TESTING
NVLAP LAB CODE 600149-0

Ningbo TengLi Testing Co., Ltd

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LM-79-08 Test Report

For

Espen Technology, Inc.

(Brand Name: Espen)

12257 FLORENCE AVE SANTA FE SPRINGS, CA 90670 USA

Model name(s): L24T8/8XX/8G-XT 2C N

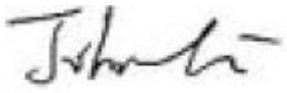
Report Type:	Testing and Report According to IES LM-79-2008
Type of Luminaire:	2-lamp External Driver Lamp-Style Retrofit Kits (UL Type C)
Report Date:	2018-08-31
Prepared By:	Ningbo TengLi Testing Co., Ltd 2nd floor, Block B, Ningbo Testing and Certification Base, No. 66 Qingyi Road, Ningbo National Hi-Tech Zone, Ningbo, Zhejiang

Test & Report By:

Johnson Sun

Engineer: Johnson Sun

Review By:



Manager: John Li

Note: 1. The results contained in this report pertain only to the tested samples

2. This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

1.1 Product Information:		
Model Number	L24T8/8XX/8G-XT 2C N	
Remark	XX stand for CCT, 30=3000K, 35=3500K, 40=4000K, 50=5000K	
Representative (Tested) Model	L24T8/830/8G-XT 2C N L24T8/850/8G-XT 2C N	
Model Difference	All construction and rating are the same, except model name.	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	2-lamp External Driver Lamp-Style Retrofit Kits (UL Type C)	
LED Manufacturer	Lumileds Holding B.V.	
LED Model	L128-3080RA35000Q1	
Dimming	N/A	
Sample Number	STD180968NB-B1, B2, B3	
Date of Receipt	Sep.30, 2018	
Luminaire Aperture (for downlights)	--	in.
Luminaire Length	--	mm
Luminaires Width	--	mm
Number of Units (modular products)	N/A	s

1.2 Rated Values:	
Rated Voltage / Frequency	120-277Vac, 50/60 Hz
Nominal Power	10W
Rated Initial Lamp Lumen	--
Declared CCT	3000K, 3500K, 4000K, 5000K

1.3 Test Specifications:

Test item	1. Total Luminous Flux 2. Luminous Distribution Intensity 3. Luminous Efficacy 4. Correlated Color Temperature 5. Color Rendering Index 6. Chromaticity Coordinate 7. Electrical Parameters
Reference Standard	1. IES LM-79-2008 Electrical and Photometric Measurements of Solid-State Lighting Products 2. ANSI C78.377-2015 Specifications for the Chromaticity of Solid State Lighting Products 3. CIE 13.3-1995 Method of Measuring and Specifying Colour Rendering Properties of Light Sources 4. CIE 15-2004 Technical Report Colorimetry 5. IESNA LM-16-93 Practical Guide to Colorimetry of Light Source 6. IESNA TM-16-05 Technical Memorandum on Light Emitting Diode (LED) Sources and Systems
Reference Work Instruction	QD25

1.4 Test Methods

1) Photometric and Light Distribution Measurement – Goniophotometer Method: Photometric parameters were measured using the goniophotometer and software. The ambient temperature shall be maintained at 25° C ± 1° C, measured at a point not more than 1 m from the sample and at the same height as the sample. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 1° vertical intervals and 22.5° horizontal intervals.
2) Chromaticity Measurement – Sphere-Spectroradiometer Method: Chromaticity parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º C. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral power distribution taken at 5 nm intervals over the range of 380 to 780 nm.
3) Electrical Measurements: Electrical parameters were measured using power meters incorporated in goniophotometer or sphere-spectroradiometer system. The ambient temperature surrounding the sample was maintained at 25º C ± 1º C. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Voltage, frequency, current, power, power factor and total harmonic distortion were measured by and read from the power meter.

