



UL-CCIC Company Limited
No.2 Chengwan Road,
Suzhou Industrial Park
Suzhou 215122, China
86-512-68086400



NVLAP LAB CODE: 600106-0

Photometric Test Report

Relevant Standards

- IES LM-79-2008
- ANSI C82.77-2002
- UL1598-2008/ UL1993-2012

Prepared For

Longhorn Lighting Co., Ltd

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Catalog Number

LH-L8X144Q00

Project Number

4787876298

Report Number

4787876298_3

Test Date

3/22/2017 - 3/24/2017

Issue Date

3/28/2017

Prepared By

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Approved By

Duff Yang

Duff Yang

The results contained in this report pertain only to the tested sample.

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1.0 Test Summary

DLC Technical Requirements v4.1

Type A, Four-foot Linear Replacement Lamps				
Requirement Category	Test Method	Requirements	Test value	Results (Fail/Pass)
Minimum Light Output (lm)	IES LM-79-2008	In Fixture: 3000 lm	3256.442	Pass
Minimum Lamp Output (lm)	IES LM-79-2008	Bare Lamp: 1600 lm	2010.76	Pass
Spacing Criteria (0-180°)	IES LM-79-2008	1.0-2.0	1.22	Pass
Spacing Criteria (90-270°)	IES LM-79-2008	1.0-2.0	1.4	Pass
Zonal Lumen Requirement (0-60°)	IES LM-79-2008	≥75%	86%	Pass
Zonal Lumen Requirement 2	IES LM-79-2008	N/A	N/A	N/A
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	100	108.26	Pass
Minimum Lamp Efficacy (lm/W)	IES LM-79-2008	110	134.01	Pass
Allowable CCTs* (K)	IES LM-79-2008	≤5000	5024	Pass
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	≥80	81.87	Pass
L70 Lumen maintenance (hours)	IES LM-80-2015 IES TM-21-2011	≥50000	≥50000	Pass
L90 Lumen maintenance (hours)	IES LM-80-2015 IES TM-21-2011	N/A	N/A	N/A
Power Factor	ANSI C82.77-2002	≥0.9	0.9338	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-2002	≤20%	4.90%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008/ UL1993-2012	≤105	48.7	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008/ UL1993-2012	N/A	N/A	N/A
Minimum Luminaire Warranty (years)	N/A	5	5	Pass

*Defined by ANSI C78.377-2011‡

‡ANSI C78.377-2015 also referred to for Duv and (x,y) chromaticity coordinates tolerances for indoor categories.



3.0 Test List

Test Item	Test	Test Date	Model Number	Tests Conducted By
1	Integrating Sphere Test for the Lower CCT	3/22/2017	LH-L8V144Q00	Gavin Yang
2	Integrating Sphere Test for the Higher CCT	3/22/2017	LH-L8R144Q00	Gavin Yang
3	Goniophotometer Test	3/24/2017	LH-L8V144Q00	Gavin Yang
4	THD and PF Test	3/22/2017	LH-L8V144Q00	Gavin Yang
5	In-Situ Temperature Measurement Test	3/24/2017	LH-L8V144Q00	Gavin Yang

Remark (if any)

1. UL test equipment information is recorded on Meter Use in UL's Laboratory Project Management (LPM) database.
2. The lamps were tested with a programmed start ballast# QHE2x28T5/UNV PSN which ballast factor is 1.0.



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4.0 Production Description

Luminaire Description: 120-277 V, 14 W

Lighting Source: 67-21S

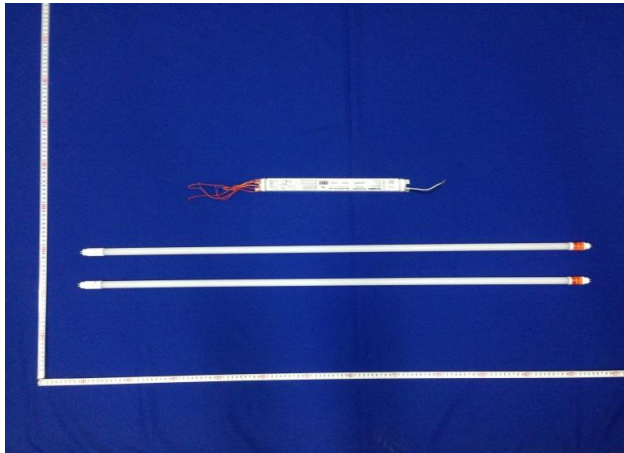
Mounting: T5 linear replacement lamps, Type A, 4 ft

