	9.020
11	9.069	8.993	8.994	9.005	9.000	9.002	9.000	9.002	9.002	9.006
12	9.071	8.991	8.993	9.003	8.998	9.002	9.002	9.002	9.003	9.003
13	9.055	8.984	8.985	8.996	8.990	8.994	8.994	8.994	8.996	8.997
14	9.068	8.993	8.994	9.009	9.000	9.006	9.004	9.003	9.006	9.006
15	9.080	9.013	9.015	9.026	9.021	9.024	9.023	9.023	9.026	9.025
16	9.043	8.961	8.959	8.974	8.967	8.973	8.974	8.972	8.974	8.975
17	9.069	9.004	9.001	9.015	9.008	9.011	9.012	9.009	9.014	9.013
18	9.060	8.989	8.989	9.001	8.996	9.000	8.999	8.999	9.002	9.001
19	9.040	8.946	8.949	8.958	8.951	8.957	8.956	8.955	8.958	8.957
20	9.087	9.000	9.003	9.013	9.006	9.010	9.011	9.010	9.014	9.013
21	9.127	9.012	9.016	9.028	9.021	9.025	9.027	9.025	9.026	9.027
22	9.068	8.987	8.986	9.002	8.994	8.998	8.999	8.999	8.999	8.999
23	9.103	8.992	8.998	9.007	9.002	9.006	9.005	9.003	9.007	9.007
24	9.047	8.969	8.966	8.973	8.971	8.973	8.975	8.972	8.975	8.975
25	9.069	8.985	8.984	8.998	8.991	8.996	8.996	8.995	8.999	8.997
Avg.	9.070	8.988	8.989	9.001	8.994	8.997	8.997	8.997	8.999	8.999
Med.	9.069	8.992	8.994	9.005	9.000	9.002	9.002	9.002	9.003	9.006
st dev	0.026	0.022	0.022	0.023	0.022	0.022	0.022	0.022	0.022	0.022
Min.	9.024	8.944	8.946	8.957	8.951	8.954	8.953	8.955	8.956	8.955
Max.	9.127	9.034	9.030	9.047	9.035	9.039	9.038	9.037	9.039	9.041