2.1 Summary of Test Result

Criteria Item	Measured Value			Compliance	Requirement (DLC V4.3)
Power(W)	3000K Bare Lamp	120V	10.34	N/A	N/A
		277V	10.45		
	3000K In Luminaire	120V	20.22		
		277V	20.44		
	5000K Bare Lamp	120V	10.44		
		277V	10.53		
Power Factor	3000K Bare Lamp	120V	0.9911	Pass	>= 0.9(-3%)
		277V	0.8936		
	3000K In Luminaire	120V	0.9923		
		277V	0.8971		
	5000K Bare Lamp	120V	0.9919		
		277V	0.8942		
THD %	3000K Bare Lamp	120V	4.84	Pass	<= 20(+5)
		277V	20.12		
	3000K In Luminaire	120V	4.91		
		277V	20.20		
	5000K Bare Lamp	120V	4.78		
		277V	20.06		
CRI	3000K Bare Lamp		83.3	Pass	>= 80(-2)
	3000K In Luminaire		83.3		
	5000K Bare Lamp		85.0		
CCT (K)	3000K Bare Lamp		3073	Pass	<=5000K
	3000K In Luminaire		3067		
	5000K Bare Lamp		4952		
Luminous Intensity Distribution	Zonal lumens in the 0-60°:		84.2	Pass	>= 75(-2)
	SC: 0-180° (if applicable):		1.34	Pass	1.0-2.0(±0.1)
	SC: 90-270° (if applicable):		1.17	Pass	
Total Luminous	3000K Bare Lamp	120V	1229	Pass	>=800(-10%)
		277V	1228		
	3000K In Luminaire	120V	2014.6		>=1350(-10%)
		277V	2013.0		
	5000K Bare Lamp	120V	1324		>=800(-10%)
		277V	1323		
Luminous Efficacy	3000K Bare Lamp	120V	118.86	Pass	Standard: >= 110(-3%)
		277V	117.51		
	3000K In Luminaire	120V	99.63		Standard: >= 100(-3%)
		277V	98.48		

	5000K Bare Lamp	120V	126.82		Standard: >= 110(-3%)
		277V	125.64		

2.2 Electrical, Photometric and Chromaticity Measurements

Test date	2018-09-30	**Test Ambient:**	25.2 º C
Test Orientation	As intended	**Stabilization Time (min)**	90
Model Number	L24T8/830/8G-XT 2C N		

Electrical Measurement for Bare-lamp:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
STD180968	120.0	60	0.0869	10.34	0.9911	4.84
NB-B1	277.0	60	0.0422	10.45	0.8936	20.12

Chromaticity Measurement - Sphere-Spectroradiometer Method:

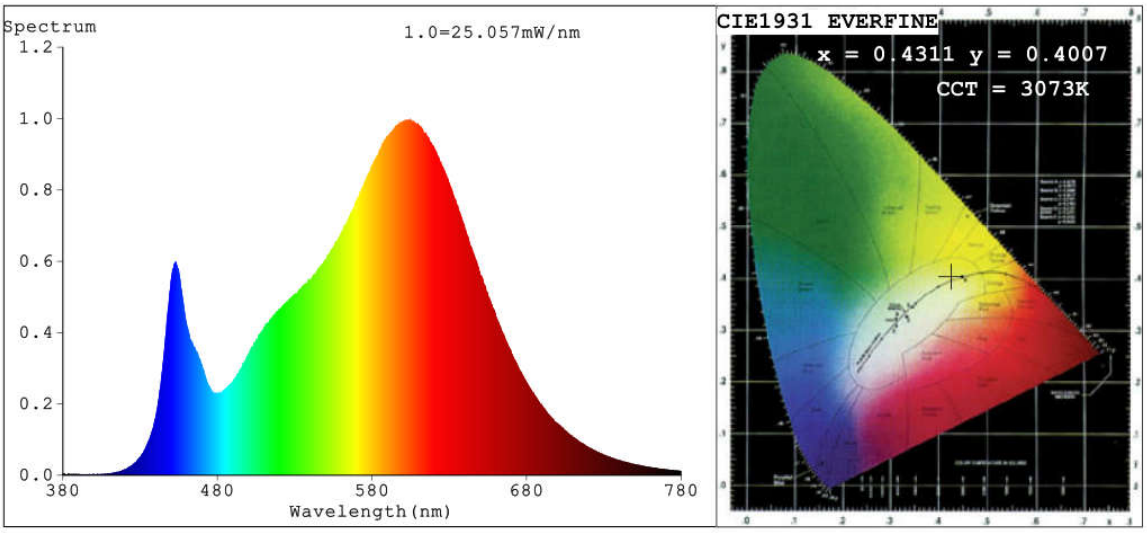
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	3073
Duv	-0.0005
Chromaticity (x, y)	x=0.4311 y=0.4007
Chromaticity (u', v')	u'=0.2483 v'=0.5192
Color Rendering Index (CRI)	83.3
R9	9