Family Model: LH-L8V144Q00, LH-L8R144Q00

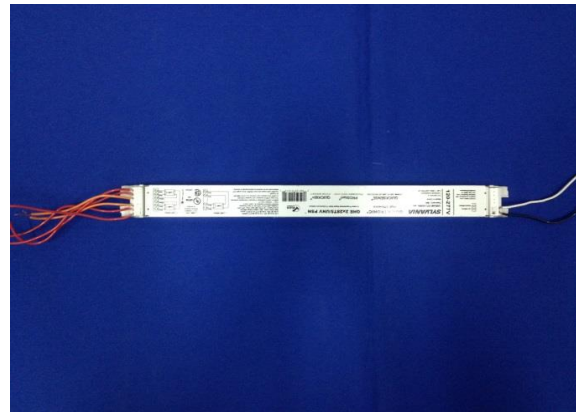
Variation: Only Variation in CCT

Photos of Luminaire Characteristics

Bare Lamp



Ballast



In Fixture





5.0 LM-79 Measurement and Test Results

5.1 Integrating Sphere Test for the lower CCT

Model No.	LH-L8V144Q00	Sample ID.	831593-3, 831593-4
Operate time (Min.)	50	Stabilization time (Min.)	45

Test Method

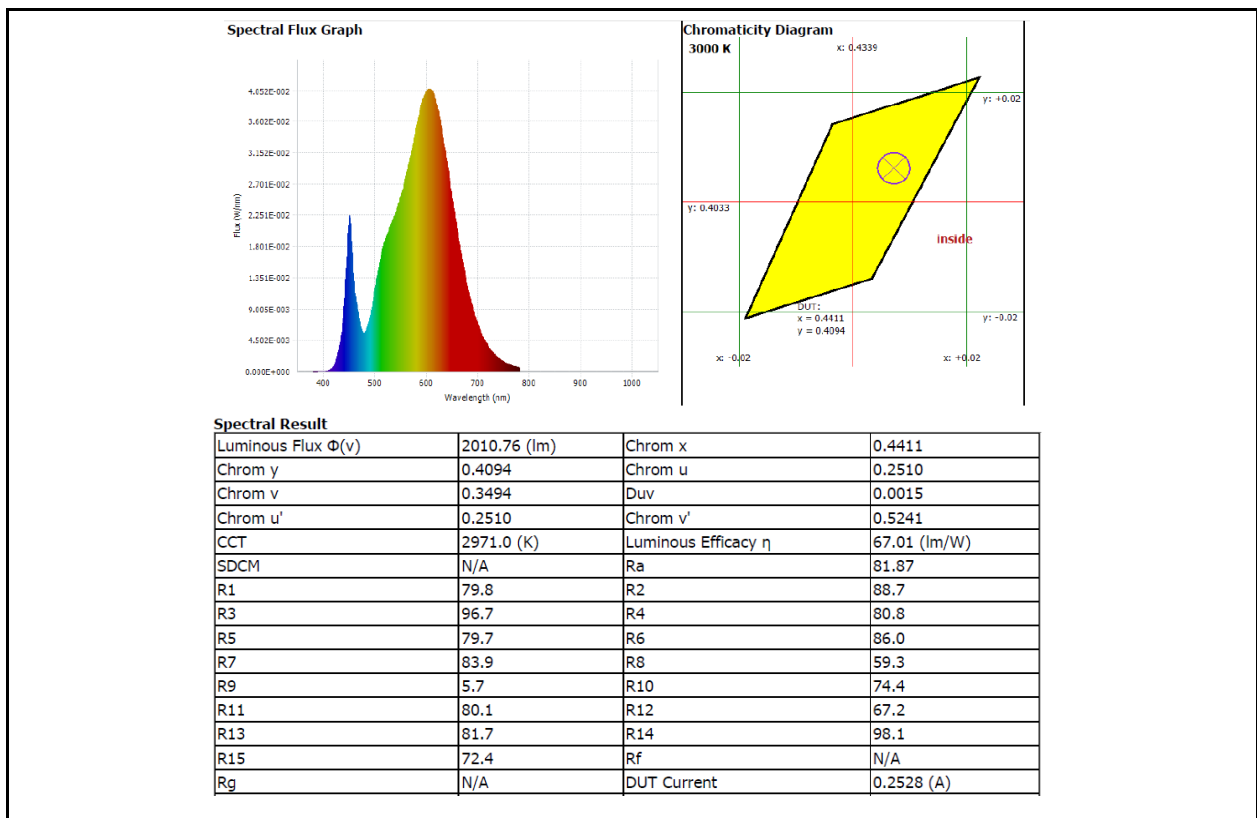
1. The sample was tested according to the IES LM-79-2008.
2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25° C ± 1° C.
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency(Hz)	Current (A)	Power (W)	Power (W)/2	Power Factor
25.1	119.99	60	0.2528	30.01	15.00	0.989

