



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai, China

Test Model: 9A19/840/277V

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	Hill Liu <i>Hill Liu</i>
Report Number:	R1KS160108003-10A1
Test Date:	2016-01-11
Report Date:	2016-10-20
Reviewed By:	Bill Xiong / EE Engineer <i>Bill Xiong</i>
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Accreditation:	The IAS Accreditation Number TL-460.

Note: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan). This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

1. Product Description

General Information:

Two samples were received on 2016-09-14. One was tested in integrating sphere and the other was tested in goniophotometer

Model Tested: 9A19/840/277V
 Manufacturer: GREEN CREATIVE LTD
 Brand Name: GREEN CREATIVE
 Product Designation: Integral LED Lamp
 Burning Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120-277V 60Hz
 Rated Power: 9 W
 Nominal CCT: 4000K
 Nominal Lumen Output: 860 lm

2. Standards Used

- IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits – Related Power Quality Requirements for Lighting
- IES TM-30-15: IES Method for Evaluating Light Source Color Rendition (This method is not in IAS accreditation scope)

3. Description of Test Equipment

Device	Manufacturer	Model No	Serial No	Test Range	Calibration date	Calibration due date
2.0m integrating sphere	EVERFINE	R98	11010018	R98	2015-11-09	2016-11-08
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2016-03-10	2017-03-09
Digital Power Meter	EVERFINE	PF2010A	1011004	600V/20A	2016-07-11	2017-07-10
Digital CC&CV DC Power Supply	EVERFINE	WY305-V1	1101047	30V/5A	2016-07-07	2017-07-06
Temperature/humidity/clock	Victor	VC230	EE023	0~40°C0~90%	2016-03-21	2017-03-20
Standard Light Source	SENSING	N/A	LSD090808	N/A	2016-09-24	2017-09-23
Special zero-voltage synchronous switching AC	EVERFINE	DPS1010-YF	1011001T	0-150V, 0-300V	2016-03-04	2017-03-03
AC Power Supply	EVERFINE	VPS1030 PWM	1012017	0-150V, 0-300V	2016-03-04	2017-03-03
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2016-03-04	2017-03-03
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2016-03-04	2017-03-03
Goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	1600mm,3000W/10A	2016-03-10	2017-03-09
Wireless Remote Sensor	N/A	433MHz	N/A	0°C~50°C;-20°C~60°C	2016-03-21	2017-03-20
Standard Light Source	EVERFINE	D908	1012003	N/A	2016-09-07	2017-09-06

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).

4. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with IES LM-79-08. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$ during measurement. And relative humidity is less than 65%.

Integrating Sphere System

The system includes AC power source, digital power meter, DC power supply, Spectroradiometer, and integrating sphere. The integrating sphere system is calibrated by standard spectrum light source before measurement.

4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the light output (luminous flux) measurements is $U=1.8\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=20\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=1.8(K=2)$, at the 95% confidence level.

The uncertainty of power meter AC current $U=0.19\%$ of rdg, AC Voltage $U=0.15\%$ of rdg, Power $U=0.20\%$ ($K=2$), at the 95% confidence level.

Goniophotometer System

The goniophotometer system is calibrated by standard light source before measurement.

Type C goniophotometer was used for measuring total luminous flux, luminous intensity distribution, and color spatial uniformity. The product was operated in its intended orientation in application and was recorded in this report. The vertical angle (γ) test intervals were set no more than 1 degree while data for 5 degree intervals is reported. The horizontal angle (C plane) test intervals were set no more than 22.5 degree.

The uncertainty of the luminous intensity is $U=1.6\%$ ($K=2$), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_i , R_g was calculated according to IES TM-30-15 by using calculation tools. The calculation was based on the measured SPD from 380nm to 780nm with 1nm intervals. All the colors in this report is for reference only.

5. Test Result

[Integrating Sphere System]

Total operating time for integrating sphere test: **1.0 hour**

Test orientation: **Base up**

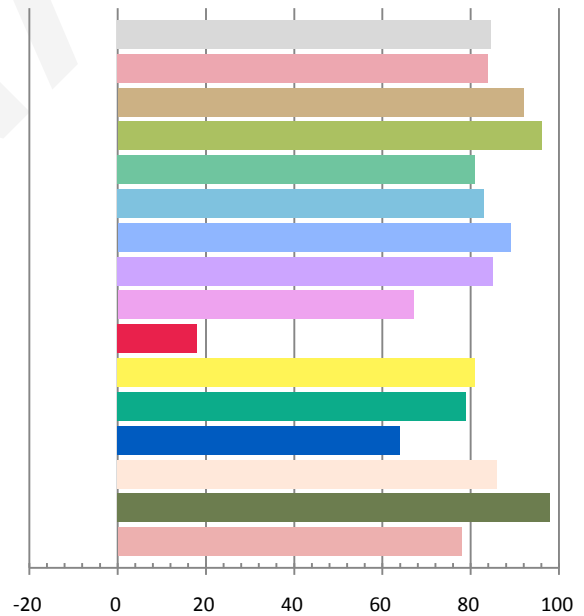
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.04	60	0.0764	8.95	0.9759	948.5	105.96