Special Color Rendering Indices			
R1	82	R9	9
R2	93	R10	83
R3	95	R11	80
R4	81	R12	72
R5	83	R13	85
R6	91	R14	98
R7	82	R15	75
R8	59	--	--

Photometric Measurement –Sphere-Spectroradiometer Method:

Parameter	Result	
Test Voltage (V)	120.0	277.0
Frequency (Hz)	60	60
Total Luminous (lm)	1229	1228
Luminous Efficacy (lm/W)	118.86	117.51
Worst Luminous/Highest Watts	117.51	

Spectral Power Distribution & Chromaticity Diagram



2.3 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction QD25)

Test date	2018-09-30	Test Ambient:	25.2 º C
Test Orientation	As intended	Stabilization Time (min)	90
Model Number	L24T8/830/8G-XT 2C N		

Electrical Measurement for 2-lamp in Lithonia 2GT8 lensed 2x2:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
STD180968	120.0	60	0.1698	20.22	0.9923	4.91
NB-B1, B2	277.0	60	0.0823	20.44	0.8971	20.20

Chromaticity Measurement - Sphere-Spectroradiometer Method for 2-lamp in Lithonia 2GT8 lensed 2x2:

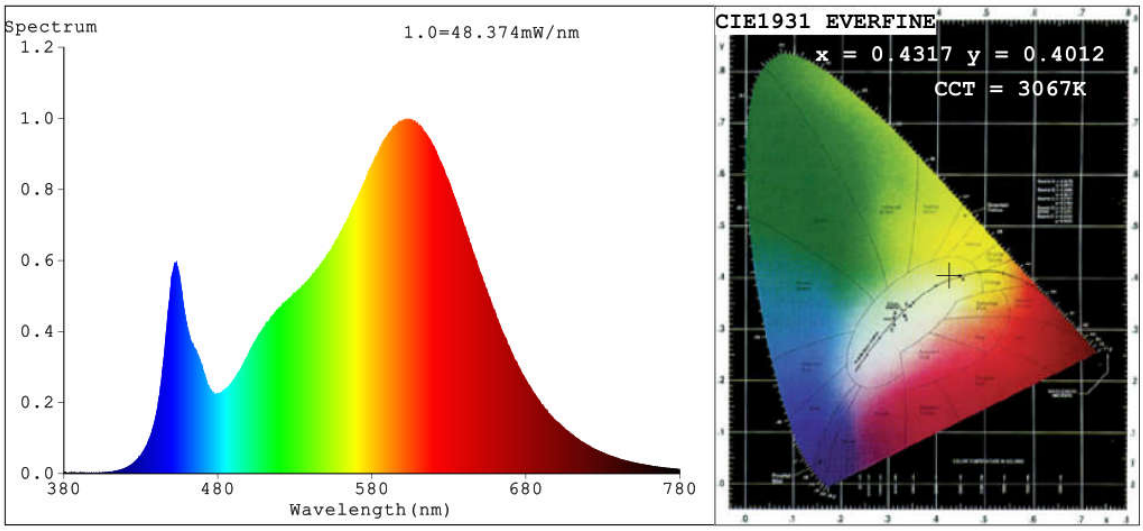
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	3067
Duv	-0.0004
Chromaticity (x, y)	x=0.4317 y=0.4012
Chromaticity (u', v')	u'=0.2484 v'=0.5195
Color Rendering Index (CRI)	83.3
R9	9