Test Results

Orientation	CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
Horizontal	2971	81.9	0.0015	2010.8	134.01





5.0 LM-79 Measurement and Test Results

5.2 Integrating Sphere Test for the higher CCT

Model No.	LH-L8R144Q00	Sample ID.	831593-1, 831593-2
Opreate time (Min.)	50	Stabilization time (Min.)	45

Test Method

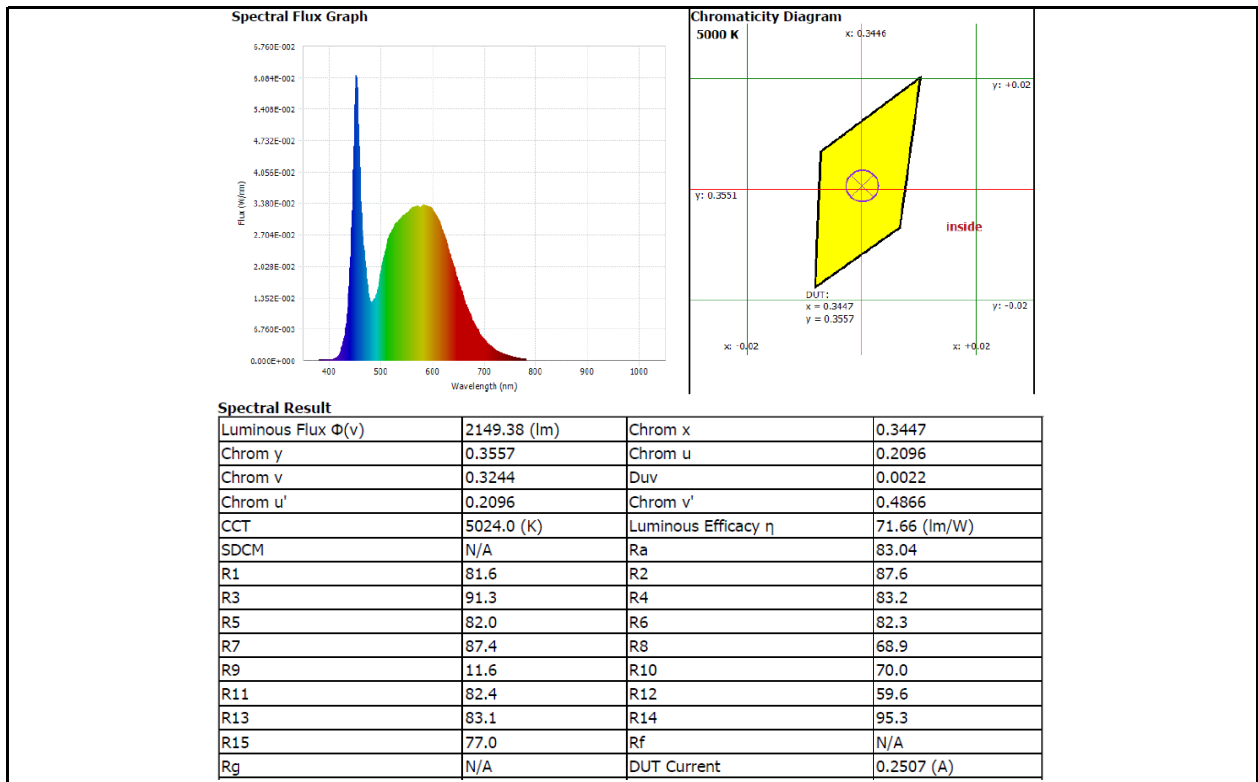
1. The sample was tested according to the IES LM-79-2008.
2. Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25° C ± 1° C.
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency(Hz)	Current (A)	Power (W)	Power (W)/2	Power Factor
25.1	120.02	60	0.2507	30.00	15.00	0.997