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3.3 Data Set 1, 85°C, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2804	0.5264	2747	0.0001	0.0004	0.0007	0.0011	0.0013	0.0015	0.0018	0.0024	0.0033
2	0.2803	0.5265	2750	0.0004	0.0004	0.0008	0.0009	0.0012	0.0013	0.0016	0.0021	0.0027
3	0.2593	0.5282	2764	0.0004	0.0004	0.0007	0.0012	0.0013	0.0014	0.0015	0.0020	0.0023
4	0.2575	0.5265	2812	0.0004	0.0006	0.0008	0.0010	0.0013	0.0015	0.0018	0.0019	0.0022
5	0.2581	0.5262	2799	0.0004	0.0004	0.0007	0.0009	0.0012	0.0014	0.0017	0.0019	0.0021
6	0.2590	0.5262	2779	0.0005	0.0006	0.0009	0.0009	0.0014	0.0016	0.0018	0.0021	0.0023
7	0.2599	0.5269	2756	0.0005	0.0007	0.0010	0.0013	0.0015	0.0018	0.0021	0.0023	0.0025
8	0.2588	0.5266	2781	0.0005	0.0006	0.0009	0.0011	0.0014	0.0018	0.0021	0.0021	0.0023
9	0.2805	0.5252	2750	0.0003	0.0008	0.0009	0.0012	0.0016	0.0020	0.0021	0.0024	0.0024
10	0.2810	0.5275	2730	0.0005	0.0009	0.0010	0.0013	0.0017	0.0020	0.0021	0.0025	0.0027
11	0.2803	0.5246	2758	0.0004	0.0009	0.0009	0.0011	0.0015	0.0018	0.0020	0.0022	0.0023
12	0.2595	0.5257	2771	0.0004	0.0009	0.0010	0.0012	0.0016	0.0018	0.0021	0.0023	0.0028
13	0.2814	0.5274	2724	0.0004	0.0009	0.0011	0.0013	0.0018	0.0020	0.0022	0.0025	0.0027
14	0.2590	0.5267	2776	0.0004	0.0009	0.0010	0.0012	0.0016	0.0022	0.0024	0.0025	0.0028
15	0.2820	0.5275	2710	0.0005	0.0009	0.0010	0.0014	0.0018	0.0019	0.0023	0.0025	0.0028
16	0.2593	0.5283	2772	0.0005	0.0009	0.0011	0.0013	0.0018	0.0018	0.0023	0.0025	0.0028
17	0.2598	0.5258	2765	0.0005	0.0010	0.0010	0.0013	0.0018	0.0019	0.0024	0.0028	0.0030
18	0.2803	0.5280	2744	0.0006	0.0010	0.0011	0.0013	0.0018	0.0022	0.0023	0.0028	0.0030
19	0.2595	0.5258	2771	0.0004	0.0009	0.0011	0.0012	0.0018	0.0023	0.0023	0.0025	0.0028
20	0.2589	0.5275	2819	0.0006	0.0009	0.0012	0.0013	0.0018	0.0023	0.0024	0.0026	0.0028
21	0.2591	0.5272	2772	0.0004	0.0008	0.0010	0.0011	0.0018	0.0023	0.0025	0.0028	0.0029
22	0.2586	0.5281	2788	0.0004	0.0008	0.0010	0.0013	0.0018	0.0022	0.0025	0.0028	0.0028
23	0.2592	0.5272	2769	0.0005	0.0009	0.0009	0.0012	0.0018	0.0023	0.0023	0.0027	0.0030
24	0.2595	0.5272	2764	0.0004	0.0009	0.0010	0.0011	0.0017	0.0023	0.0025	0.0026	0.0029
25	0.2811	0.5273	2729	0.0004	0.0009	0.0011	0.0012	0.0017	0.0022	0.0024	0.0026	0.0028
Avg.	0.2596	0.5267	2764	0.0004	0.0008	0.0010	0.0012	0.0016	0.0019	0.0022	0.0024	0.0027
Med.	0.2595	0.5266	2765	0.0004	0.0009	0.0010	0.0012	0.0017	0.0019	0.0022	0.0025	0.0028
st dev	0.0012	0.0009	26	0.0001	0.0002	0.0001	0.0001	0.0002	0.0003	0.0003	0.0003	0.0003
Min.	0.2589	0.5246	2710	0.0001	0.0004	0.0007	0.0009	0.0012	0.0013	0.0015	0.0019	0.0021
Max.	0.2820	0.5282	2819	0.0006	0.0010	0.0012	0.0014	0.0018	0.0023	0.0025	0.0028	0.0033



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3.4 Data Set 2, 105°C, 100mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	136.6	99.85	99.78	99.71	99.63	99.56	99.34	99.34	99.05	98.76
27	139.5	100.00	99.64	99.28	99.07	98.92	98.64	98.42	98.42	98.35
28	139.3	99.93	99.78	99.57	99.35	98.99	98.85	98.49	98.35	97.92
29	137.1	99.93	99.71	99.49	99.42	99.12	99.05	98.91	98.61	98.18
30	136.1	99.85	99.85	99.85	99.71	99.63	99.27	98.90	98.60	98.24
31	138.2	99.71	99.49	99.20	98.84	98.55	98.41	98.12	98.12	97.90
32	137.1	99.85	99.56	99.12	99.12	98.98	98.91	98.83	98.69	98.25
33	136.3	99.85	99.85	99.78	99.63	99.41	99.34	99.34	99.27	98.97
34	137.2	99.64	99.56	99.20	99.20	99.20	98.83	98.83	98.83	98.62
35	137.7	99.64	99.49	99.49	99.08	98.91	98.91	98.62	98.69	98.28
36	136.3	99.71	99.41	99.12	98.68	98.53	98.17	98.09	97.87	97.73
37	137.5	99.78	99.71	99.49	99.42	99.20	98.91	98.76	98.69	98.47
38	138.7	99.64	99.42	99.06	99.06	98.70	98.34	98.13	97.98	97.62
39	136.7	99.56	99.41	99.27	98.90	98.83	98.46	98.10	97.66	97.66
40	137.9	99.85	99.56	99.20	99.13	98.69	98.33	98.04	97.61	97.32
41	137.7	99.64	99.42	98.98	98.77	98.62	98.26	97.82	97.46	97.24
42	137.9	99.93	99.71	99.49	98.98	98.84	98.69	98.55	98.33	97.90
43	137.8	99.85	99.78	99.78	99.42	99.27	99.06	98.62	98.26	98.04
44	131.6	99.77	99.62	99.39	99.01	99.01	98.94	98.63	98.33	98.25
45	138.4	99.78	99.64	99.49	99.13	98.92	98.92	98.92	98.48	98.12
46	138.0	99.86	99.64	99.28	98.99	98.77	98.70	98.48	98.33	97.83
47	137.0	99.78	99.64	99.56	98.98	99.12	98.83	98.69	98.32	98.18
48	136.9	99.71	99.63	99.34	99.05	98.98	98.61	98.32	98.17	98.03
49	137.8	99.85	99.71	99.56	99.27	98.77	98.48	98.19	97.97	97.97
50	135.1	99.93	99.70	99.63	99.33	99.26	98.89	98.74	98.30	97.85
Avg.	137.2	99.80	99.63	99.41	99.17	98.99	98.76	98.56	98.34	98.07
Med.	137.5	99.85	99.64	99.49	99.12	98.98	98.83	98.62	98.33	98.04
st dev	1.5	0.12	0.13	0.24	0.27	0.29	0.33	0.39	0.43	0.40
Min.	131.6	99.56	99.41	98.98	98.68	98.53	98.17	97.82	97.46	97.24
Max.	139.5	100.00	99.85	99.85	99.71	99.63	99.34	99.34	99.27	98.97