Special Color Rendering Indices			
R1	82	R9	9
R2	93	R10	83
R3	95	R11	80
R4	81	R12	72
R5	82	R13	85
R6	91	R14	98
R7	82	R15	75
R8	60	--	--

Photometric Measurement – Goniophotometer Method for 2-lamp in Lithonia 2GT8 lensed 2x2:

Parameter	Result	
Test Voltage (V)	120.0	277.0
Frequency (Hz)	60	60
Total Luminous (lm)	2014.6	2013.0
Luminous Efficacy (lm/W)	99.63	98.48
Worst Luminous/Highest Watts	98.48	
Zonal lumens in the 0-60° zone (%)	84.2	--
SC: 0-180° (if applicable)	1.34	--
SC: 90-270° (if applicable)	1.17	--
Beam Angle (°)	101.1	--
Center Beam Candle Power (cd)	808	--

Spectral Power Distribution & Chromaticity Diagram



Zonal Lumen Tabulation

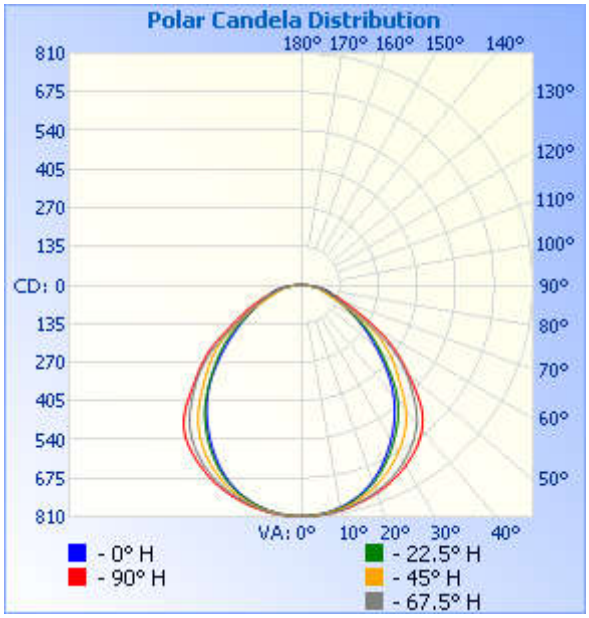
Zonal Lumen Summary

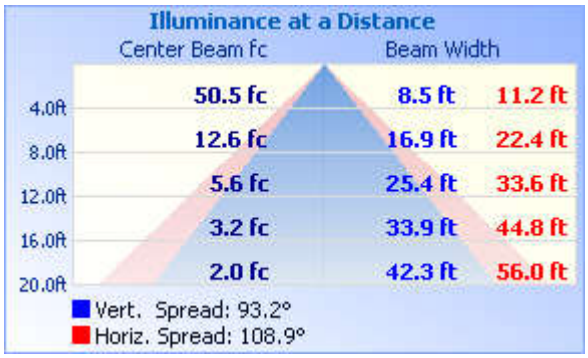
Zone	Lumens	% Luminaire
0-30	625.5	31.1%
0-40	1,017.4	50.5%
0-60	1,695.8	84.2%
60-90	312.3	15.5%
70-100	136.6	6.8%
90-120	2.9	0.1%
0-90	2,008.0	99.7%
90-180	6.3	0.3%
0-180	2,014.3	100%

