TESTING
NVLAP LAB CODE 600149-0

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
Tel: 86574-8783 6802
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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): L24T8/840/8G-XT 2C N

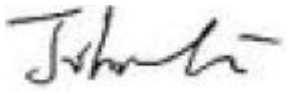
Report Type:	Testing and Report According to IES LM-79-2008
Type of Luminaire:	2-lamp External Driver Lamp-Style Retrofit Kits (UL Type C)
Report Date:	2018-10-15
Prepared By:	Ningbo TengLi Testing Co., Ltd 2nd floor, Block B, Ningbo Testing and Certification Base, No. 66 Qingyi Road, Ningbo National 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	L24T8/840/8G-XT 2C N	
Remark	N/A	
Representative (Tested) Model	L24T8/840/8G-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-B6, 7	
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	4000K

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)	4000K Bare Lamp	120V	10.28	N/A	N/A
		277V	10.35		
	4000K In Luminaire	120V	20.12		
		277V	20.26		
Power Factor	4000K Bare Lamp	120V	0.9927	Pass	>= 0.9(-3%)
		277V	0.8965		
	4000K In Luminaire	120V	0.9936		
		277V	0.8978		
THD %	4000K Bare Lamp	120V	5.04	Pass	<= 20(+5)
		277V	20.63		
	4000K In Luminaire	120V	4.97		
		277V	20.58		
CRI	4000K Bare Lamp		83.9	Pass	>= 80(-2)
	4000K In Luminaire		84.0		
CCT (K)	4000K Bare Lamp		4146	Pass	<=5000K
	4000K In Luminaire		4149		
Luminous Intensity Distribution	Zonal lumens in the 0-60°:		84.4	Pass	>= 75(-2)
	SC: 0-180° (if applicable):		1.35	Pass	1.0-2.0(±0.1)
	SC: 90-270° (if applicable):		1.17	Pass	
Total Luminous	4000K Bare Lamp	120V	1283	Pass	>=800(-10%)
		277V	1281		
	4000K In Luminaire	120V	2088.1		>=1350(-10%)
		277V	2085.6		
Luminous Efficacy	4000K Bare Lamp	120V	124.81	Pass	Standard: >= 110(-3%)
		277V	123.77		
	4000K In Luminaire	120V	103.78		Standard: >= 100(-3%)
		277V	102.94		

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2.2 Electrical, Photometric and Chromaticity Measurements

Test date	2018-10-08	**Test Ambient:**	25.2 º C
Test Orientation	As intended	**Stabilization Time (min)**	90
Model Number	L24T8/840/8G-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	0.0863	10.28	0.9927	5.04
NB-B6	277.0	60	0.0417	10.35	0.8965	20.63

Chromaticity Measurement - Sphere-Spectroradiometer Method:

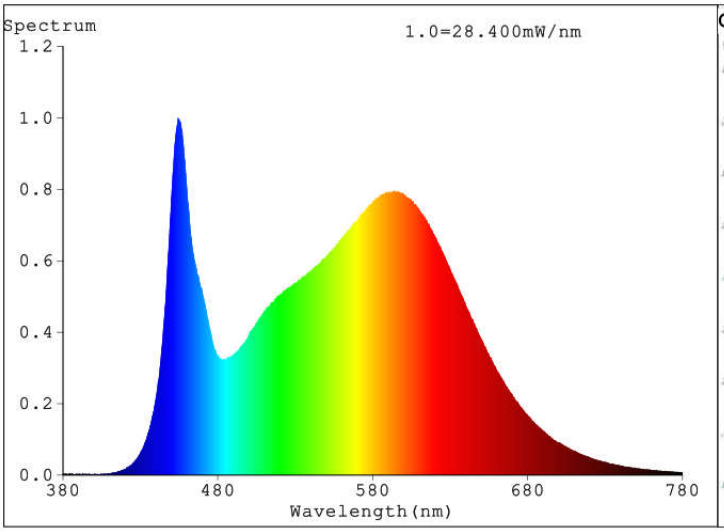
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	4146
Duv	-0.0010
Chromaticity (x, y)	x=0.3735 y=0.3703
Chromaticity (u', v')	u'=0.2231 v'=0.4977
Color Rendering Index (CRI)	83.9
R9	11

