

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 13PAR30/930FL40/277V

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	Hill Liu <i>Hill Liu</i>
Report Number:	R1KS170323010-10A1
Test Date:	2017-03-28 to 2017-03-30
Report Date:	2017-04-01
Reviewed By:	Bill Xiong / EE Engineer <i>Bill Xiong</i>
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69, Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax: +86-0769-86858588
Test Facility:	Test facility was located at No.69, Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.
Accreditation:	The IAS Accreditation Number TL-460.

1. Product Description

General Information:

Two samples were received on 2017-03-23. One was tested in integrating sphere and the other was tested in goniophotometer.

Model Tested: 13PAR30/930FL40/277V
Manufacturer: GREEN CREATIVE LTD
Brand Name: GREEN CREATIVE
Product Designation: Directional LED Lamp
Burning Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120-277 VAC 60Hz
Rated Power: 13W
Nominal CCT: 3000K
Nominal Lumen Output: 1050lm

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	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integrating Sphere	SENSING	SPR-600	S09008	25~50°C	2017-03-09	2018-03-08
High Accuracy Array spectroradiometer	EVERFINE	HAAS-2000	M112048CA1361125	380-780nm	2016-07-08	2017-07-07
Power meter	YOKOGAWA	WT310	C20E17024V	2kV/20A	2016-07-08	2017-07-07
DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	2017-03-03	2018-03-02
Thermal Meter	SENSING	N/A	N/A	25、50°C	2017-03-09	2018-03-08
Standard Light Source	SENSING	N/A	LSD090808	N/A	2016-12-05	2017-12-04
AC Power Supply	ALL Power	APW-105N	970613	220V±10% 50Hz	2017-03-03	2018-03-02
AC Power Supply	EVERFINE	VPS1030 PWM	1012017	0-150V, 0-300V	2017-03-03	2018-03-02
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2017-03-03	2018-03-02
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2017-03-03	2018-03-02
Goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	1600mm,3000W/10A	2017-03-09	2018-03-08
Wireless Remote Sensor	N/A	433MHz	N/A	0°C~50°C;-20°C~60°C	2017-03-20	2018-03-19
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.

4 π 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 $U=2.1\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=32\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=2.1$ ($K=2$), 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: **0.5hour**

Test orientation: **Base Up**

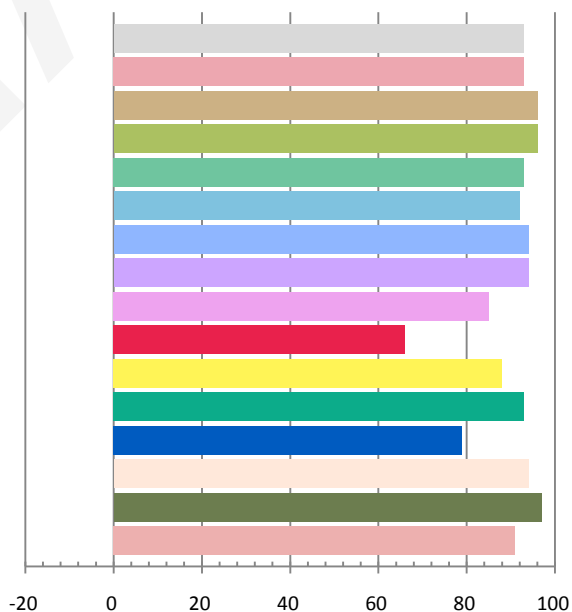
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.1113	12.89	0.9649	1204.3	93.40

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
4.2832	2975	-0.00040	0.4384	0.4041	0.2515	0.5216

Color Rendering Index

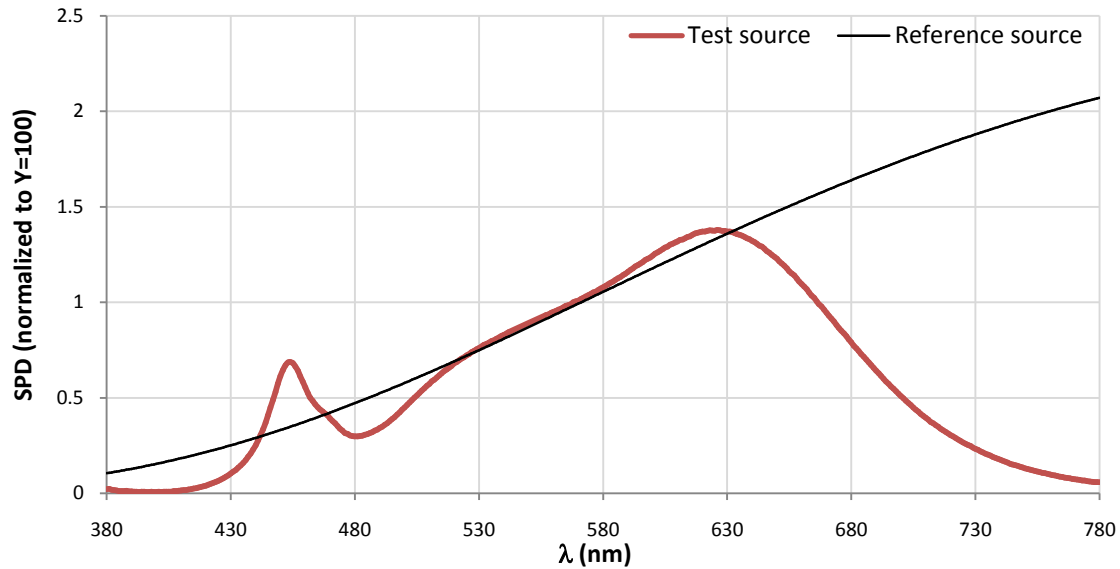
Ra			
92.9			
R1	R2	R3	R4
93	96	96	93
R5	R6	R7	R8
92	94	94	85
R9	R10	R11	R12
66	88	93	79
R13	R14	R15	
94	97	91	



