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): L24T8/835/8G-XT 2C N

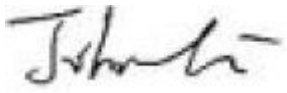
Report Type:	Testing and Report According to IES LM-79-2008
Type of Luminaire:	2-lamp External Driver Lamp-Style Retrofit Kits (UL Type C)
Report Date:	2018-10-15
Prepared By:	Ningbo TengLi Testing Co., Ltd 2nd floor, Block B, Ningbo Testing and Certification Base, No. 66 Qingyi Road, Ningbo National 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	L24T8/835/8G-XT 2C N	
Remark	N/A	
Representative (Tested) Model	L24T8/835/8G-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-B4, 5	
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	3500K

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)	3500K Bare Lamp	120V	10.45	N/A	N/A
		277V	10.52		
	3500K In Luminaire	120V	20.61		
		277V	20.74		
Power Factor	3500K Bare Lamp	120V	0.9936	Pass	>= 0.9(-3%)
		277V	0.8981		
	3500K In Luminaire	120V	0.9938		
		277V	0.8984		
THD %	3500K Bare Lamp	120V	4.76	Pass	<= 20(+5)
		277V	20.43		
	3500K In Luminaire	120V	4.83		
		277V	20.52		
CRI	3500K Bare Lamp		82.6	Pass	>= 80(-2)
	3500K In Luminaire		84.4		
CCT (K)	3500K Bare Lamp		3441	Pass	<=5000K
	3500K In Luminaire		3424		
Luminous Intensity Distribution	Zonal lumens in the 0-60°:		84.4	Pass	>= 75(-2)
	SC: 0-180° (if applicable):		1.33	Pass	1.0-2.0(±0.1)
	SC: 90-270° (if applicable):		1.17	Pass	
Total Luminous	3500K Bare Lamp	120V	1280	Pass	>=800(-10%)
		277V	1273		
	3500K In Luminaire	120V	2128.4		>=1350(-10%)
		277V	2117.4		
Luminous Efficacy	3500K Bare Lamp	120V	122.49	Pass	Standard: >= 110(-3%)
		277V	121.01		
	3500K In Luminaire	120V	103.27		Standard: >= 100(-3%)
		277V	102.10		

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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	L24T8/835/8G-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	0.0876	10.45	0.9936	4.76
NB-B4	277.0	60	0.0423	10.52	0.8981	20.43

Chromaticity Measurement - Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	3441
Duv	0.0001
Chromaticity (x, y)	x=0.4088 y=0.3927
Chromaticity (u', v')	u'=0.2372 v'=0.5126
Color Rendering Index (CRI)	82.6
R9	5

Special Color Rendering Indices			
R1	81	R9	5
R2	91	R10	80
R3	96	R11	79
R4	80	R12	67
R5	81	R13	84
R6	89	R14	98
R7	83	R15	74
R8	60	--	--

Photometric Measurement –Sphere-Spectroradiometer Method:

Parameter	Result	
Test Voltage (V)	120.0	277.0
Frequency (Hz)	60	60
Total Luminous (lm)	1280	1273
Luminous Efficacy (lm/W)	122.49	121.01
Worst Luminous/Highest Watts	121.01	

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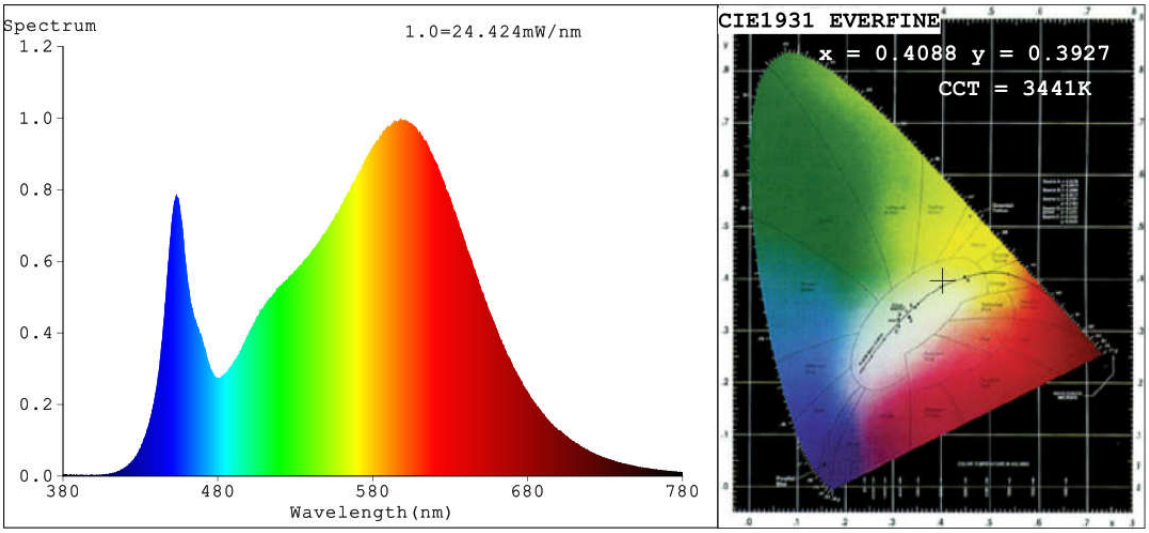
Spectral Power Distribution & Chromaticity Diagram