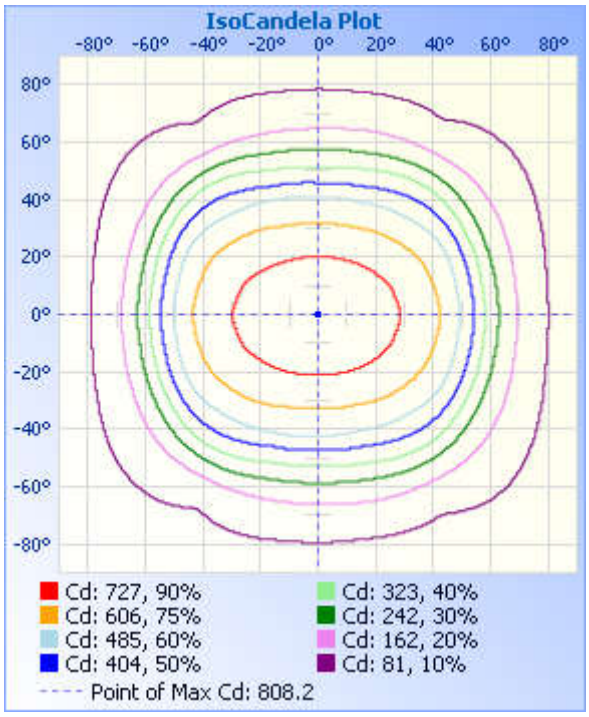
Lumens Per Zone

Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	76.5	3.8%	90-100	0.5	0%
10-20	218.9	10.9%	100-110	1.1	0.1%
20-30	330.1	16.4%	110-120	1.3	0.1%
30-40	391.9	19.5%	120-130	1.0	0%
40-50	380.1	18.9%	130-140	0.8	0%
50-60	298.3	14.8%	140-150	0.7	0%
60-70	176.2	8.7%	150-160	0.5	0%
70-80	100.3	5.0%	160-170	0.3	0%
80-90	35.7	1.8%	170-180	0.1	0%