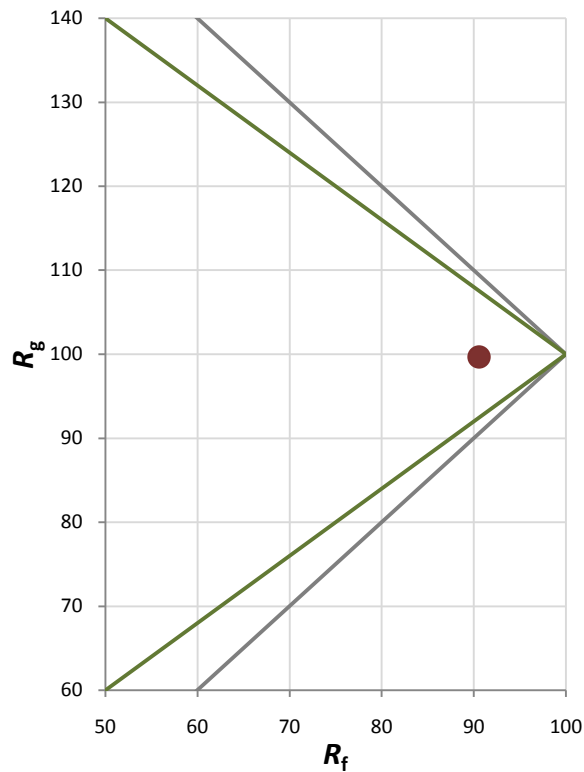
Fidelity Index and Gamut Index

Fidelity Index R_f	91
Gamut Index R_g	100

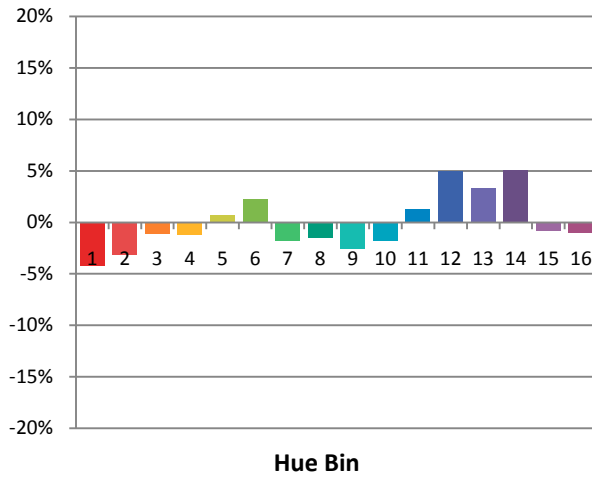
Spectral Power Distribution Comparison



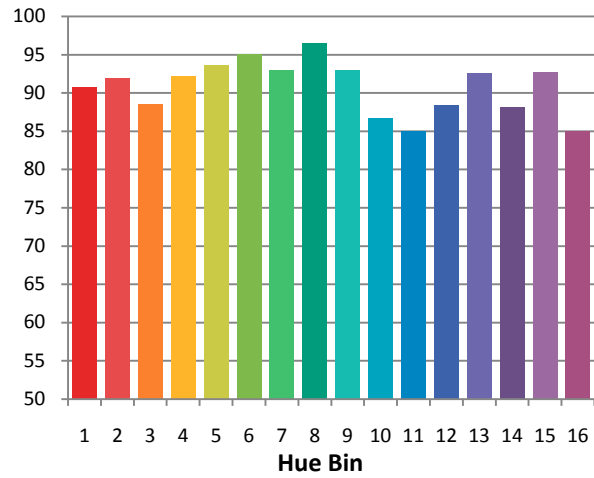
Plot of R_g versus R_f



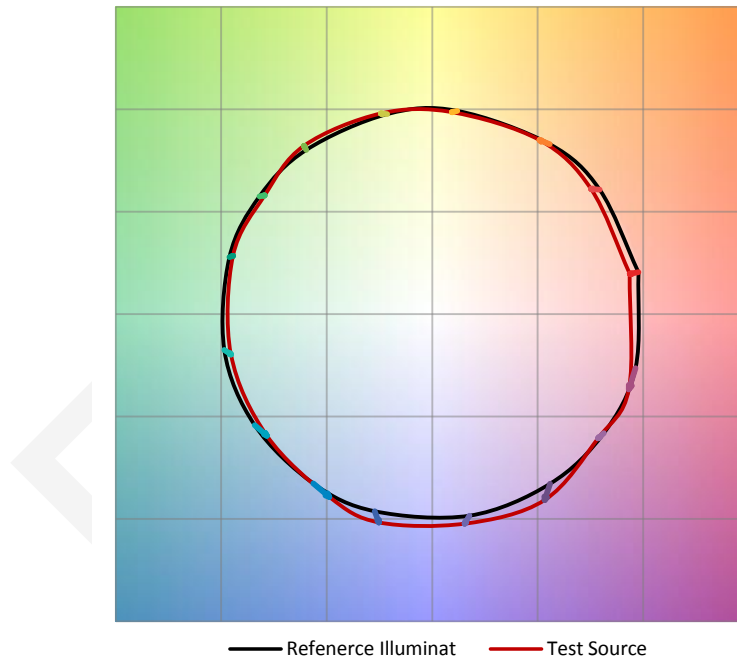
Chroma Shift by Hue



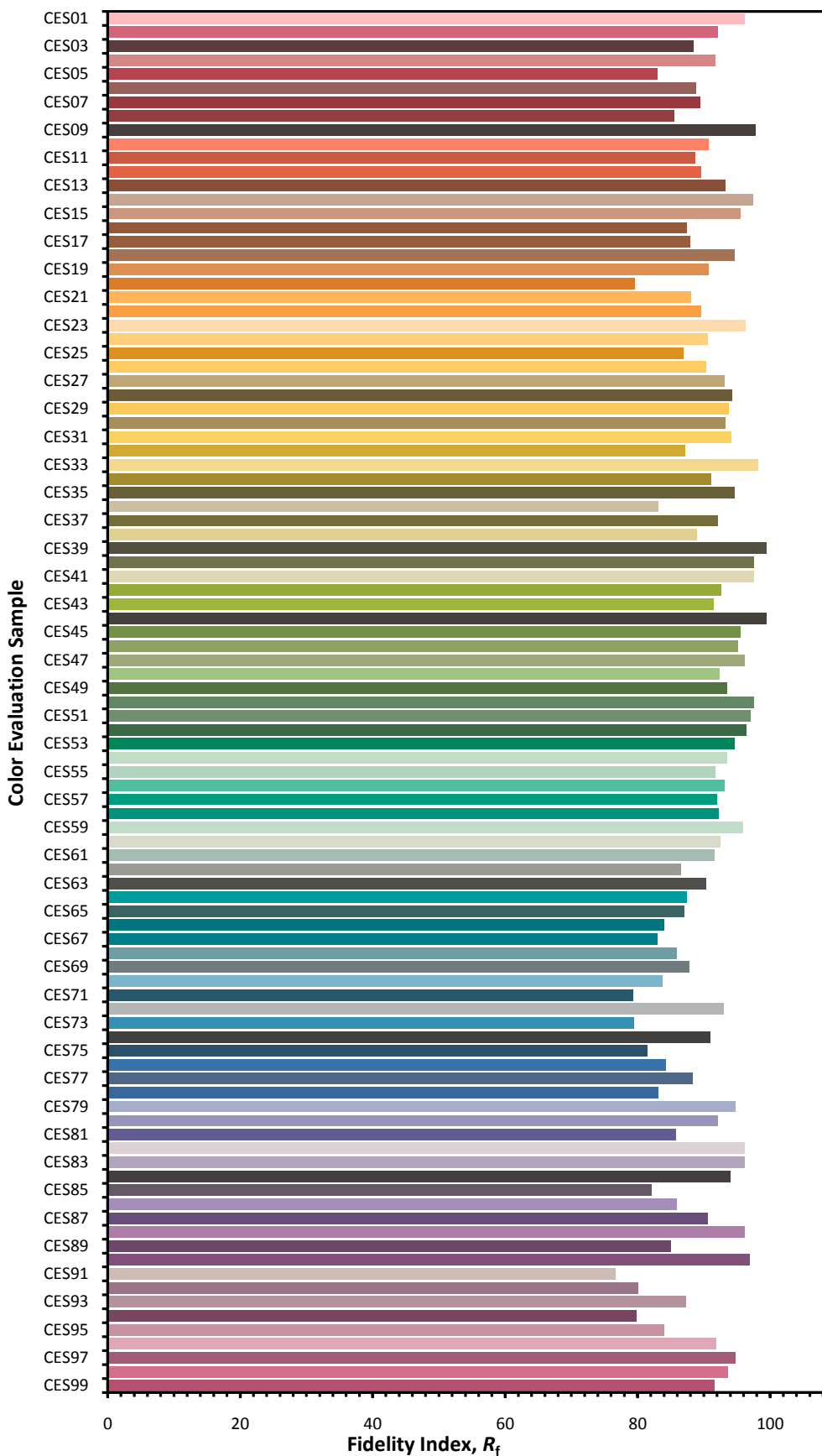
R_f by Hue



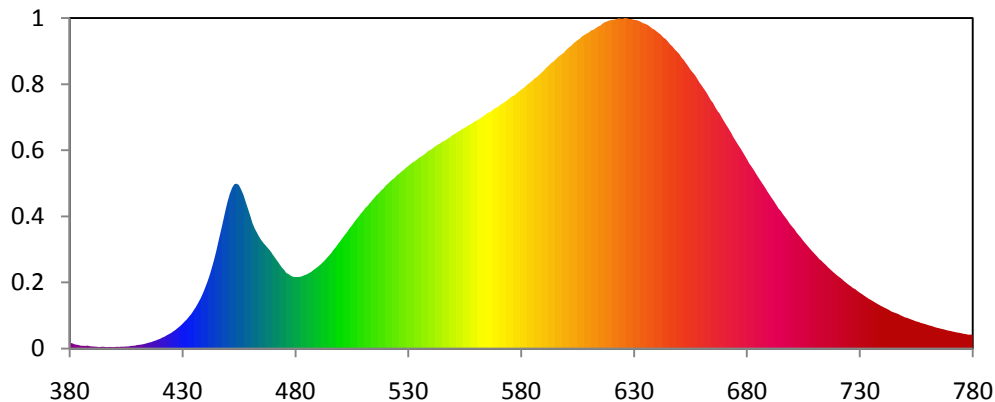
Color Vector Graphic



Color Fidelity by CES Sample



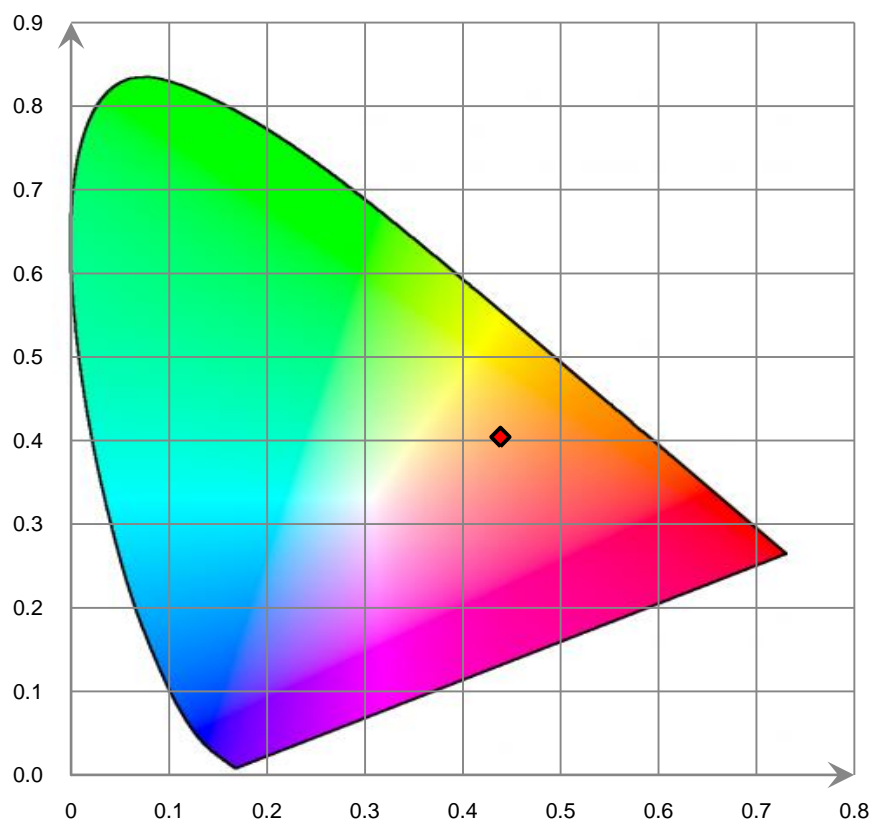
Relative Spectral Power Distribution



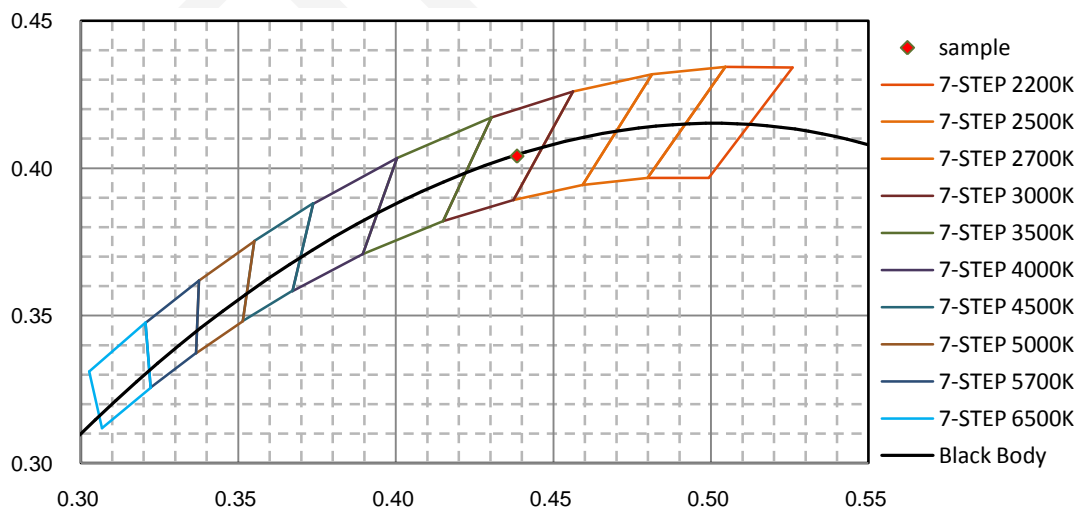
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.730E-01	421	8.024E-01	462	8.839E+00	503	8.584E+00	544	1.506E+01
381	4.080E-01	422	8.726E-01	463	8.522E+00	504	8.837E+00	545	1.520E+01
382	3.337E-01	423	9.736E-01	464	8.217E+00	505	9.035E+00	546	1.527E+01
383	2.884E-01	424	1.064E+00	465	7.957E+00	506	9.273E+00	547	1.537E+01
384	2.663E-01	425	1.153E+00	466	7.737E+00	507	9.494E+00	548	1.549E+01
385	2.145E-01	426	1.272E+00	467	7.558E+00	508	9.696E+00	549	1.560E+01
386	2.127E-01	427	1.386E+00	468	7.360E+00	509	9.922E+00	550	1.573E+01
387	1.977E-01	428	1.529E+00	469	7.170E+00	510	1.011E+01	551	1.581E+01
388	2.235E-01	429	1.659E+00	470	6.915E+00	511	1.033E+01	552	1.594E+01