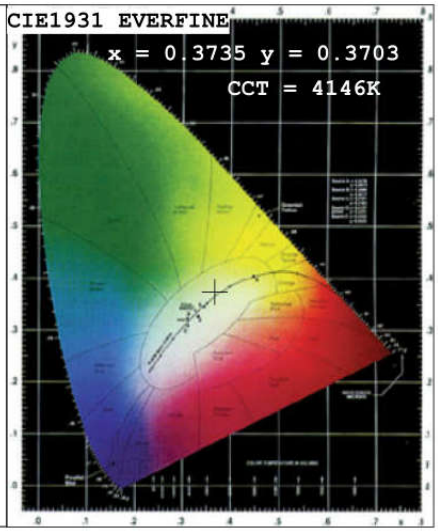
Special Color Rendering Indices			
R1	83	R9	11
R2	94	R10	84
R3	94	R11	79
R4	80	R12	63
R5	83	R13	87
R6	90	R14	98
R7	83	R15	77
R8	63	--	--

Photometric Measurement –Sphere-Spectroradiometer Method:

Parameter	Result	
Test Voltage (V)	120.0	277.0
Frequency (Hz)	60	60
Total Luminous (lm)	1283	1281
Luminous Efficacy (lm/W)	124.81	123.77
Worst Luminous/Highest Watts	123.77	

Spectral Power Distribution & Chromaticity Diagram





2.3 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction QD25)

Test date	2018-10-08	Test Ambient:	25.2 º C
Test Orientation	As intended	Stabilization Time (min)	90
Model Number	L24T8/840/8G-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	0.1687	20.12	0.9936	4.97
NB-B6, 7	277.0	60	0.0815	20.26	0.8978	20.58

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)	4149
Duv	-0.0011
Chromaticity (x, y)	x=0.3735 y=0.3701
Chromaticity (u', v')	u'=0.2232 v'=0.4976
Color Rendering Index (CRI)	84.0
R9	12

Special Color Rendering Indices			
R1	84	R9	12
R2	94	R10	85
R3	94	R11	79
R4	80	R12	63
R5	83	R13	87
R6	90	R14	98
R7	83	R15	77
R8	64	--	--

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)	2088.1	2085.6
Luminous Efficacy (lm/W)	103.78	102.94
Worst Luminous/Highest Watts	102.94	
Zonal lumens in the 0-60° zone (%)	84.4	--
SC: 0-180° (if applicable)	1.35	--
SC: 90-270° (if applicable)	1.17	--
Beam Angle (°)	100.6	--
Center Beam Candle Power (cd)	842	--

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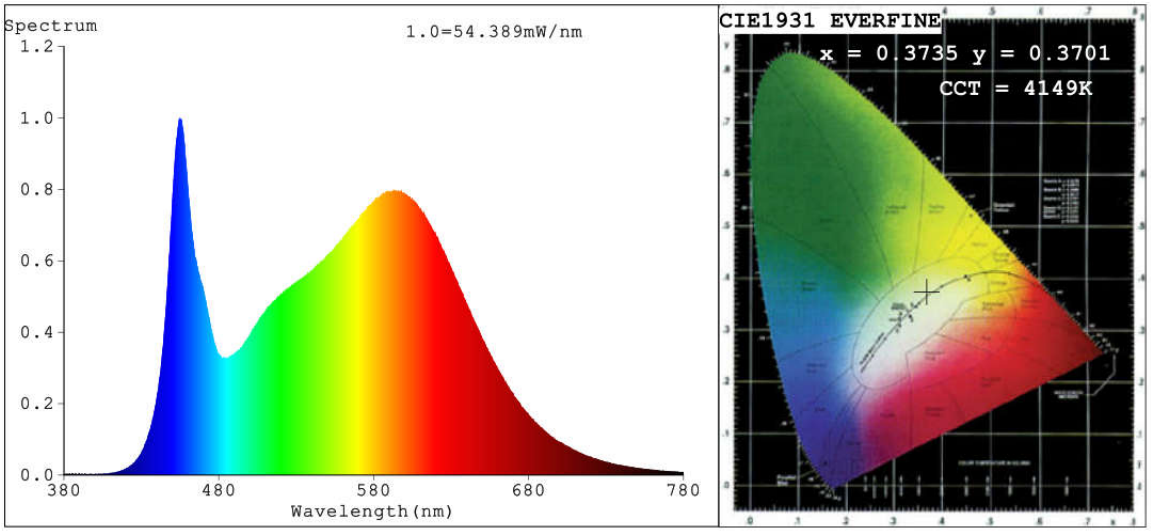
Spectral Power Distribution & Chromaticity Diagram



