



Report of Test LLI-19275-6

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 40 X 3G2S XXXX XXXX
Grey cast aluminum top housing and white plastic bottom housing with clear flat glass lens.
16 LEDs in 4 x 4 array with clear plastic sheet of individual lenses.
One Osram Optotronic LED driver. Model: QT50W/UNV/1250C/2DIMLT2/P6 set to 800ma.
Operating at 120v AC and 60 Hz.



Performance Summary

Total Light Output	5541 lm	Min Power Factor	0.94 @ 277 V
Luminaire Power	43.4 W	Max THD(i)*	9.8 % @ 277 V
Luminous Efficacy	127.7 lm/W	0-90° Zonal Flux %	100.0 %
CCT	2980 K	80-90° Zonal Flux %	0.6 %
CIE(x,y) 1931	(0.439, 0.406)	BUG Rating*	B1-U0-G1
CRI	71	Street Classification*	Type II Short

PREPARED FOR : LED Roadway Lighting Ltd, 115 Chain Lake Drive, Halifax. NS Canada



Test Report No. LLI-19275-6

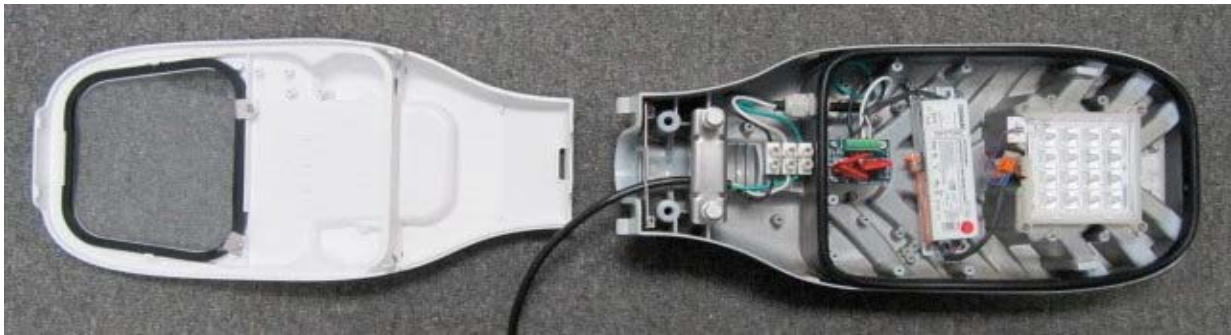
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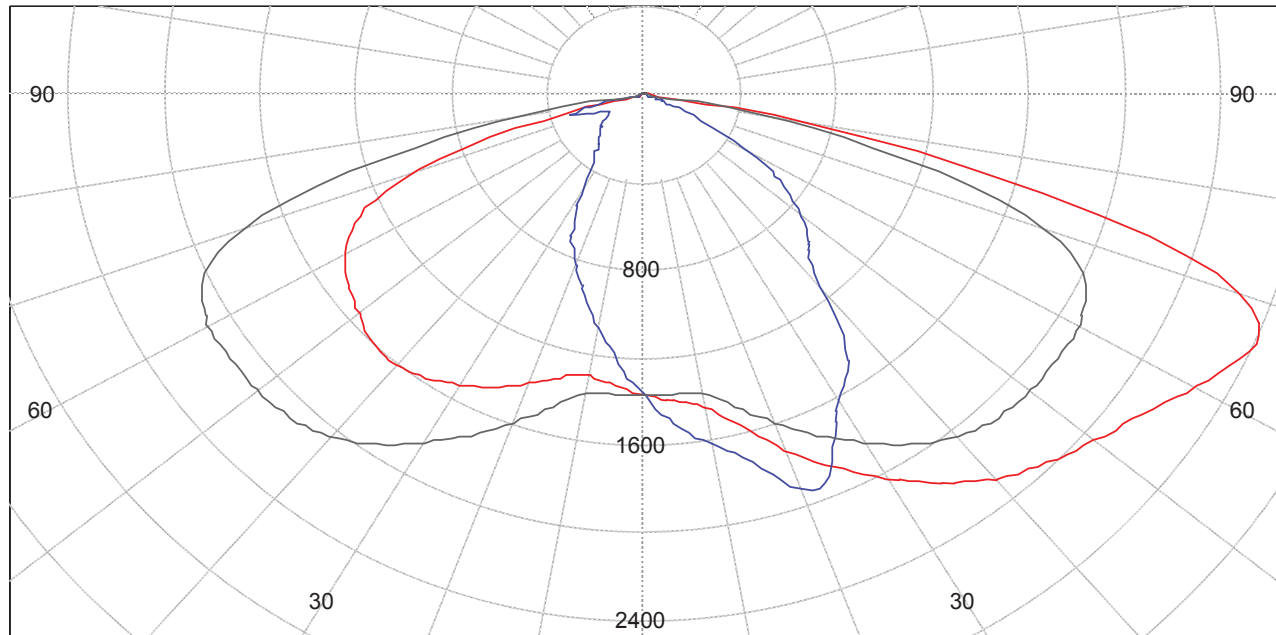




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Polar Light Distribution Curves



House side / L270

L90 / 270 - Black, Plane of maximum - Red, L0 / 180 - Blue (cd)

Street side / L90

Percentage Outputs

	Upward	Downward	Total
Street Side	0.0 %	67.8 %	67.8 %
House Side	0.0 %	32.2 %	32.2 %
	0.0 %	100.0 %	100.0 %

Report data based on absolute values as measured.