389	1.778E-01	430	1.816E+00	471	6.685E+00	512	1.049E+01	553	1.602E+01
390	1.629E-01	431	1.994E+00	472	6.453E+00	513	1.069E+01	554	1.615E+01
391	1.518E-01	432	2.156E+00	473	6.215E+00	514	1.089E+01	555	1.623E+01
392	1.413E-01	433	2.361E+00	474	5.971E+00	515	1.108E+01	556	1.634E+01
393	1.148E-01	434	2.560E+00	475	5.796E+00	516	1.129E+01	557	1.644E+01
394	1.341E-01	435	2.819E+00	476	5.562E+00	517	1.143E+01	558	1.652E+01
395	1.420E-01	436	3.067E+00	477	5.482E+00	518	1.162E+01	559	1.665E+01
396	1.187E-01	437	3.367E+00	478	5.358E+00	519	1.176E+01	560	1.674E+01
397	1.104E-01	438	3.674E+00	479	5.283E+00	520	1.198E+01	561	1.683E+01
398	1.337E-01	439	4.036E+00	480	5.269E+00	521	1.211E+01	562	1.694E+01
399	1.076E-01	440	4.441E+00	481	5.263E+00	522	1.228E+01	563	1.705E+01
400	1.212E-01	441	4.876E+00	482	5.273E+00	523	1.243E+01	564	1.716E+01
401	1.365E-01	442	5.368E+00	483	5.323E+00	524	1.255E+01	565	1.731E+01
402	1.256E-01	443	5.915E+00	484	5.394E+00	525	1.273E+01	566	1.738E+01
403	1.474E-01	444	6.513E+00	485	5.454E+00	526	1.286E+01	567	1.747E+01
404	1.419E-01	445	7.184E+00	486	5.547E+00	527	1.301E+01	568	1.762E+01
405	1.570E-01	446	7.913E+00	487	5.635E+00	528	1.313E+01	569	1.772E+01
406	1.574E-01	447	8.621E+00	488	5.776E+00	529	1.329E+01	570	1.779E+01