Photometric Data







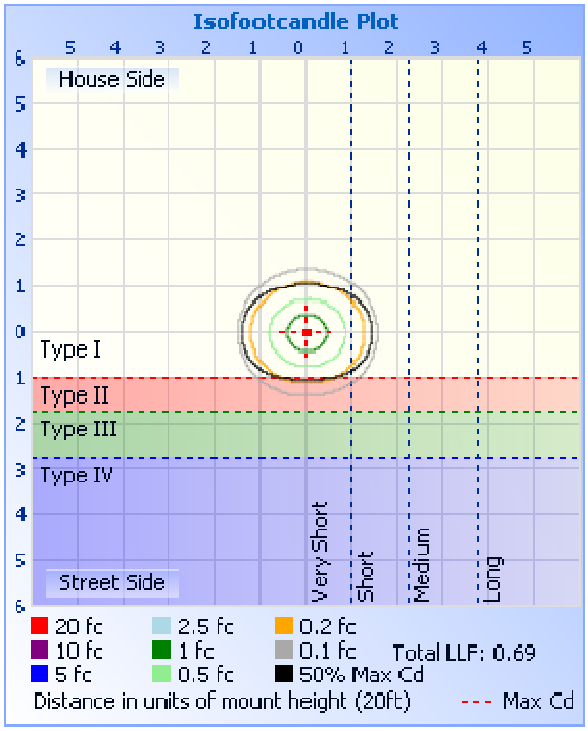


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Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	
0	808	808	808	808	808	808	808	808	808	808	808	808	808	808	808	808	
5	806	805	804	804	803	804	805	806	806	806	805	804	804	804	804	805	
10	798	796	793	790	789	790	795	799	799	798	795	791	790	790	793	796	
15	785	781	775	767	764	769	777	786	788	785	778	770	766	769	775	781	
20	768	761	748	735	729	736	751	768	773	767	753	739	733	737	749	761	
25	746	736	713	691	681	692	717	745	754	745	719	696	686	695	715	736	
30	717	702	670	638	627	641	676	715	730	715	679	646	632	643	673	703	
35	685	661	617	580	568	587	630	677	699	676	634	591	574	585	622	662	
40	638	605	550	510	502	524	569	629	657	627	573	531	510	517	556	607	
45	555	530	475	433	425	444	489	557	590	556	493	451	436	441	479	533	
50	466	454	410	364	345	364	421	480	494	477	424	370	354	370	413	456	
55	383	357	333	294	276	292	347	388	405	383	348	297	283	298	337	360	
60	281	251	239	220	214	219	250	276	306	273	250	223	220	225	245	256	
65	210	180	161	167	163	161	159	183	212	182	159	163	167	170	167	184	
70	151	131	106	130	128	127	100	126	150	125	100	129	130	132	111	136	
75	108	94.2	78.2	99.2	103	98.4	75.4	91.8	107	90.6	75.4	100	104	99.5	80.2	97.7	
80	79.1	64.9	62.0	68.4	74.4	69.2	61.8	63.2	77.3	63.2	63.0	71.3	76.3	68.0	63.8	65.7	
85	35.3	31.6	29.0	33.9	34.1	35.2	32.2	33.0	37.2	33.5	34.5	39.3	37.9	35.5	31.8	32.3	
90	0.35	0.43	0.52	0.76	0.77	0.55	0.88	0.38	0.23	0.20	2.00	0.58	0.15	0.29	0.29	0.29	
95	0.38	0.43	0.35	0.35	0.42	0.41	0.38	0.39	0.37	0.35	0.66	0.86	0.43	0.32	0.40	0.35	
100	0.43	0.40	0.46	0.34	0.40	0.46	0.72	0.40	0.89	0.79	1.15	0.76	0.44	0.32	0.72	0.69	
105	1.00	0.98	0.80	0.42	0.38	0.45	1.32	1.35	2.16	1.90	1.56	0.66	0.41	0.35	1.04	1.38	
110	1.82	1.70	1.23	0.37	0.35	0.43	1.67	2.27	2.50	2.50	1.75	0.57	0.43	0.35	1.29	1.90	
115	1.72	1.76	1.21	0.73	0.38	0.49	1.12	2.59	2.62	2.30	1.30	0.63	0.54	0.72	0.97	2.19	
120	1.63	1.64	1.06	0.81	0.44	0.49	1.04	1.61	2.30	2.04	1.40	0.78	0.62	0.93	0.88	1.84	
125	1.41	1.12	0.70	0.77	0.49	0.49	0.78	1.40	1.88	1.90	0.89	0.89	0.80	0.96	0.86	1.36	
130	0.87	0.85	1.27	0.76	0.78	0.52	0.78	1.24	1.85	1.75	0.94	0.97	0.96	1.03	1.08	1.18	
135	1.07	0.81	1.12	0.72	0.83	0.54	0.83	1.11	1.29	1.15	0.97	1.05	1.09	1.07	1.33	1.35	
140	1.15	1.25	1.03	0.67	0.86	0.66	0.83	1.18	1.35	1.29	0.99	1.10	1.21	1.11	1.38	1.67	
145	1.09	1.25	0.91	0.69	0.89	0.75	0.81	1.24	1.33	1.34	1.01	1.13	1.24	1.15	1.23	1.81	
150	1.03	1.35	0.67	0.71	1.07	0.86	0.78	1.31	1.32	1.33	1.03	1.21	1.41	1.20	1.07	1.38	
155	1.01	0.89	0.60	0.73	1.07	0.87	0.75	1.08	1.32	1.23	1.15	1.35	1.35	1.27	1.12	0.87	
160	0.96	0.85	0.60	0.74	1.07	0.88	0.79	1.17	1.25	1.21	1.23	1.29	1.34	1.30	1.19	0.88	
165	0.98	0.88	0.60	0.78	1.07	0.89	0.80	1.27	1.31	1.33	1.26	1.16	1.33	1.31	1.24	0.89	
170	0.99	0.92	0.72	0.98	1.17	1.24	0.80	1.32	1.35	1.36	1.30	0.98	1.35	1.32	1.31	0.91	
175	1.01	0.95	0.79	1.03	1.28	1.32	0.80	1.25	1.35	1.35	1.27	0.98	1.35	1.32	1.36	0.92	
180	1.32	1.12	0.83	1.04	1.33	1.35	0.95	1.35	1.41	1.32	1.27	0.83	1.04	1.32	1.38	0.92	

2.4 Electrical, Photometric and Chromaticity Measurements

Test date	2018-09-30	**Test Ambient:**	25.2 º C
Test Orientation	As intended	**Stabilization Time (min)**	90
Model Number	L24T8/850/8G-XT 2C N		