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
2.918	3929	0.0002	0.3838	0.3792	0.2263	0.5032

Color Rendering Index

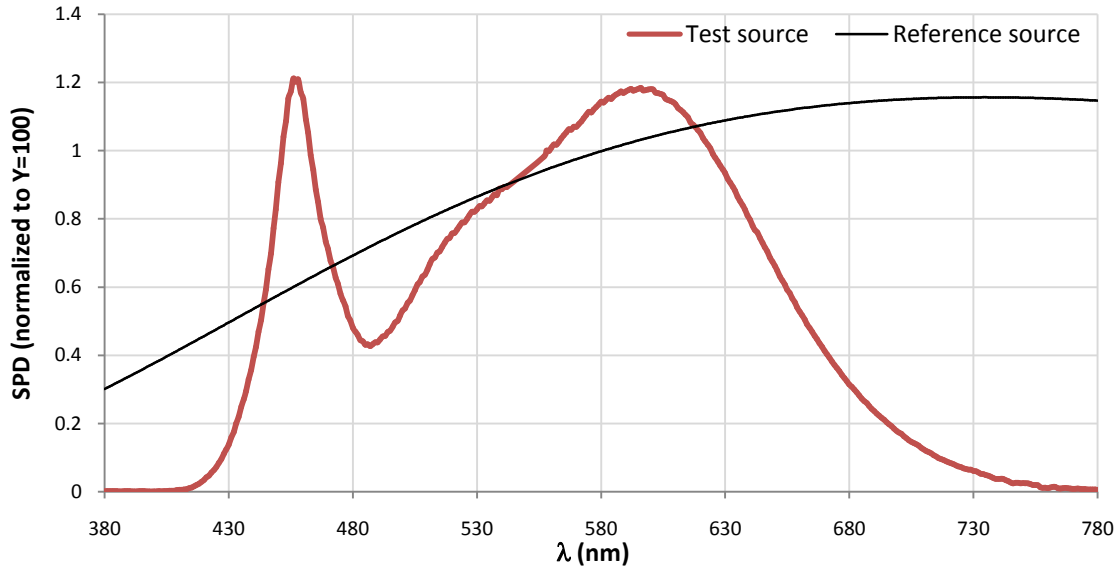
Ra			
84.6			
R1	R2	R3	R4
84	92	96	81
R5	R6	R7	R8
83	89	85	67
R9	R10	R11	R12
18	81	79	64
R13	R14	R15	
86	98	78	