407	1.921E-01	448	9.363E+00	489	5.889E+00	530	1.342E+01	571	1.794E+01
408	2.120E-01	449	1.011E+01	490	6.020E+00	531	1.356E+01	572	1.804E+01
409	2.218E-01	450	1.081E+01	491	6.154E+00	532	1.369E+01	573	1.815E+01
410	2.696E-01	451	1.138E+01	492	6.317E+00	533	1.378E+01	574	1.827E+01
411	2.802E-01	452	1.182E+01	493	6.479E+00	534	1.391E+01	575	1.841E+01
412	3.058E-01	453	1.208E+01	494	6.669E+00	535	1.405E+01	576	1.855E+01
413	3.389E-01	454	1.212E+01	495	6.849E+00	536	1.413E+01	577	1.860E+01
414	3.863E-01	455	1.203E+01	496	7.042E+00	537	1.426E+01	578	1.876E+01
415	4.367E-01	456	1.170E+01	497	7.279E+00	538	1.439E+01	579	1.889E+01
416	4.688E-01	457	1.131E+01	498	7.473E+00	539	1.454E+01	580	1.902E+01
417	5.339E-01	458	1.080E+01	499	7.707E+00	540	1.462E+01	581	1.915E+01
418	5.890E-01	459	1.030E+01	500	7.922E+00	541	1.474E+01	582	1.929E+01
419	6.579E-01	460	9.787E+00	501	8.152E+00	542	1.488E+01	583	1.944E+01
420	7.141E-01	461	9.240E+00	502	8.375E+00	543	1.498E+01	584	1.956E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.970E+01	626	2.430E+01	667	1.746E+01	708	7.329E+00	749	2.378E+00
586	1.986E+01	627	2.427E+01	668	1.726E+01	709	7.139E+00	750	2.298E+00
587	1.996E+01	628	2.423E+01	669	1.695E+01	710	6.966E+00	751	2.257E+00
588	2.013E+01	629	2.422E+01	670	1.667E+01	711	6.792E+00	752	2.191E+00