Zonal Lumen Tabulation

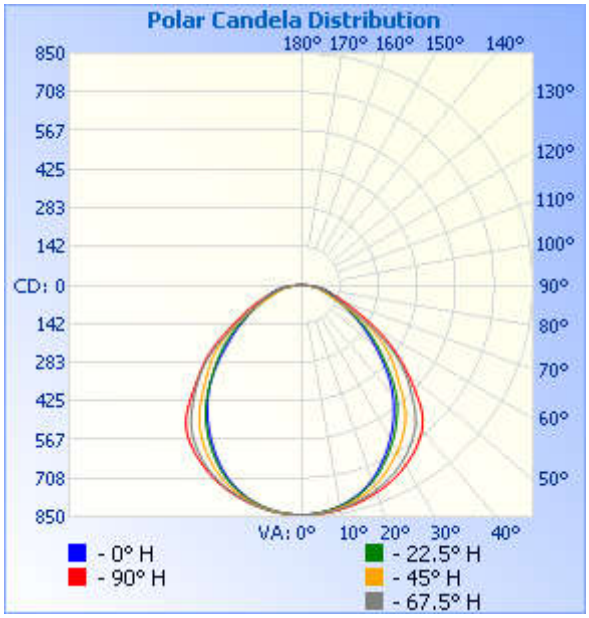
Zonal Lumen Summary

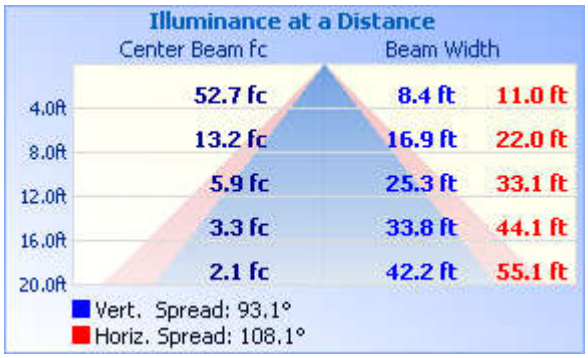
Zone	Lumens	% Luminaire
0-30	651.8	31.2%
0-40	1,059.6	50.8%
0-60	1,761.2	84.4%
60-90	319.9	15.3%
70-100	139.2	6.7%
90-120	2.8	0.1%
0-90	2,081.2	99.7%
90-180	6.7	0.3%
0-180	2,087.8	100%