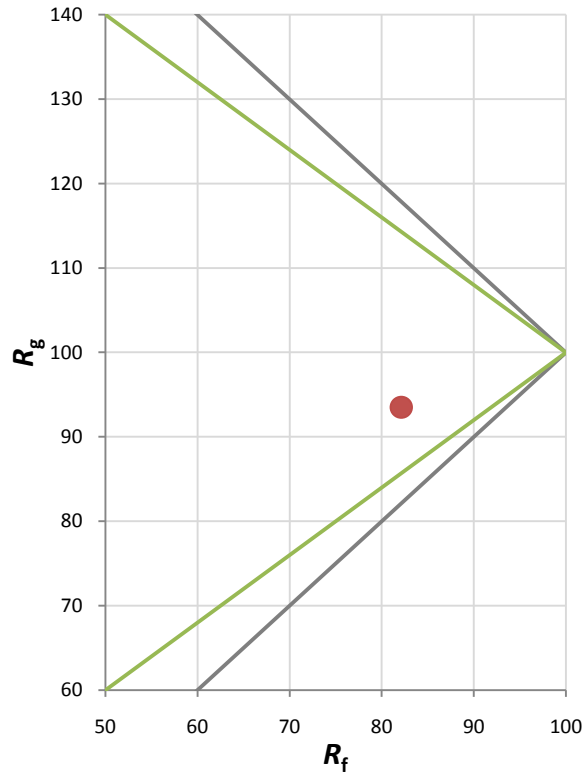
Fidelity Index and Gamut Index

Fidelity Index R_f	82
Gamut Index R_g	94

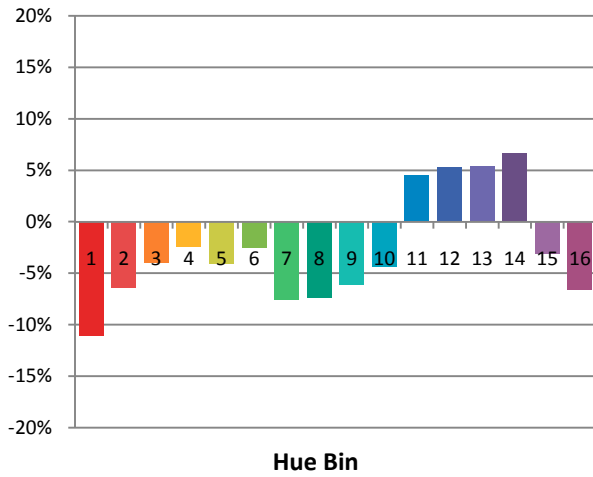
Spectral Power Distribution Comparison



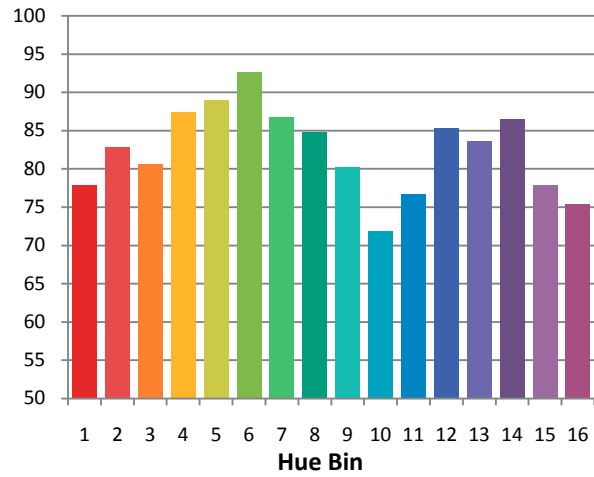
Plot of R_g versus R_f



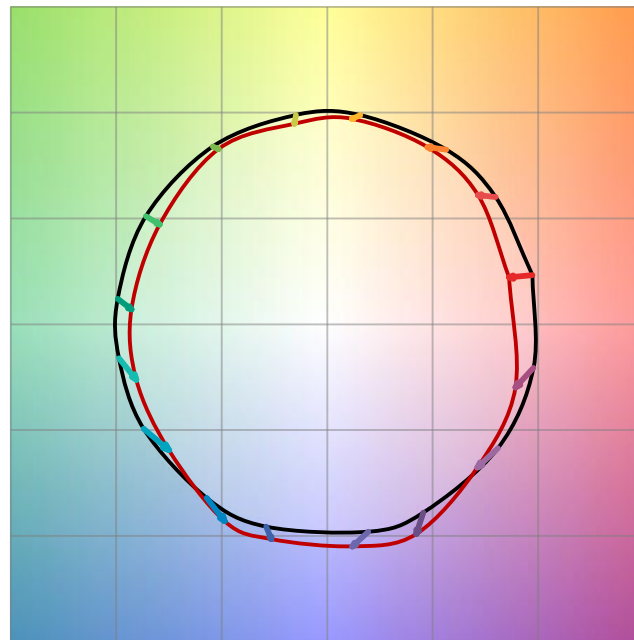
Chroma Shift by Hue



R_f by Hue

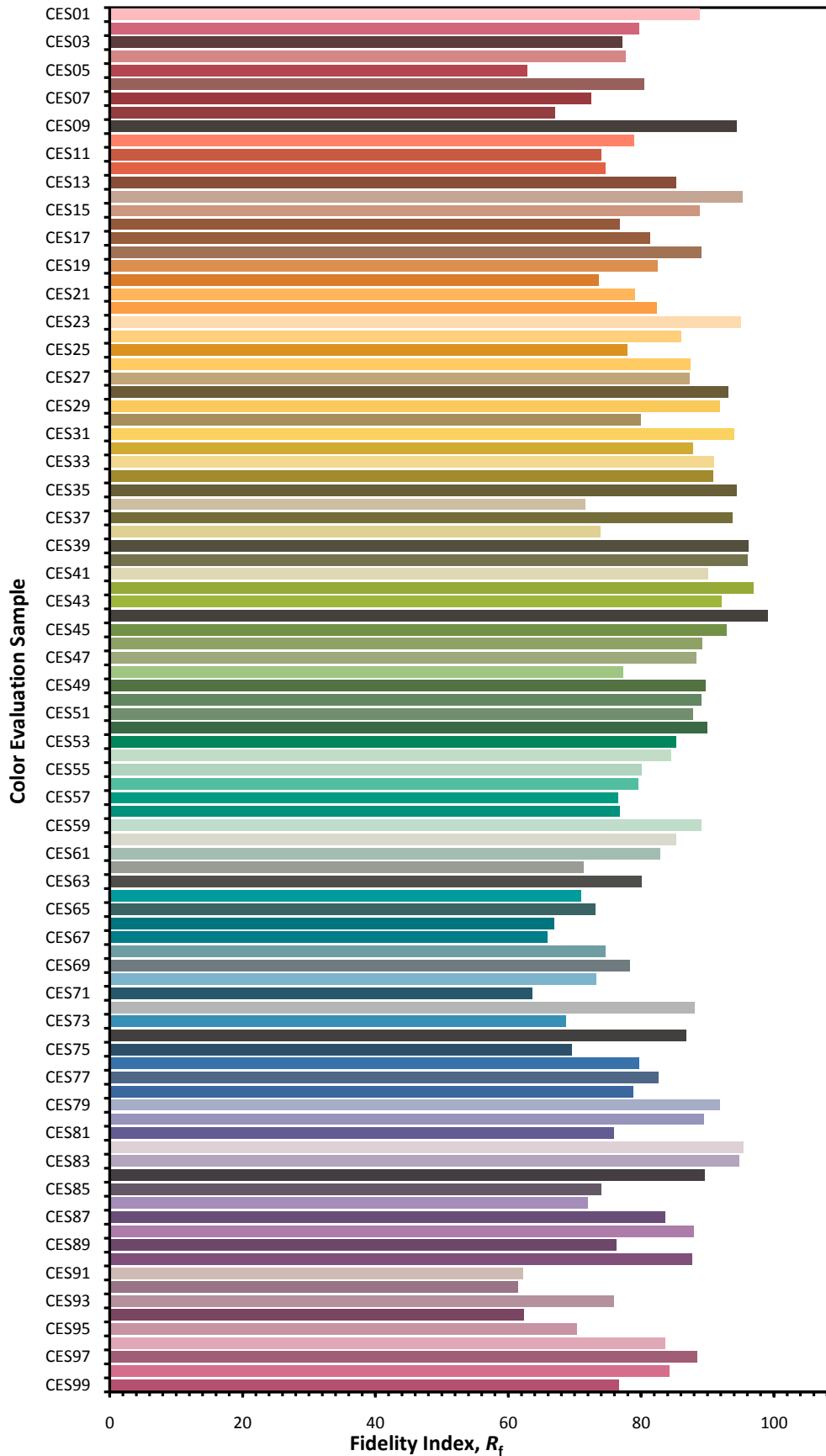


Color Vector Graphic

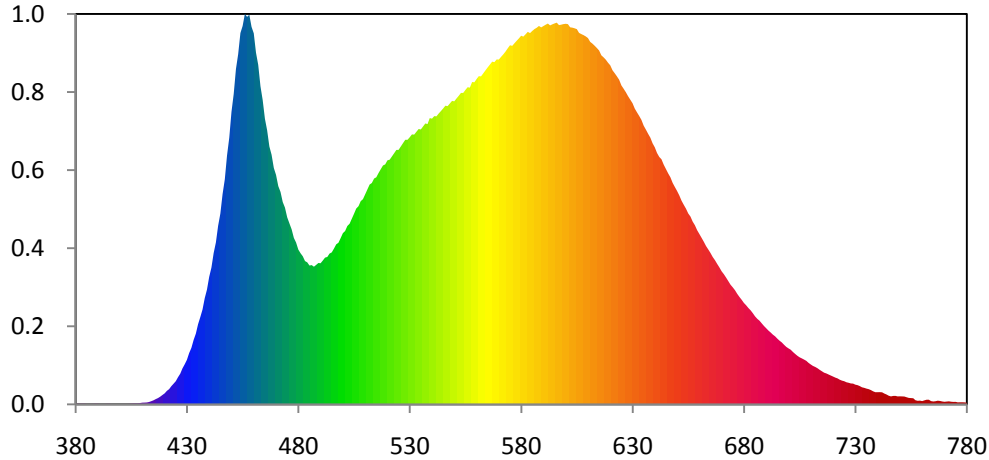


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



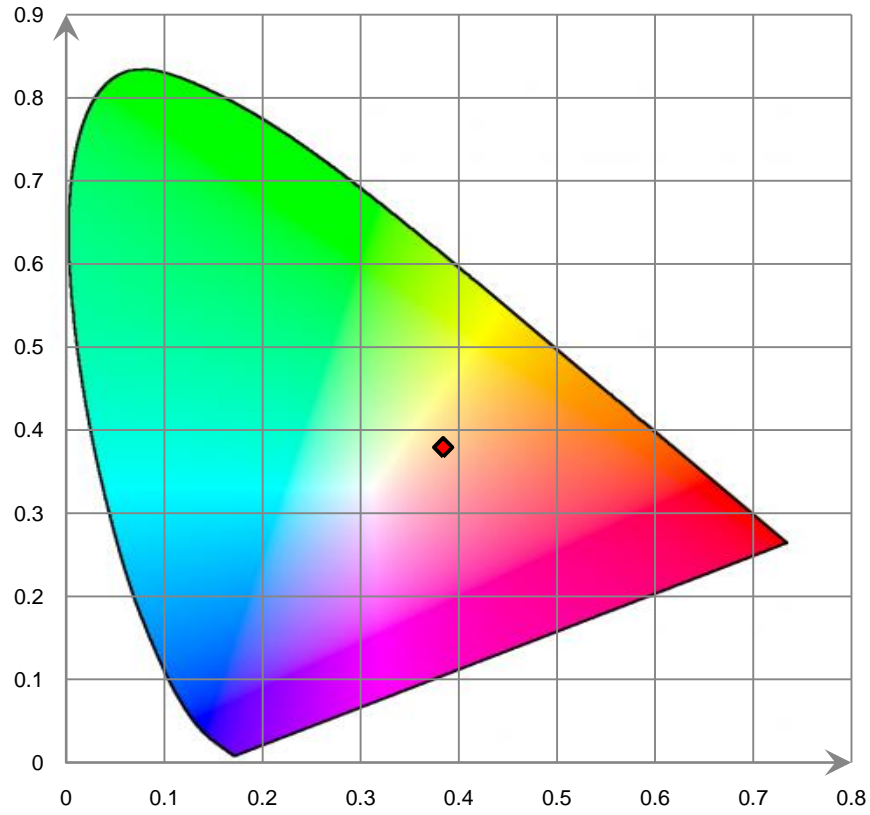
Relative Spectral Power Distribution



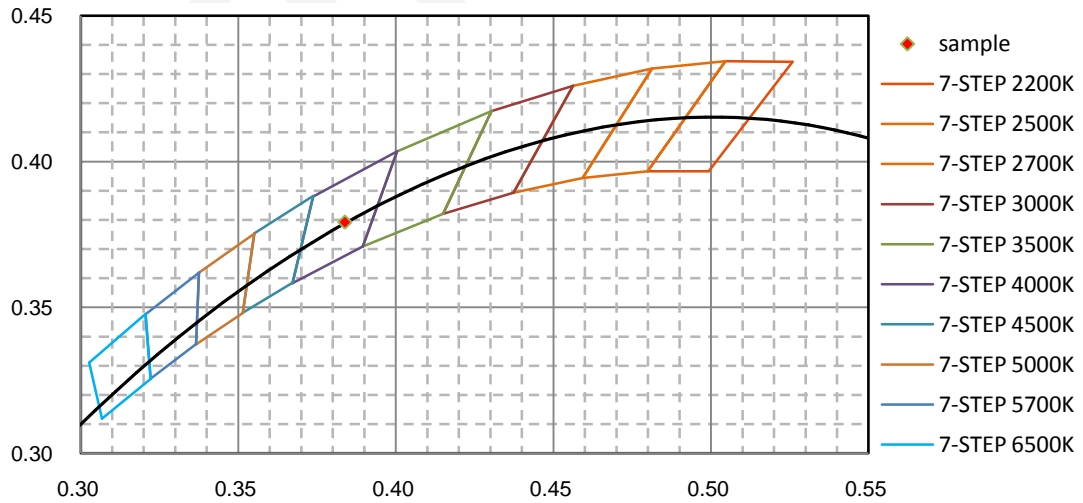
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	2.970E-02	421	5.812E-01	462	1.462E+01	503	7.781E+00	544	1.263E+01
381	2.740E-02	422	6.567E-01	463	1.370E+01	504	7.995E+00	545	1.274E+01
382	2.460E-02	423	7.846E-01	464	1.311E+01	505	8.213E+00	546	1.286E+01
383	2.640E-02	424	8.900E-01	465	1.230E+01	506	8.437E+00	547	1.285E+01
384	2.630E-02	425	9.992E-01	466	1.181E+01	507	8.535E+00	548	1.296E+01
385	1.870E-02	426	1.171E+00	467	1.111E+01	508	8.753E+00	549	1.307E+01
386	1.710E-02	427	1.322E+00	468	1.075E+01	509	8.839E+00	550	1.306E+01
387	1.840E-02	428	1.550E+00	469	1.018E+01	510	9.046E+00	551	1.318E+01
388	1.950E-02	429	1.725E+00	470	9.884E+00	511	9.260E+00	552	1.329E+01
389	2.710E-02	430	1.919E+00	471	9.401E+00	512	9.469E+00	553	1.342E+01
390	2.720E-02	431	2.210E+00	472	9.150E+00	513	9.536E+00	554	1.342E+01
391	1.310E-02	432	2.435E+00	473	8.718E+00	514	9.727E+00	555	1.355E+01
392	1.180E-02	433	2.774E+00	474	8.474E+00	515	9.782E+00	556	1.366E+01