589	2.027E+01	630	2.416E+01	671	1.640E+01	712	6.591E+00	753	2.128E+00
590	2.043E+01	631	2.415E+01	672	1.614E+01	713	6.462E+00	754	2.066E+00
591	2.062E+01	632	2.410E+01	673	1.586E+01	714	6.289E+00	755	2.000E+00
592	2.077E+01	633	2.401E+01	674	1.554E+01	715	6.142E+00	756	1.960E+00
593	2.093E+01	634	2.392E+01	675	1.528E+01	716	5.961E+00	757	1.892E+00
594	2.107E+01	635	2.387E+01	676	1.501E+01	717	5.815E+00	758	1.846E+00
595	2.120E+01	636	2.379E+01	677	1.476E+01	718	5.658E+00	759	1.800E+00
596	2.136E+01	637	2.367E+01	678	1.449E+01	719	5.515E+00	760	1.744E+00
597	2.152E+01	638	2.353E+01	679	1.421E+01	720	5.378E+00	761	1.693E+00
598	2.164E+01	639	2.345E+01	680	1.393E+01	721	5.246E+00	762	1.653E+00
599	2.176E+01	640	2.331E+01	681	1.361E+01	722	5.120E+00	763	1.592E+00
600	2.195E+01	641	2.318E+01	682	1.339E+01	723	4.966E+00	764	1.541E+00
601	2.211E+01	642	2.305E+01	683	1.314E+01	724	4.832E+00	765	1.505E+00
602	2.223E+01	643	2.286E+01	684	1.286E+01	725	4.702E+00	766	1.457E+00
603	2.240E+01	644	2.276E+01	685	1.260E+01	726	4.584E+00	767	1.426E+00
604	2.255E+01	645	2.256E+01	686	1.235E+01	727	4.452E+00	768	1.378E+00
605	2.267E+01	646	2.236E+01	687	1.209E+01	728	4.366E+00	769	1.331E+00
606	2.278E+01	647	2.220E+01	688	1.185E+01	729	4.229E+00	770	1.307E+00