Signed:


Ryder Tunney
Authorized Signatory

Date of test
Date of report

15-Oct-2019
16-Oct-2019



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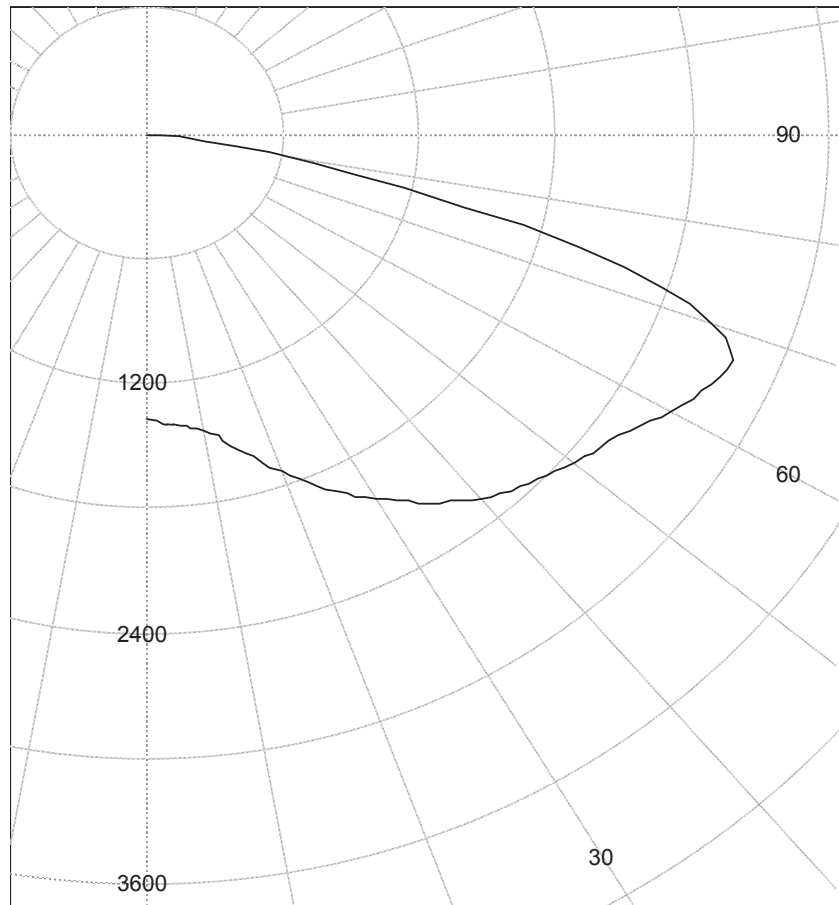
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Operating at 120v AC and 60 Hz.

Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (cd)
0.0	1372.4
10.0	1449.7
20.0	1723.0
30.0	2020.8
35.0	2163.1
40.0	2287.2
45.0	2375.4
47.5	2411.6
50.0	2450.3
52.5	2493.1
55.0	2533.4
57.5	2598.8
60.0	2661.2
62.5	2723.1
65.0	2780.9
67.5	2780.9
70.0	2641.0
72.5	2295.6
75.0	1713.9
77.5	1047.5
80.0	555.9
82.5	195.4
85.0	11.1
87.5	4.7
90.0	0.0
92.5	0.0
95.0	0.0
97.5	0.0
100.0	0.0
102.5	0.0
105.0	0.0
120.0	0.0
135.0	0.0
150.0	0.0
165.0	0.0
180.0	0.0

Principal Vertical Plane



Plane of maximum intensity (cd)

House side max intensity
2106.5 cd @ (90.0°, 58.0°)

Street side max intensity
2795.2 cd @ (75.0°, 66.5°)

Coordinates expressed in the C Type coordinate system

Data for the two symmetric halves of the luminaire has been averaged.