393	1.740E-02	434	3.048E+00	475	8.060E+00	516	9.965E+00	557	1.364E+01
394	2.340E-02	435	3.452E+00	476	7.795E+00	517	1.013E+01	558	1.389E+01
395	2.490E-02	436	3.761E+00	477	7.539E+00	518	1.029E+01	559	1.387E+01
396	1.930E-02	437	4.086E+00	478	7.169E+00	519	1.034E+01	560	1.401E+01
397	1.440E-02	438	4.579E+00	479	6.969E+00	520	1.051E+01	561	1.414E+01
398	9.900E-03	439	4.945E+00	480	6.665E+00	521	1.054E+01	562	1.413E+01
399	6.000E-03	440	5.497E+00	481	6.510E+00	522	1.068E+01	563	1.426E+01
400	1.440E-02	441	5.891E+00	482	6.379E+00	523	1.082E+01	564	1.439E+01
401	1.820E-02	442	6.518E+00	483	6.173E+00	524	1.096E+01	565	1.452E+01
402	1.910E-02	443	6.979E+00	484	6.119E+00	525	1.096E+01	566	1.464E+01
403	1.810E-02	444	7.690E+00	485	5.980E+00	526	1.111E+01	567	1.476E+01
404	2.250E-02	445	8.221E+00	486	6.000E+00	527	1.125E+01	568	1.474E+01
405	2.920E-02	446	9.055E+00	487	5.931E+00	528	1.140E+01	569	1.486E+01
406	3.480E-02	447	9.694E+00	488	6.007E+00	529	1.140E+01	570	1.485E+01
407	3.830E-02	448	1.072E+01	489	6.090E+00	530	1.151E+01	571	1.497E+01
408	3.600E-02	449	1.149E+01	490	6.080E+00	531	1.163E+01	572	1.508E+01
409	5.820E-02	450	1.260E+01	491	6.198E+00	532	1.162E+01	573	1.520E+01
410	7.350E-02	451	1.337E+01	492	6.322E+00	533	1.174E+01	574	1.534E+01
411	7.790E-02	452	1.445E+01	493	6.348E+00	534	1.186E+01	575	1.547E+01
412	8.480E-02	453	1.509E+01	494	6.496E+00	535	1.184E+01	576	1.544E+01
413	1.030E-01	454	1.600E+01	495	6.548E+00	536	1.197E+01	577	1.555E+01
414	1.378E-01	455	1.630E+01	496	6.713E+00	537	1.210E+01	578	1.566E+01
415	1.748E-01	456	1.682E+01	497	6.892E+00	538	1.207E+01	579	1.576E+01