607	2.295E+01	648	2.200E+01	689	1.157E+01	730	4.109E+00	771	1.261E+00
608	2.304E+01	649	2.183E+01	690	1.131E+01	731	4.003E+00	772	1.225E+00
609	2.315E+01	650	2.166E+01	691	1.107E+01	732	3.882E+00	773	1.188E+00
610	2.324E+01	651	2.140E+01	692	1.083E+01	733	3.773E+00	774	1.165E+00
611	2.338E+01	652	2.122E+01	693	1.056E+01	734	3.656E+00	775	1.132E+00
612	2.343E+01	653	2.099E+01	694	1.030E+01	735	3.566E+00	776	1.086E+00
613	2.354E+01	654	2.075E+01	695	1.011E+01	736	3.469E+00	777	1.067E+00
614	2.366E+01	655	2.049E+01	696	9.866E+00	737	3.363E+00	778	1.025E+00
615	2.373E+01	656	2.030E+01	697	9.653E+00	738	3.269E+00	779	1.028E+00
616	2.388E+01	657	2.010E+01	698	9.430E+00	739	3.176E+00	780	1.030E+00
617	2.399E+01	658	1.983E+01	699	9.172E+00	740	3.088E+00		
618	2.404E+01	659	1.955E+01	700	8.971E+00	741	3.003E+00		
619	2.411E+01	660	1.933E+01	701	8.778E+00	742	2.925E+00		
620	2.416E+01	661	1.908E+01	702	8.529E+00	743	2.837E+00		
621	2.417E+01	662	1.884E+01	703	8.327E+00	744	2.729E+00		
622	2.421E+01	663	1.856E+01	704	8.139E+00	745	2.667E+00		
623	2.427E+01	664	1.826E+01	705	7.913E+00	746	2.605E+00		
624	2.426E+01	665	1.806E+01	706	7.721E+00	747	2.548E+00		
625	2.424E+01	666	1.773E+01	707	7.523E+00	748	2.457E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