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3.5 Data Set 2, 105°C, 100mA (Forward Voltage)

No.	Forward Voltage (V)									
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	9.107	8.994	8.988	8.988	8.994	9.000	9.003	8.995	8.997	8.998
27	9.125	9.032	9.027	9.040	9.036	9.043	9.045	9.037	9.038	9.039
28	9.103	9.023	9.017	9.029	9.025	9.029	9.034	9.028	9.028	9.027
29	9.112	9.035	9.031	9.046	9.037	9.045	9.045	9.039	9.045	9.042
30	9.040	8.976	8.973	8.983	8.978	8.981	8.984	8.979	8.982	8.983
31	9.051	8.967	8.968	8.979	8.974	8.980	8.981	8.975	8.978	8.979
32	9.052	8.976	8.977	8.985	8.980	8.986	8.988	8.982	8.988	8.984
33	9.024	8.953	8.951	8.982	8.957	8.963	8.964	8.959	8.963	8.963
34	9.075	9.004	9.002	9.010	9.005	9.012	9.012	9.009	9.012	9.011
35	9.107	9.018	9.016	9.026	9.021	9.027	9.027	9.023	9.026	9.025
36	9.052	8.976	8.971	8.982	8.975	8.981	8.980	8.977	8.982	8.979
37	9.080	8.987	8.985	8.997	8.992	8.998	8.998	8.996	8.999	8.997
38	9.062	8.983	8.984	8.992	8.986	8.991	8.992	8.990	8.992	8.990
39	9.070	8.975	8.971	8.983	8.976	8.982	8.982	8.979	8.982	8.980
40	9.091	8.991	8.992	9.000	8.996	8.999	9.000	8.997	9.001	8.999
41	9.089	8.990	8.987	8.995	8.992	8.997	8.996	8.993	8.997	8.995
42	9.060	8.976	8.973	8.982	8.975	8.982	8.980	8.979	8.984	8.980
43	9.108	9.025	9.024	9.032	9.027	9.033	9.030	9.028	9.031	9.032
44	9.077	8.991	8.990	8.999	8.996	8.998	8.999	8.998	9.001	8.999
45	9.072	8.983	8.983	8.975	8.970	8.972	8.972	8.970	8.974	8.972
46	9.081	9.008	9.005	9.015	9.009	9.014	9.013	9.013	9.015	9.014
47	9.122	9.031	9.028	9.042	9.036	9.040	9.038	9.038	9.041	9.039
48	9.085	8.997	8.996	9.006	8.999	9.004	9.003	9.004	9.007	9.002
49	9.104	9.016	9.016	9.025	9.020	9.022	9.023	9.021	9.026	9.021
50	9.079	8.992	8.987	8.999	8.995	8.998	8.998	8.998	9.001	8.998
Avg.	9.081	8.995	8.993	9.003	8.998	9.003	9.003	9.000	9.004	9.002
Med.	9.080	8.991	8.988	8.999	8.995	8.998	8.999	8.997	9.001	8.998
st dev	0.026	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023
Min.	9.024	8.953	8.951	8.982	8.957	8.963	8.964	8.959	8.963	8.963
Max.	9.125	9.035	9.031	9.046	9.037	9.045	9.045	9.039	9.045	9.042