416	2.268E-01	457	1.669E+01	498	6.962E+00	539	1.233E+01	580	1.588E+01
417	2.700E-01	458	1.678E+01	499	7.161E+00	540	1.231E+01	581	1.584E+01
418	3.308E-01	459	1.626E+01	500	7.375E+00	541	1.241E+01	582	1.594E+01
419	4.038E-01	460	1.598E+01	501	7.466E+00	542	1.241E+01	583	1.604E+01
420	4.750E-01	461	1.515E+01	502	7.685E+00	543	1.253E+01	584	1.599E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.609E+01	626	1.360E+01	667	6.209E+00	708	1.875E+00	749	3.439E-01
586	1.617E+01	627	1.344E+01	668	6.050E+00	709	1.789E+00	750	3.458E-01
587	1.622E+01	628	1.328E+01	669	5.896E+00	710	1.718E+00	751	3.433E-01
588	1.630E+01	629	1.312E+01	670	5.732E+00	711	1.656E+00	752	3.387E-01
589	1.624E+01	630	1.297E+01	671	5.605E+00	712	1.613E+00	753	3.086E-01
590	1.630E+01	631	1.274E+01	672	5.462E+00	713	1.558E+00	754	2.788E-01
591	1.635E+01	632	1.258E+01	673	5.306E+00	714	1.489E+00	755	2.712E-01
592	1.640E+01	633	1.242E+01	674	5.154E+00	715	1.426E+00	756	2.642E-01
593	1.632E+01	634	1.225E+01	675	5.041E+00	716	1.366E+00	757	1.776E-01
594	1.637E+01	635	1.201E+01	676	4.916E+00	717	1.331E+00	758	1.538E-01
595	1.641E+01	636	1.183E+01	677	4.760E+00	718	1.286E+00	759	1.618E-01
596	1.644E+01	637	1.166E+01	678	4.625E+00	719	1.242E+00	760	1.411E-01
597	1.634E+01	638	1.149E+01	679	4.503E+00	720	1.198E+00	761	1.732E-01
598	1.636E+01	639	1.125E+01	680	4.368E+00	721	1.154E+00	762	2.000E-01
599	1.638E+01	640	1.107E+01	681	4.268E+00	722	1.121E+00	763	1.997E-01
600	1.639E+01	641	1.083E+01	682	4.151E+00	723	1.063E+00	764	1.413E-01
601	1.638E+01	642	1.066E+01	683	4.051E+00	724	1.023E+00	765	1.245E-01