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	L24T8/835/8G-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	0.1728	20.61	0.9938	4.83
NB-B4, 5	277.0	60	0.0833	20.74	0.8984	20.52

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)	3424
Duv	0.0002
Chromaticity (x, y)	x=0.4099 y=0.3935
Chromaticity (u', v')	u'=0.2375 v'=0.5131
Color Rendering Index (CRI)	82.7
R9	6

Special Color Rendering Indices			
R1	81	R9	6
R2	91	R10	80
R3	96	R11	79
R4	80	R12	67
R5	81	R13	84
R6	89	R14	98
R7	83	R15	74
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)	2128.4	2117.5
Luminous Efficacy (lm/W)	103.27	102.10
Worst Luminous/Highest Watts	102.10	
Zonal lumens in the 0-60° zone (%)	84.4	--
SC: 0-180° (if applicable)	1.33	--
SC: 90-270° (if applicable)	1.17	--
Beam Angle (°)	100.2	--
Center Beam Candle Power (cd)	862	--

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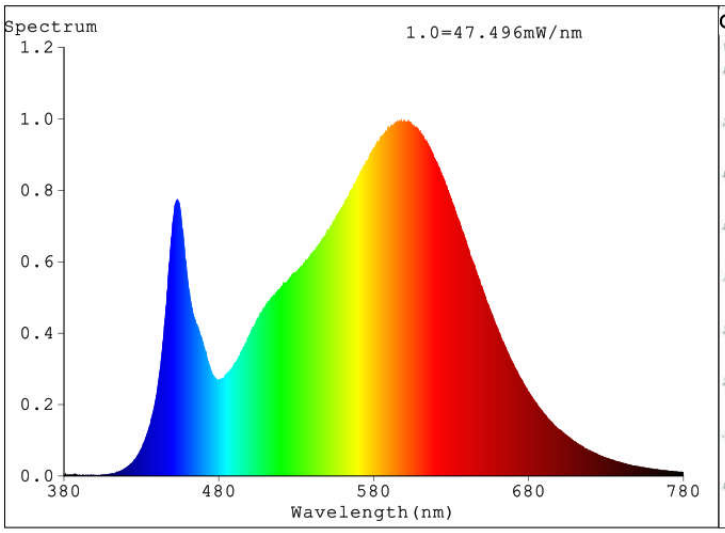
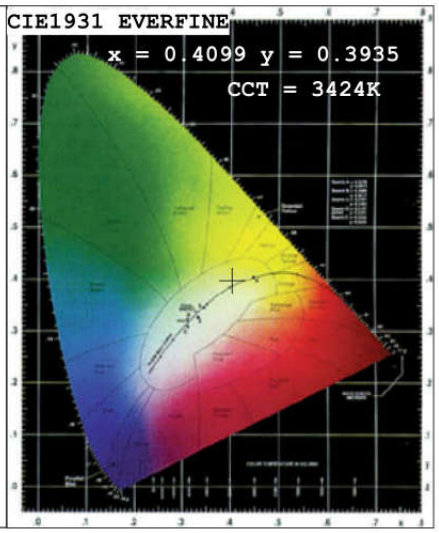