Test Results

Orientation	CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
Horizontal	5024	83.0	0.0022	2149.4	143.32





5.0 LM-79 Measurement and Test Results

5.3 Goniophotometer Test

Model No.	LH-L8V144Q00	Sample ID.	831593-3, 831593-4
Operate time (Min.)	50	Stabilization time (Min.)	45

Test Method

1. The sample was tested according to the IES LM-79-2008 in fixture Lithonia 2PM3N G B 2 28T5 12 LD MVOLT GEB10PS.
2. Photometric parameters were measured using a type C goniophotometer and software.
3. The ambient temperature shall be maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, measured at a point not more than 1 m from the sample and at the same height as the sample.
4. The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 0.5° vertical intervals and 22.5° horizontal intervals.

Goniophotometer Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency	Current (A)	Power (W)	Power Factor	Orientation
25.5	120.02	60	0.2520	30.08	0.994	Horizontal

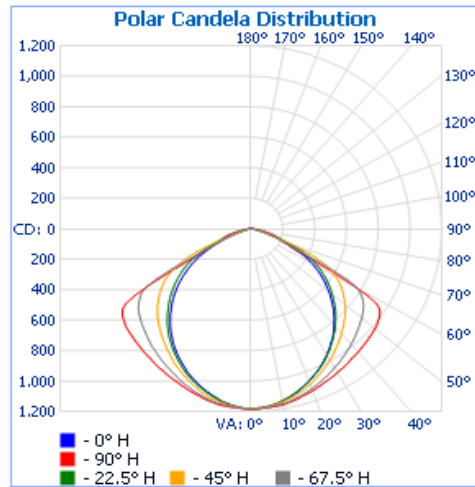
Test Result

Flux (lm)	Zonal Lumen Requirement (0-60°)	Field Angle (10%)		Beam Angle (50%)		Luminous Efficacy (lm/W)
		Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
3256.4	86.2%	151.5	141.5	122	103.8	108.26
Spacing Criteria (0-180°)		Spacing Criteria (90-270°)				
1.22		1.4				

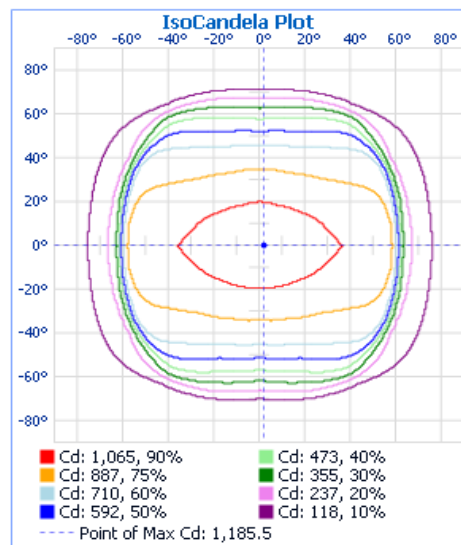


5.2 Goniophotometer Test (Cont'd)

Light Distribution Curve



IsoCandela Plot





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5.2 Goniophotometer Test (Cont'd)

Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	913.6	28.1%
0-40	1,512.5	46.4%
0-60	2,806.8	86.2%
60-90	444.3	13.6%
70-100	100.8	3.1%
90-120	1.8	0.1%
0-90	3,251.1	99.8%
90-180	5.4	0.2%
0-180	3,256.4	100%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	28.1	0.9%	90-95	0.3	0%
5-10	83.3	2.6%	95-100	0.3	0%
10-15	135.3	4.2%	100-105	0.3	0%
15-20	182.7	5.6%	105-110	0.3	0%
20-25	224.4	6.9%	110-115	0.3	0%
25-30	259.8	8.0%	115-120	0.3	0%
30-35	288.6	8.9%	120-125	0.4	0%
35-40	310.4	9.5%	125-130	0.4	0%
40-45	324.7	10.0%	130-135	0.4	0%
45-50	331.3	10.2%	135-140	0.4	0%
50-55	328.6	10.1%	140-145	0.4	0%
55-60	309.7	9.5%	145-150	0.4	0%
60-65	221.4	6.8%	150-155	0.3	0%
65-70	122.5	3.8%	155-160	0.3	0%
70-75	58.1	1.8%	160-165	0.3	0%
75-80	28.1	0.9%	165-170	0.2	0%
80-85	11.6	0.4%	170-175	0.2	0%
85-90	2.5	0.1%	175-180	0.1	0%



5.2 Goniophotometer Test (Cont'd)

Intensity Data(cd)

	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182
1	1178	1181	1179	1184	1186	1184	1181	1180	1178	1180	1181	1184	1186	1184	1179	1181	1178
2	1177	1180	1180	1182	1184	1182	1181	1178	1178	1178	1181	1182	1184	1182	1180	1180	1177
3	1177	1178	1178	1180	1183	1179	1179	1179	1176	1179	1179	1179	1183	1180	1178	1178	1177
4	1175	1176	1176	1176	1179	1176	1175	1174	1173	1174	1175	1176	1179	1176	1176	1176	1175
5	1174	1170	1172	1175	1178	1174	1172	1171	1168	1171	1172	1174	1178	1175	1172	1170	1174
6	1170	1168	1169	1174	1179	1171	1169	1168	1164	1168	1169	1171	1179	1174	1169	1168	1170
7	1164	1164	1164	1170	1176	1172	1167	1162	1159	1162	1167	1172	1176	1170	1164	1164	1164
8	1169	1160	1162	1169	1174	1168	1162	1156	1154	1156	1162	1168	1174	1169	1162	1160	1159
9	1153	1151	1158	1166	1175	1165	1157	1150	1148	1150	1157	1165	1175	1166	1158	1151	1153
10	1148	1146	1152	1163	1172	1164	1153	1143	1140	1143	1153	1164	1172	1163	1152	1146	1148
11	1141	1140	1149	1164	1169	1162	1146	1136	1132	1136	1146	1162	1169	1164	1149	1140	1141
12	1136	1133	1142	1158	1165	1158	1143	1131	1125	1131	1143	1158	1165	1158	1142	1133	1136
13	1128	1125	1137	1154	1161	1154	1140	1121	1116	1121	1140	1154	1161	1154	1137	1125	1128
14	1120	1116	1132	1149	1157	1149	1133	1114	1108	1114	1133	1149	1157	1149	1132	1116	1120
15	1112	1108	1126	1144	1153	1143	1125	1106	1100	1106	1125	1143	1153	1144	1126	1108	1112
16	1103	1100	1120	1141	1148	1137	1118	1098	1092	1098	1118	1137	1148	1141	1120	1100	1103
17	1094	1091	1112	1134	1143	1134	1109	1089	1082	1089	1109	1134	1143	1134	1112	1091	1094
18	1084	1084	1104	1129	1140	1128	1102	1083	1072	1083	1102	1128	1140	1129	1104	1084	1084
19	1075	1075	1094	1124	1136	1122	1093	1073	1063	1073	1093	1122	1136	1124	1094	1075	1075
20	1067	1064	1087	1118	1132	1116	1084	1064	1053	1064	1084	1116	1132	1118	1087	1064	1067
25	1013	1016	1042	1087	1108	1084	1040	1013	999	1013	1040	1084	1108	1087	1042	1016	1013
30	955	958	994	1053	1090	1050	991	955	938	955	991	1050	1090	1053	994	958	955
35	888	894	942	1020	1070	1017	937	890	867	890	937	1017	1070	1020	942	894	888
40	812	825	888	984	1053	984	885	819	792	819	885	984	1053	984	888	825	812
45	730	751	833	947	1035	946	831	737	705	737	831	946	1035	947	833	751	730
50	638	666	773	911	1018	911	766	652	612	652	766	911	1018	911	773	666	638
55	539	577	701	863	987	862	690	561	505	561	690	862	987	863	701	577	539
60	427	477	606	761	734	755	594	457	390	457	594	755	734	761	606	477	427
65	302	353	447	262	265	248	424	325	258	325	424	248	265	262	447	353	302
70	154	186	154	163	195	161	127	156	113	156	127	161	195	163	154	186	154
75	55	59	63	98	129	97	59	50	42	50	59	97	129	98	63	59	55
80	22	23	29	46	62	44	27	20	17	20	27	44	62	46	29	23	22
85	7	8	10	15	20	14	9	6	5	6	9	14	20	15	10	8	7
90	0	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	0
95	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0
100	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0
105	0	1	1	0	1	0	1	1	0	1	1	0	1	0	1	1	0
110	0	0	0	1	1	1	1	0	1	0	1	1	1	1	0	0	0
115	0	0	1	1	1	1	0	0	0	0	0	1	1	1	1	0	0
120	1	1	1	1	2	1	1	0	1	0	1	1	2	1	1	1	1
125	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
130	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
135	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
140	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
145	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1
150	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
155	1	2	2	1	1	1	2	2	1	2	2	1	1	1	2	2	1
160	1	1	2	2	2	1	2	1	2	1	2	1	2	2	2	1	1
165	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
170	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
175	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
180	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2