602	1.624E+01	643	1.056E+01	684	3.928E+00	725	9.971E-01	766	1.367E-01
603	1.623E+01	644	1.033E+01	685	3.791E+00	726	9.538E-01	767	1.582E-01
604	1.620E+01	645	1.014E+01	686	3.686E+00	727	9.306E-01	768	1.473E-01
605	1.616E+01	646	9.948E+00	687	3.603E+00	728	9.006E-01	769	1.251E-01
606	1.600E+01	647	9.781E+00	688	3.490E+00	729	8.954E-01	770	1.115E-01
607	1.595E+01	648	9.542E+00	689	3.376E+00	730	8.492E-01	771	1.211E-01
608	1.591E+01	649	9.363E+00	690	3.280E+00	731	8.280E-01	772	1.305E-01
609	1.585E+01	650	9.191E+00	691	3.179E+00	732	7.866E-01	773	1.148E-01
610	1.578E+01	651	8.999E+00	692	3.096E+00	733	7.343E-01	774	1.056E-01
611	1.562E+01	652	8.772E+00	693	3.003E+00	734	7.120E-01	775	1.094E-01
612	1.554E+01	653	8.596E+00	694	2.932E+00	735	6.802E-01	776	8.740E-02
613	1.545E+01	654	8.429E+00	695	2.831E+00	736	6.554E-01	777	9.140E-02
614	1.535E+01	655	8.224E+00	696	2.744E+00	737	6.150E-01	778	9.060E-02
615	1.524E+01	656	8.090E+00	697	2.667E+00	738	5.615E-01	779	8.700E-02
616	1.504E+01	657	7.873E+00	698	2.568E+00	739	5.242E-01	780	7.570E-02
617	1.495E+01	658	7.715E+00	699	2.477E+00	740	5.254E-01		
618	1.485E+01	659	7.502E+00	700	2.411E+00	741	5.259E-01		
619	1.472E+01	660	7.338E+00	701	2.354E+00	742	5.200E-01		
620	1.461E+01	661	7.172E+00	702	2.257E+00	743	4.680E-01		
621	1.439E+01	662	7.004E+00	703	2.173E+00	744	4.252E-01		
622	1.426E+01	663	6.819E+00	704	2.093E+00	745	3.730E-01		
623	1.413E+01	664	6.672E+00	705	2.027E+00	746	3.423E-01		
624	1.398E+01	665	6.520E+00	706	1.980E+00	747	3.626E-01		
625	1.374E+01	666	6.347E+00	707	1.930E+00	748	3.660E-01		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **1.0 hour**