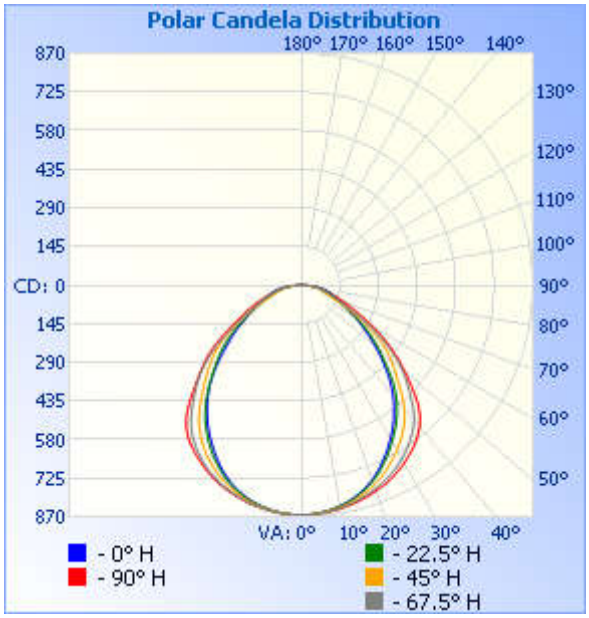


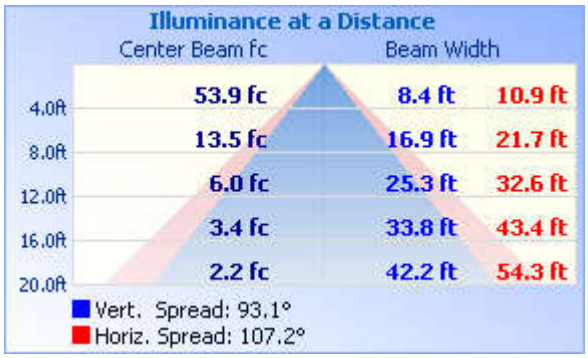
Zonal Lumen Tabulation

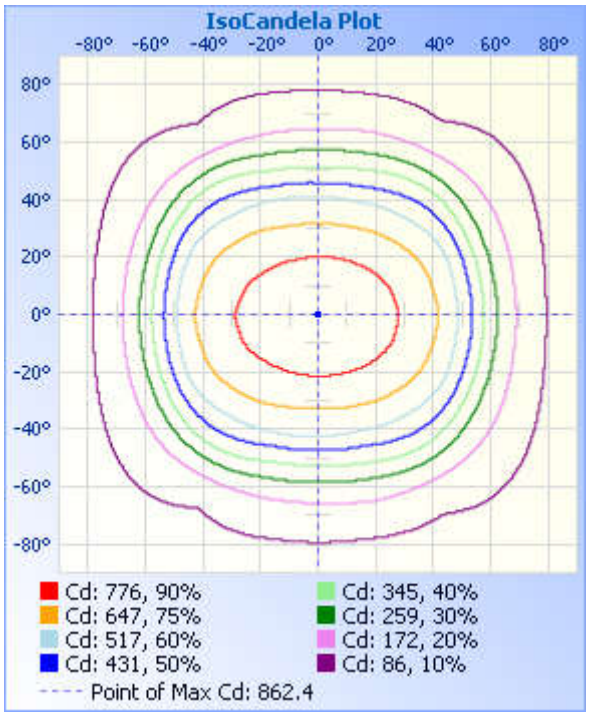
Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	666.5	31.3%
0-40	1,082.6	50.9%
0-60	1,795.4	84.4%
60-90	325.8	15.3%
70-100	142.6	6.7%
90-120	3.0	0.1%
0-90	2,121.2	99.7%
90-180	6.9	0.3%
0-180	2,128.2	100%

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	81.6	3.8%	90-100	0.8	0%
10-20	233.4	11.0%	100-110	1.0	0%
20-30	351.5	16.5%	110-120	1.1	0.1%
30-40	416.1	19.6%	120-130	1.1	0.1%
40-50	401.1	18.8%	130-140	1.0	0%
50-60	311.8	14.7%	140-150	0.8	0%
60-70	184.0	8.6%	150-160	0.5	0%
70-80	105.2	4.9%	160-170	0.3	0%
80-90	36.6	1.7%	170-180	0.1	0%