6.0 THD and PF Test

Model No.	LH-L8V144Q00	Sample ID.	831593-3, 831593-4
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Test Method

1. The samples were tested according to the ANSI C82.77-2002.
2. The ambient temperature condition was maintained at 25° C ± 1° C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency	Current (A)	Power (W)	Power Factor	Current THD
25.1	277.04	60	0.116	29.87	0.934	4.9%



7.0 In-Situ Temperature Measurement Test

Model No.	LH-L8V144Q00	Sample ID.	831593-3, 831593-4
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Test Method

- In-Situ Temperature Measurement Test is conducted according to the UL1598-2008, Section 14 or UL1993-2012, Section 8.5 in fixture Lithonia 2PM3N G B 2 28T5 12 LD MVOLT GEB10PS.
- The testing was conducted in a room with ambient temperature of $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$. The apparatus construction followed those described in UL1598-2008 for normal temperature testing. Thermocouples were placed on the LED package in the locations indicated by LM-80 report. The temperature was recorded after the lamp was operated by 3.5 hours in stability or by 7.5 hours.

In-Situ Temperature Measurement Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency	Current (A)	Power (W)	Power Factor	Orientation
24.5	119.99	60	0.2528	30.01	0.989	Horizontal

Test Results

Thermocouple Location	Manufacturer Declared Current (mA)	Temperature for Lighting source (°C)		LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp. (°C)
		Test result column 1	Test result (Correct to 25 °C)			
TMP1 of LEDs	34	48.5	49.0	67-21S	60	55
TMP2 of LEDs		48.2	48.7			
Ambient temperature	N/A	24.5	25.0			



7.0 In-Situ Temperature Measurement Test (Cont'd)

Test Photos for Tc Point of LED Packages





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