Test orientation: **Base up**

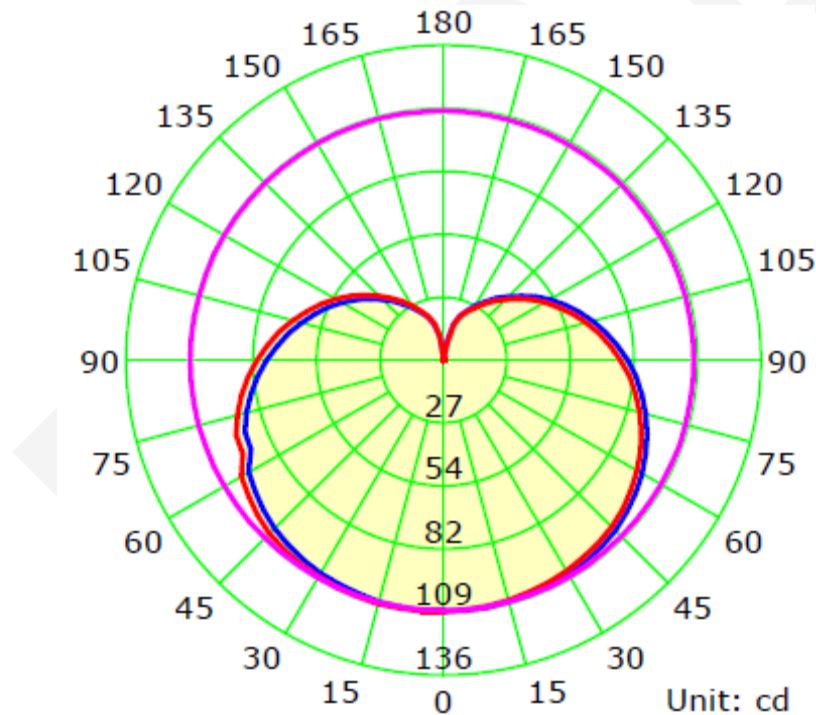
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.1	60	0.0770	8.99	0.9720

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
919.8	102.13	109.0	1.49	1.50

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	233.7	233.6	234.1	234.2	233.9
Field Angle (10% I _{max}):	338.1	339.4	337.9	337.1	338.1

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	109	109	109	109	109	109	109	109
5.0°	109	109	109	109	109	109	109	109
10.0°	109	109	108	108	108	108	108	108
15.0°	109	109	108	108	108	108	108	108
20.0°	108	108	108	107	107	107	107	108
25.0°	108	108	107	107	106	107	107	107
30.0°	107	107	106	106	106	106	106	106
35.0°	107	106	105	105	105	105	105	105
40.0°	106	105	104	104	104	103	104	104
45.0°	104	104	103	102	102	102	102	103
50.0°	103	102	101	101	101	100	101	101
55.0°	101	100	99	99	99	98	99	99
60.0°	99	98	97	96	96	96	96	96
65.0°	96	95	94	94	93	93	94	94
70.0°	93	92	91	91	91	90	91	91
75.0°	90	89	88	88	87	87	87	87
80.0°	87	86	85	84	84	84	84	84
85.0°	83	82	81	80	80	80	80	80
90.0°	79	78	77	77	76	76	76	76
95.0°	75	74	73	73	72	72	72	72
100.0°	71	70	69	68	68	68	68	68
105.0°	66	66	65	64	64	64	64	64
110.0°	62	61	60	60	59	59	59	59
115.0°	57	57	56	55	55	55	55	55
120.0°	53	52	51	51	51	50	50	50
125.0°	48	48	47	47	46	46	46	46
130.0°	44	43	43	42	42	42	42	42
135.0°	40	39	38	38	38	38	38	38
140.0°	35	35	34	34	34	34	34	34
145.0°	31	31	31	30	30	30	30	30
150.0°	28	27	27	27	26	26	26	26
155.0°	24	24	24	23	23	23	23	23
160.0°	21	20	20	20	20	20	20	20
165.0°	16	16	16	16	16	13	15	16
170.0°	8	9	10	8	6	8	8	10
175.0°	1	0	1	1	0	1	1	0
180.0°	0	0	0	0	0	0	0	0

Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	109	109	109	109	109	109	109	109
5.0°	109	109	109	109	109	109	109	109
10.0°	109	109	109	109	109	109	109	109
15.0°	109	109	109	109	109	109	109	109
20.0°	108	109	109	109	109	109	109	109
25.0°	107	108	108	109	109	109	109	108
30.0°	107	107	108	108	109	109	108	108
35.0°	106	107	107	108	108	108	108	107
40.0°	105	105	106	107	107	107	107	106
45.0°	103	104	105	106	106	106	106	105
50.0°	101	102	103	104	105	105	105	104
55.0°	99	100	101	102	103	103	103	102
60.0°	97	98	99	100	101	101	101	100
65.0°	92	93	94	95	96	96	95	94
70.0°	91	92	93	94	95	95	95	94
75.0°	88	89	90	91	92	92	92	91
80.0°	84	85	86	88	89	89	88	87
85.0°	81	82	83	84	85	85	85	84
90.0°	77	78	79	80	81	81	81	80
95.0°	72	73	74	76	76	77	77	76
100.0°	68	69	70	71	72	73	72	72
105.0°	64	65	66	67	68	68	68	67
110.0°	59	60	61	62	63	63	63	63
115.0°	55	56	57	58	58	59	59	58
120.0°	50	51	52	53	54	54	54	53
125.0°	46	47	47	48	49	49	49	49
130.0°	42	42	43	44	44	45	45	44
135.0°	38	38	39	39	40	40	40	40
140.0°	34	34	35	35	36	36	36	36
145.0°	30	30	31	31	32	32	32	32
150.0°	26	27	27	27	28	28	28	28
155.0°	23	23	24	24	24	24	24	24
160.0°	20	20	20	21	21	21	21	21
165.0°	16	16	17	17	17	17	16	16
170.0°	11	11	11	11	12	11	10	9
175.0°	1	1	1	1	1	0	0	0
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	2.6	0.28	0-5	2.6	0.28
5-10	7.8	0.85	0-10	10.4	1.13
10-15	12.9	1.40	0-15	23.3	2.53
15-20	17.9	1.94	0-20	41.2	4.47
20-25	22.6	2.46	0-25	63.8	6.94
25-30	27.2	2.95	0-30	91.0	9.89
30-35	31.4	3.41	0-35	122.4	13.30
35-40	35.3	3.84	0-40	157.6	17.14
40-45	38.7	4.21	0-45	196.4	21.35
45-50	41.7	4.53	0-50	238.1	25.88
50-55	44.1	4.79	0-55	282.2	30.68
55-60	45.9	4.99	0-60	328.1	35.67
60-65	46.8	5.08	0-65	374.8	40.75
65-70	47.3	5.14	0-70	422.1	45.89
70-75	47.5	5.17	0-75	469.6	51.06
75-80	46.9	5.09	0-80	516.5	56.15
80-85	45.6	4.96	0-85	562.1	61.11
85-90	43.9	4.77	0-90	606.0	65.88
90-95	41.7	4.53	0-95	647.6	70.41
95-100	39.1	4.25	0-100	686.7	74.66
100-105	36.1	3.93	0-105	722.8	78.59
105-110	33.0	3.59	0-110	755.8	82.17
110-115	29.7	3.23	0-115	785.5	85.40
115-120	26.3	2.86	0-120	811.8	88.26
120-125	22.9	2.49	0-125	834.8	90.76
125-130	19.7	2.14	0-130	854.4	92.89
130-135	16.5	1.80	0-135	870.9	94.69
135-140	13.6	1.48	0-140	884.5	96.17
140-145	10.9	1.18	0-145	895.4	97.35
145-150	8.5	0.92	0-150	903.9	98.27
150-155	6.4	0.70	0-155	910.3	98.97
155-160	4.6	0.50	0-160	914.9	99.47
160-165	3.0	0.32	0-165	917.9	99.80
165-170	1.5	0.16	0-170	919.4	99.96
170-175	0.4	0.04	0-175	919.8	100.00
175-180	0.0	0.00	0-180	919.8	100.00

6. Product Photo



*****END OF REPORT*****