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

Test orientation: **Base Up**

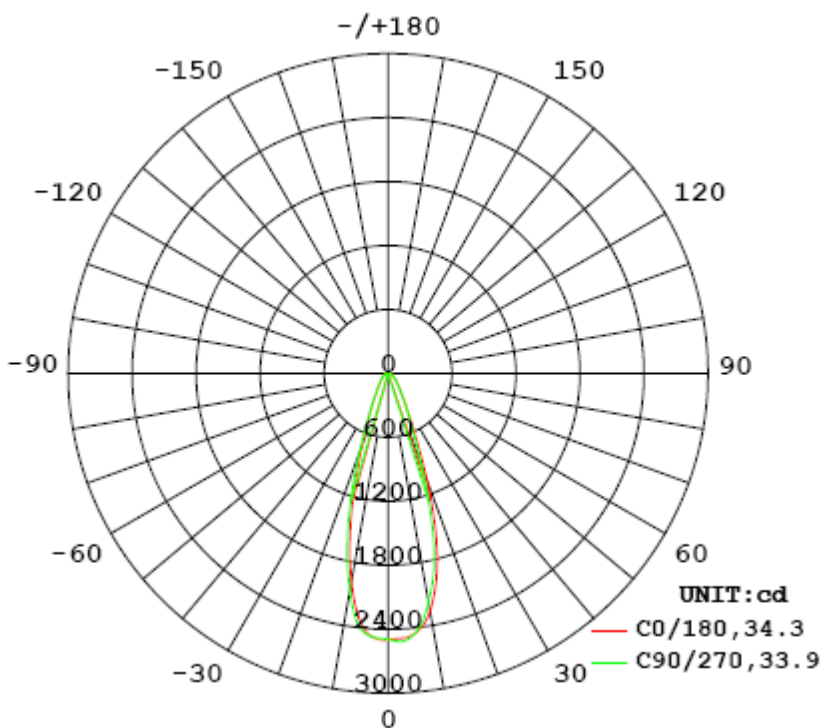
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1117	12.93	0.9646

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1208.94	93.50	2531	0.50	0.53

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	34.3	34.7	33.9	34.7	34.4
Field Angle (10% I_{max}):	62.5	61.1	62.0	60.7	61.6

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	2496	2496	2496	2496	2496	2496	2496	2496
5.0°	2471	2483	2512	2504	2482	2507	2519	2459
10.0°	2267	2256	2329	2279	2183	2185	2168	2036
15.0°	1787	1745	1744	1734	1663	1587	1506	1365
20.0°	1070	1002	1022	1005	909	855	808	711
25.0°	547	529	532	525	494	455	408	374
30.0°	312	315	296	294	299	276	243	230
35.0°	206	207	195	194	197	185	168	161
40.0°	149	148	142	141	142	136	126	121
45.0°	115	114	111	109	111	109	102	98
50.0°	92	91	89	88	88	87	82	79
55.0°	74	72	71	70	69	67	64	63
60.0°	58	58	57	56	55	53	51	50
65.0°	47	46	46	45	43	42	41	40
70.0°	36	36	35	35	33	32	31	30
75.0°	27	27	26	25	24	23	22	21
80.0°	18	18	17	17	16	15	14	13
85.0°	10	10	9	9	8	6	5	5
90.0°	2	2	1	1	0	0	0	0
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	0	0	0	0	0	0	0	0
110.0°	0	0	0	0	0	0	0	0
115.0°	0	0	0	0	0	0	0	0
120.0°	0	0	0	0	0	0	0	0
125.0°	0	0	0	0	0	0	0	0
130.0°	0	0	0	0	0	0	0	0
135.0°	0	0	0	0	0	0	0	0
140.0°	0	0	0	0	0	0	0	0
145.0°	0	0	0	0	0	0	0	0
150.0°	0	0	0	0	0	0	0	0
155.0°	0	0	0	0	0	0	0	0
160.0°	0	0	0	0	0	0	0	0
165.0°	0	0	0	0	0	0	0	0
170.0°	0	0	0	0	0	0	0	0
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

Luminous Intensity (cd) Distribution Data (cont.)