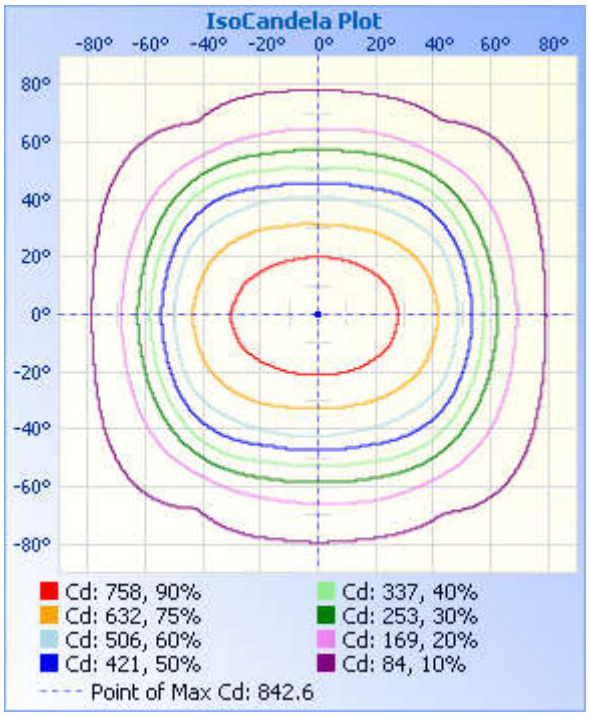
Lumens Per Zone

Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	79.7	3.8%	90-100	0.7	0%
10-20	228.2	10.9%	100-110	1.0	0%
20-30	343.9	16.5%	110-120	1.2	0.1%
30-40	407.8	19.5%	120-130	1.1	0.1%
40-50	394.1	18.9%	130-140	1.0	0%
50-60	307.5	14.7%	140-150	0.8	0%
60-70	181.4	8.7%	150-160	0.5	0%
70-80	103.2	4.9%	160-170	0.3	0%
80-90	35.3	1.7%	170-180	0.1	0%