Photometric Data







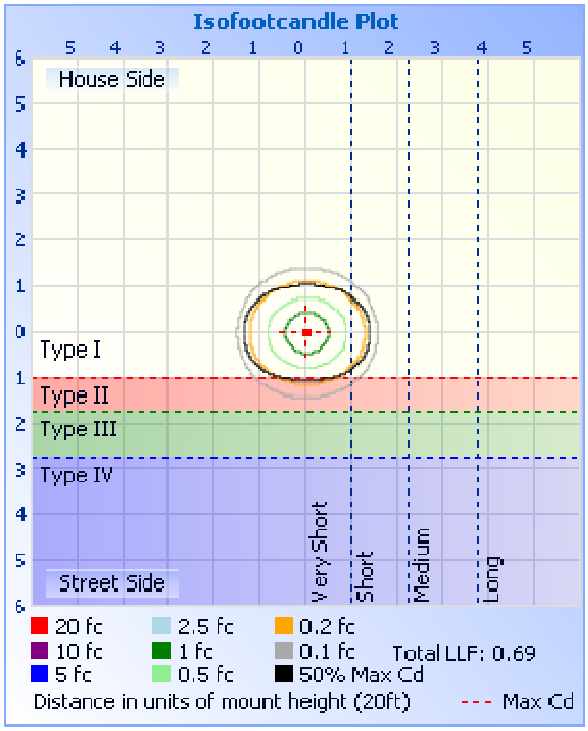


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Table--1 UNIT: cd

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	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862
5	859	859	858	857	857	857	858	859	860	859	858	858	858	858	859	860
10	850	849	846	843	842	842	846	850	852	850	847	845	844	845	847	850
15	836	833	826	819	816	818	827	834	839	835	828	822	819	822	828	835
20	817	811	798	784	778	783	799	814	822	816	801	789	783	789	801	814
25	793	784	760	737	727	736	761	788	801	791	765	743	734	744	765	787
30	761	746	712	681	669	681	717	754	772	758	721	689	676	689	720	751
35	725	700	655	618	606	623	667	712	737	716	671	630	613	626	664	706
40	671	638	582	543	535	557	602	659	692	663	607	565	545	552	591	642
45	577	559	502	460	454	472	515	578	615	584	520	478	464	470	509	562
50	487	476	433	387	368	385	442	496	510	498	446	392	376	395	440	480
55	396	371	350	312	293	309	362	395	412	394	362	312	299	317	356	376
60	293	262	250	233	227	230	258	279	310	279	257	233	231	238	258	267
65	219	188	169	176	172	169	165	188	219	189	165	171	176	181	176	193
70	157	137	111	136	134	133	105	130	156	132	105	135	138	141	116	141
75	113	99.2	81.5	103	108	104	79.1	94.3	111	96.4	79.7	104	111	107	85.6	102
80	80.1	66.6	64.2	70.7	78.2	73.6	64.0	64.9	78.6	65.8	66.0	74.3	80.9	73.6	68.0	67.5
85	32.3	29.8	28.8	35.3	36.7	38.1	32.0	30.9	35.0	32.9	34.2	40.4	39.7	37.7	31.5	30.3
90	0.31	0.47	0.73	0.90	0.18	0.59	0.52	0.30	0.26	0.29	7.29	7.01	0.15	0.41	0.68	3.60
95	0.32	0.41	0.44	0.26	0.20	0.40	0.35	0.35	0.41	0.44	3.61	0.38	0.30	0.38	0.47	0.52
100	0.71	0.49	0.52	0.29	0.24	0.34	0.52	0.61	1.00	0.96	0.64	0.44	0.46	0.35	1.17	1.22
105	1.31	1.31	0.84	0.32	0.28	0.37	0.82	1.37	1.83	1.69	1.10	0.73	0.61	0.64	1.49	1.92
110	1.61	1.45	0.96	0.40	0.32	0.49	0.83	1.71	2.16	1.75	1.16	0.87	0.66	0.67	1.08	2.21
115	1.37	1.19	0.96	0.64	0.35	0.71	0.96	1.30	1.80	1.54	1.48	1.05	0.71	0.84	1.34	1.60
120	1.18	1.21	0.96	0.77	0.40	0.75	1.25	1.25	2.06	1.73	1.48	1.13	0.84	0.97	1.36	1.79
125	1.24	1.25	1.07	0.81	0.47	0.79	1.31	1.40	2.18	1.89	1.48	1.28	1.01	1.11	1.37	1.82
130	1.32	1.28	1.06	0.81	0.53	0.83	1.28	1.44	2.18	1.97	1.48	1.36	1.16	1.21	1.38	1.85
135	1.34	1.28	1.05	0.82	0.69	1.02	1.26	1.45	2.15	1.84	1.47	1.35	1.24	1.24	1.39	1.74
140	1.29	1.27	1.03	0.81	0.82	1.00	1.23	1.45	1.89	1.83	1.47	1.34	1.36	1.28	1.39	1.74
145	1.24	1.26	1.02	0.83	0.83	0.93	1.14	1.45	1.89	1.81	1.46	1.28	1.33	1.31	1.34	1.72
150	1.19	1.25	0.82	0.83	0.84	0.87	1.09	1.41	1.88	1.73	1.46	1.11	1.33	1.31	1.25	1.48
155	1.13	1.06	0.70	0.80	0.85	0.84	0.96	1.39	1.87	1.69	1.45	0.96	1.33	1.31	1.28	1.36
160	1.05	0.84	0.67	0.81	0.86	0.81	0.76	1.37	1.86	1.54	1.37	0.96	1.33	1.31	1.28	1.16
165	1.08	0.99	0.75	0.83	0.98	1.00	0.76	1.32	1.47	1.41	1.16	0.88	1.33	1.31	1.22	1.01
170	1.10	1.13	0.79	1.13	1.25	1.31	0.76	1.25	1.44	1.34	1.28	0.84	1.33	1.31	1.31	0.87
175	1.28	1.22	0.81	1.30	1.29	1.31	0.76	1.23	1.41	1.29	1.34	0.82	1.33	1.31	1.35	0.77
180	1.25	1.28	0.81	1.34	1.30	1.31	0.76	1.28	1.39	1.31	1.28	0.81	1.33	1.31	1.31	0.76

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 ********