$\begin{matrix} C \\ \backslash \\ \gamma \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	2496	2496	2496	2496	2496	2496	2496	2496
5.0°	2433	2424	2434	2454	2450	2448	2458	2473
10.0°	1992	2008	2098	2133	2077	2118	2208	2367
15.0°	1326	1357	1446	1472	1442	1522	1693	1909
20.0°	704	719	768	800	791	840	1015	1165
25.0°	400	396	391	401	414	450	493	555
30.0°	249	246	238	239	251	274	279	301
35.0°	169	170	168	166	171	183	190	201
40.0°	125	128	126	125	129	135	141	149
45.0°	99	102	102	101	103	107	111	116
50.0°	80	81	82	82	83	86	92	95
55.0°	63	63	63	64	65	68	70	74
60.0°	50	50	51	51	52	54	56	59
65.0°	40	40	40	41	42	43	45	47
70.0°	30	30	30	31	32	34	35	37
75.0°	21	21	22	22	23	25	26	27
80.0°	13	13	13	14	15	16	17	18
85.0°	5	5	5	6	7	8	9	10
90.0°	0	0	0	0	0	1	1	2
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	0	0	0	0	0	0	0	0
110.0°	0	0	0	0	0	0	0	0
115.0°	0	0	0	0	0	0	0	0
120.0°	0	0	0	0	0	0	0	0
125.0°	0	0	0	0	0	0	0	0
130.0°	0	0	0	0	0	0	0	0
135.0°	0	0	0	0	0	0	0	0
140.0°	0	0	0	0	0	0	0	0
145.0°	0	0	0	0	0	0	0	0
150.0°	0	0	0	0	0	0	0	0
155.0°	0	0	0	0	0	0	0	0
160.0°	0	0	0	0	0	0	0	0
165.0°	0	0	0	0	0	0	0	0
170.0°	0	0	0	0	0	0	0	0
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	59.5	4.92
5-10	166.9	13.80
10-15	222.3	18.39
15-20	199.4	16.50
20-25	133.8	11.06
25-30	88.8	7.35
30-35	65.4	5.41
35-40	52.3	4.33
40-45	44.4	3.67
45-50	38.9	3.21
50-55	33.2	2.74
55-60	27.9	2.31
60-65	23.5	1.94
65-70	19.2	1.59
70-75	14.8	1.23
75-80	10.5	0.87
80-85	6.2	0.51
85-90	2.0	0.16
90-95	0.1	0.01
95-100	0.0	0.00
100-105	0.0	0.00
105-110	0.0	0.00
110-115	0.0	0.00
115-120	0.0	0.00
120-125	0.0	0.00
125-130	0.0	0.00
130-135	0.0	0.00
135-140	0.0	0.00
140-145	0.0	0.00
145-150	0.0	0.00
150-155	0.0	0.00
155-160	0.0	0.00
160-165	0.0	0.00
165-170	0.0	0.00
170-175	0.0	0.00
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	59.5	4.92
0-10	226.4	18.72
0-15	448.7	37.11
0-20	648.1	53.61
0-25	781.9	64.67
0-30	870.7	72.02
0-35	936.1	77.43
0-40	988.4	81.76
0-45	1032.8	85.43
0-50	1071.6	88.64
0-55	1104.8	91.38
0-60	1132.7	93.69
0-65	1156.2	95.63
0-70	1175.4	97.22
0-75	1190.2	98.45
0-80	1200.7	99.32
0-85	1206.8	99.83
0-90	1208.8	99.99
0-95	1208.9	100.00
0-100	1208.9	100.00
0-105	1208.9	100.00
0-110	1208.9	100.00
0-115	1208.9	100.00
0-120	1208.9	100.00
0-125	1208.9	100.00
0-130	1208.9	100.00
0-135	1208.9	100.00
0-140	1208.9	100.00
0-145	1208.9	100.00
0-150	1208.9	100.00
0-155	1208.9	100.00
0-160	1208.9	100.00
0-165	1208.9	100.00
0-170	1208.9	100.00
0-175	1208.9	100.00
0-180	1208.9	100.00

6. Product Photo



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