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3.6 Data Set 2, 105°C, 100mA (Chromaticity Shift)

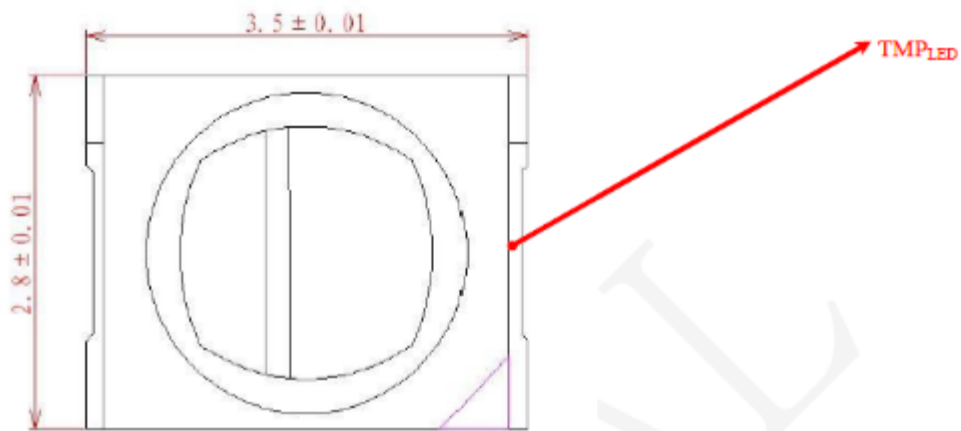
No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
26	0.2625	0.5274	2699	0.0004	0.0010	0.0013	0.0013	0.0018	0.0021	0.0025	0.0026	0.0028
27	0.2591	0.5269	2773	0.0004	0.0009	0.0011	0.0013	0.0019	0.0022	0.0025	0.0028	0.0030
28	0.2590	0.5283	2771	0.0004	0.0010	0.0013	0.0013	0.0018	0.0022	0.0026	0.0028	0.0030
29	0.2601	0.5257	2757	0.0004	0.0009	0.0011	0.0012	0.0018	0.0020	0.0026	0.0028	0.0031
30	0.2589	0.5256	2784	0.0005	0.0009	0.0011	0.0012	0.0013	0.0020	0.0025	0.0028	0.0030
31	0.2596	0.5266	2765	0.0005	0.0009	0.0011	0.0013	0.0018	0.0020	0.0025	0.0028	0.0030
32	0.2606	0.5278	2738	0.0004	0.0009	0.0012	0.0013	0.0015	0.0021	0.0025	0.0028	0.0030
33	0.2607	0.5274	2737	0.0005	0.0009	0.0012	0.0014	0.0015	0.0020	0.0025	0.0027	0.0028
34	0.2592	0.5271	2771	0.0005	0.0009	0.0012	0.0013	0.0014	0.0019	0.0025	0.0028	0.0031
35	0.2567	0.5255	2833	0.0005	0.0009	0.0011	0.0013	0.0015	0.0020	0.0025	0.0028	0.0031
36	0.2605	0.5259	2749	0.0006	0.0011	0.0013	0.0015	0.0017	0.0022	0.0027	0.0030	0.0033
37	0.2557	0.5261	2852	0.0005	0.0010	0.0012	0.0012	0.0018	0.0021	0.0027	0.0028	0.0032
38	0.2581	0.5260	2799	0.0004	0.0009	0.0013	0.0012	0.0018	0.0020	0.0025	0.0027	0.0031
39	0.2610	0.5276	2730	0.0005	0.0010	0.0011	0.0013	0.0015	0.0020	0.0025	0.0028	0.0030
40	0.2600	0.5272	2753	0.0006	0.0011	0.0012	0.0013	0.0018	0.0021	0.0025	0.0028	0.0032
41	0.2590	0.5273	2774	0.0006	0.0009	0.0012	0.0013	0.0017	0.0021	0.0026	0.0030	0.0032
42	0.2598	0.5257	2763	0.0005	0.0008	0.0012	0.0014	0.0014	0.0018	0.0024	0.0028	0.0030
43	0.2604	0.5262	2749	0.0004	0.0009	0.0011	0.0011	0.0018	0.0020	0.0024	0.0028	0.0031
44	0.2597	0.5268	2760	0.0004	0.0009	0.0013	0.0013	0.0014	0.0019	0.0023	0.0027	0.0031
45	0.2599	0.5279	2751	0.0004	0.0009	0.0011	0.0014	0.0018	0.0020	0.0026	0.0030	0.0033
46	0.2599	0.5266	2758	0.0004	0.0009	0.0012	0.0014	0.0018	0.0019	0.0021	0.0029	0.0032
47	0.2595	0.5257	2771	0.0005	0.0009	0.0011	0.0014	0.0018	0.0021	0.0021	0.0025	0.0031
48	0.2593	0.5252	2777	0.0004	0.0007	0.0009	0.0013	0.0014	0.0020	0.0022	0.0023	0.0030
49	0.2583	0.5258	2796	0.0004	0.0008	0.0011	0.0012	0.0018	0.0021	0.0023	0.0025	0.0030
50	0.2610	0.5272	2733	0.0005	0.0009	0.0012	0.0015	0.0017	0.0023	0.0025	0.0028	0.0033
Avg.	0.2595	0.5266	2766	0.0005	0.0009	0.0012	0.0013	0.0018	0.0020	0.0025	0.0028	0.0031
Med.	0.2597	0.5266	2763	0.0005	0.0009	0.0012	0.0013	0.0018	0.0020	0.0025	0.0028	0.0031
st dev	0.0014	0.0009	32	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001
Min.	0.2557	0.5252	2899	0.0004	0.0007	0.0009	0.0011	0.0013	0.0018	0.0021	0.0023	0.0028
Max.	0.2625	0.5283	2852	0.0006	0.0011	0.0013	0.0015	0.0019	0.0023	0.0027	0.0030	0.0033