Photometric Data







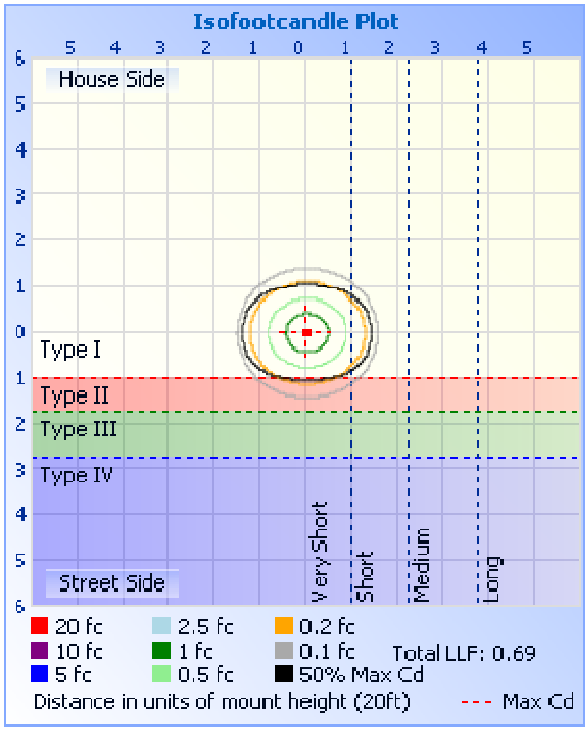


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Table--1 UNIT: cd

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	842	842	842	842	842	842	842	842	842	842	842	842	842	842	842	842
5	839	839	839	838	837	838	839	840	841	840	839	838	838	838	839	839
10	829	829	827	824	822	824	828	832	835	833	829	825	824	824	826	830
15	815	813	806	799	797	800	810	819	824	820	811	803	799	801	808	814
20	797	792	778	765	759	766	784	800	810	802	786	771	764	769	781	794
25	774	765	741	719	709	720	748	776	790	780	751	727	715	724	745	767
30	743	728	695	663	653	667	705	745	764	749	709	674	658	669	700	732
35	709	684	639	602	591	610	656	705	732	709	662	617	597	609	646	688
40	657	623	567	528	522	546	593	654	690	659	599	554	531	537	575	627
45	565	547	489	449	442	462	508	575	617	583	515	470	453	457	496	549
50	476	466	422	377	359	378	438	496	514	499	442	386	367	384	427	469
55	387	362	340	304	287	303	359	396	418	397	362	309	293	309	347	367
60	286	255	243	227	222	226	256	280	315	282	259	231	227	232	252	261
65	214	184	164	171	169	167	164	187	221	190	165	169	172	176	172	188
70	154	134	108	133	132	132	104	129	156	132	105	132	134	138	114	137
75	109	96.9	79.9	101	106	103	79.0	93.1	110	95.8	78.6	102	108	104	83.1	98.6
80	76.7	64.0	62.1	68.4	76.1	72.5	63.5	64.0	78.5	65.3	64.8	72.2	78.6	71.7	65.3	64.9
85	29.4	27.2	26.7	33.1	34.8	36.8	30.9	29.8	34.9	32.5	33.6	39.0	38.6	36.4	30.0	27.9
90	0.33	0.37	0.80	0.95	0.18	0.67	0.55	0.26	0.17	0.20	0.57	6.18	0.12	5.61	0.37	0.38
95	0.34	0.38	0.54	0.38	0.25	0.38	0.43	0.28	0.34	0.37	0.66	0.58	0.36	1.26	0.37	0.43
100	0.74	0.69	0.77	0.41	0.26	0.39	0.43	0.31	1.24	1.00	0.75	0.50	0.49	0.40	1.01	0.98
105	1.49	1.40	1.23	0.44	0.26	0.40	0.91	1.40	1.49	1.30	1.26	0.61	0.54	0.60	1.31	1.75
110	1.74	1.60	1.23	0.46	0.30	0.45	0.92	1.79	1.77	2.03	1.06	0.65	0.64	0.72	1.12	1.95
115	2.00	1.72	1.17	0.60	0.40	0.57	1.15	1.41	1.88	1.43	1.27	0.86	0.69	0.77	1.24	1.80
120	1.21	1.09	1.10	0.77	0.51	0.63	1.39	1.31	1.77	1.72	1.31	0.97	0.77	0.82	1.28	1.57
125	1.24	1.19	1.14	0.83	0.53	0.69	1.35	1.55	2.12	1.86	1.29	1.14	0.94	1.00	1.27	1.63
130	1.31	1.34	1.13	0.86	0.56	0.76	1.35	1.59	2.14	1.80	1.30	1.20	1.04	1.20	1.29	1.69
135	1.42	1.38	1.12	0.86	0.80	0.81	1.40	1.63	1.94	1.79	1.30	1.14	1.08	1.22	1.30	1.62
140	1.40	1.35	1.10	0.86	0.83	0.80	1.35	1.63	2.03	1.78	1.30	1.11	1.12	1.23	1.36	1.60
145	1.37	1.32	1.09	0.84	1.00	0.80	0.91	1.58	1.83	1.78	1.29	1.06	1.29	1.23	1.17	1.66
150	1.35	1.28	0.91	0.82	0.97	0.80	0.83	1.49	1.61	1.69	1.30	1.00	1.27	1.23	1.15	1.46
155	1.32	1.16	0.79	0.81	0.97	0.80	0.69	1.36	1.50	1.52	1.26	0.83	1.26	1.29	1.09	1.43
160	1.17	0.95	0.77	0.83	0.97	0.81	0.67	1.12	1.42	1.43	1.17	0.83	1.26	1.34	1.04	1.18
165	1.16	0.97	0.77	0.86	1.13	0.85	0.65	1.03	1.37	1.37	1.16	0.83	1.26	1.36	1.09	1.09
170	1.15	0.99	0.78	1.00	1.23	1.11	0.66	1.03	1.34	1.31	1.18	0.83	1.26	1.37	1.32	0.99
175	1.20	1.29	0.84	1.26	1.26	1.21	0.77	1.03	1.32	1.25	1.26	0.83	1.26	1.37	1.34	0.90
180	1.23	1.29	0.83	1.26	1.37	1.29	0.77	1.32	1.29	1.23	1.29	0.83	1.26	1.37	1.23	0.77

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 ********