Electrical Measurement for Bare-lamp:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
STD180968	120.0	60	0.0877	10.44	0.9919	4.78
NB-B3	277.0	60	0.0425	10.53	0.8942	20.06

Chromaticity Measurement - Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	4952
Duv	0.0021
Chromaticity (x, y)	x=0.3469 y=0.3572
Chromaticity (u', v')	u'=0.2105 v'=0.4877
Color Rendering Index (CRI)	85.0
R9	15

Special Color Rendering Indices			
R1	83	R9	15
R2	91	R10	79
R3	96	R11	82
R4	83	R12	61
R5	83	R13	86
R6	87	R14	98
R7	88	R15	78
R8	69	--	--

Photometric Measurement –Sphere-Spectroradiometer Method:

Parameter	Result	
Test Voltage (V)	120.0	277.0
Frequency (Hz)	60	60
Total Luminous (lm)	1324	1323
Luminous Efficacy (lm/W)	126.82	125.64
Worst Luminous/Highest Watts	125.64	

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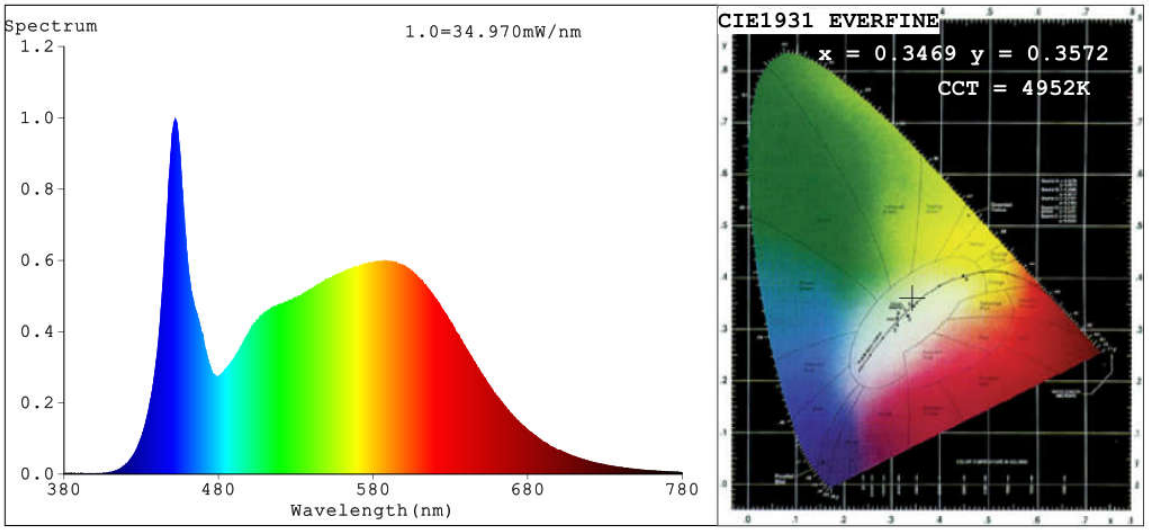
Spectral Power Distribution & Chromaticity Diagram



3. Test Equipment

Equipment ID	Equipment Name	Last Calibration Date	Next Calibration Date
ST-R-702	2 meter Integrating Sphere	Verified by D204 standard lamp	
ST-R-701	Spectral analysis system HAAS-2000	Verified by D204 standard lamp	
D204	Standard Lamp	2018-02-08	2019-02-07
ST-R-704	Power Meter for Integrating Sphere	2018-01-07	2019-01-06
ST-R-714	Goniophotometer system	Verified by D908S standard lamp	
D908S	Standard Lamp	2018-02-13	2019-02-14
ST-R-711	Power Meter for Goniophotometer	2018-01-07	2019-01-06
Uncertainty: Photometric Measurement (Sphere):1.74% Chromaticity Measurement(Sphere):14.3K Photometric Measurement(Goniophotometer):1.62%			

4. Product Photo

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