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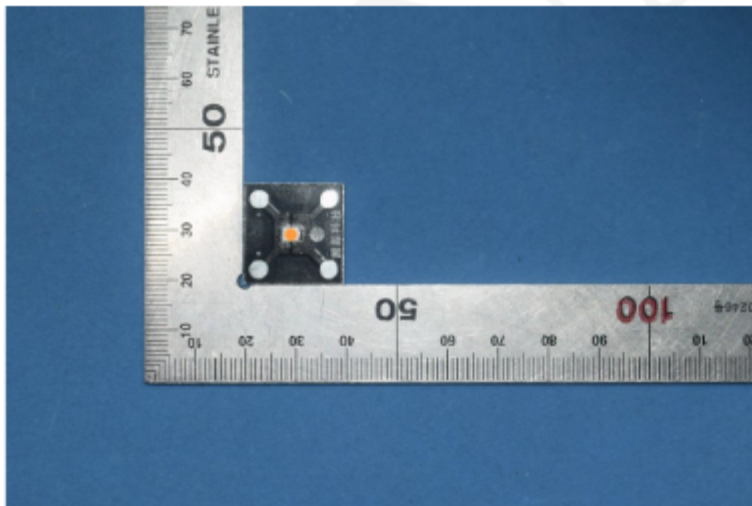
4 - DUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 DUT Photo



6 ANNEX 3 ADDITIONAL TYPE LIST

For testing, the highest wattage is used. The following types are the same luminaire design but with lower or equal wattages. In all of these types, the same LED's are used.

IL-P595K4N LED Easyfit Next paneel 30W (595x595x33mm) 4.000K UGR22 + driver
IL-P195K4N LED Easyfit Next paneel 30W (295x1195x32mm) 4.000K UGR22 + driver
IL-P595K4NU LED Easyfit Next+ paneel 30W (595x595x33mm) 4.000K UGR<19 + driver
IL-P195K4NU LED Easyfit Next+ paneel 30W (295x1195x32mm) 4.000K UGR<19 + driver

7 ANNEX 4 PICTURES