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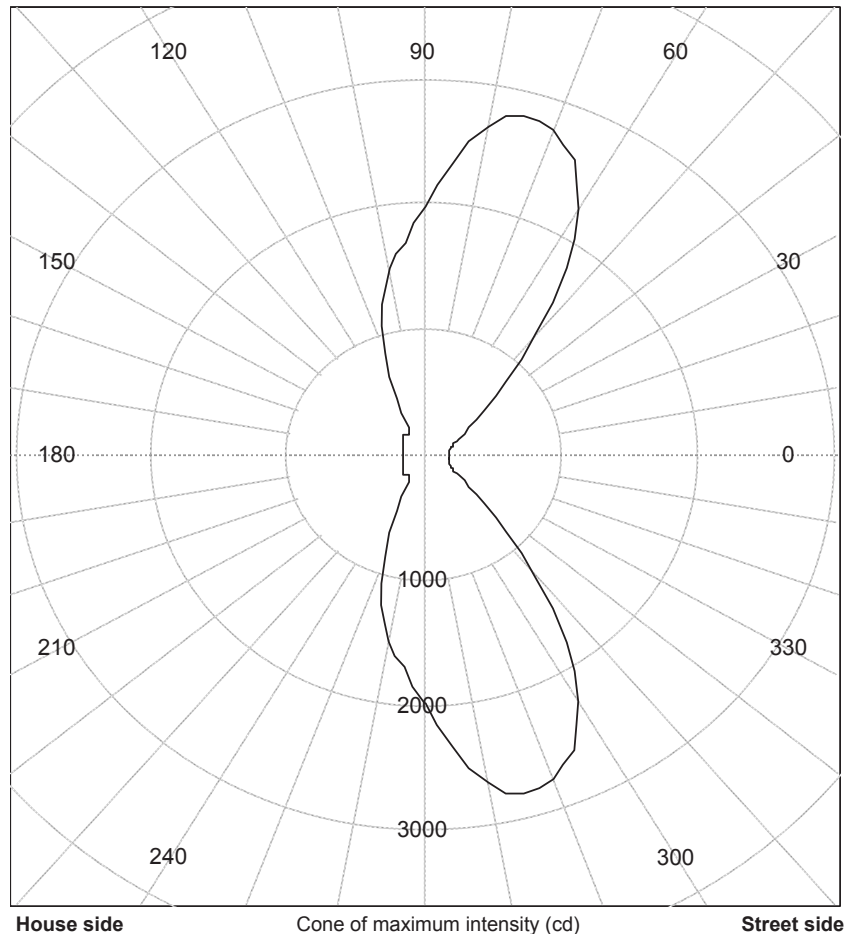
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Operating at 120v AC and 60 Hz.

Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V66.5) (cd)
0	171.4
15	182.5
30	289.5
40	573.1
45	843.3
50	1268.4
55	1820.1
60	2264.1
65	2594.4
70	2755.7
75	2795.2
80	2671.2
85	2341.6
90	1987.3
95	1714.2
100	1505.5
105	1243.9
110	868.8
115	483.2
120	254.9
125	196.3
130	204.8
135	212.7
140	205.6
150	182.2
165	173.2
180	168.6

Principal Conical Surface



House side

Cone of maximum intensity (cd)

Street side

House side max intensity
2106.5 cd @ (90.0°, 58.0°)

Street side max intensity
2795.2 cd @ (75.0°, 66.5°)

Coordinates expressed in the C Type coordinate system

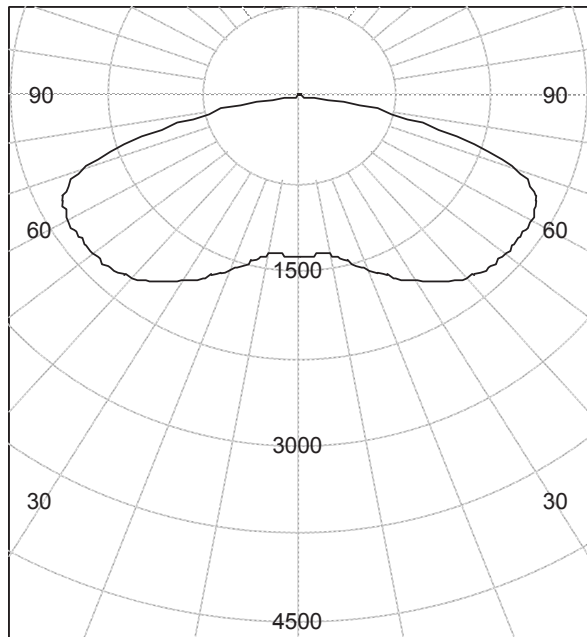
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Polar curve through L90 / L270

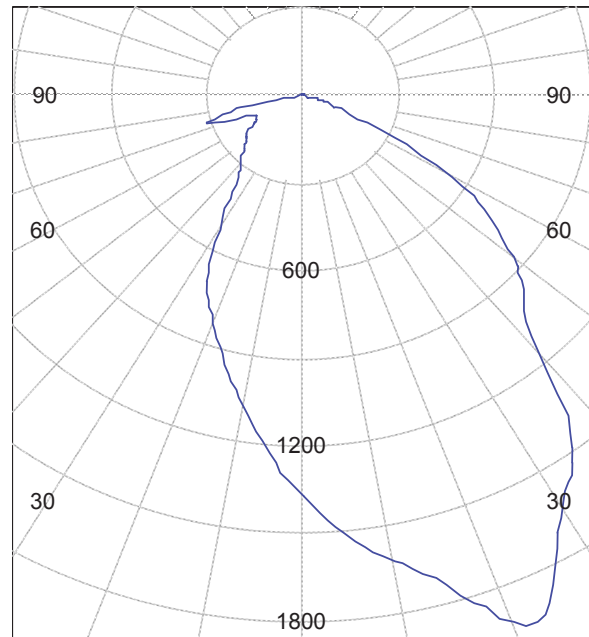


(L90)

(cd)

(L270)

Polar curve through L0 / L180



House side (L180)

(cd)

Street side (L0)



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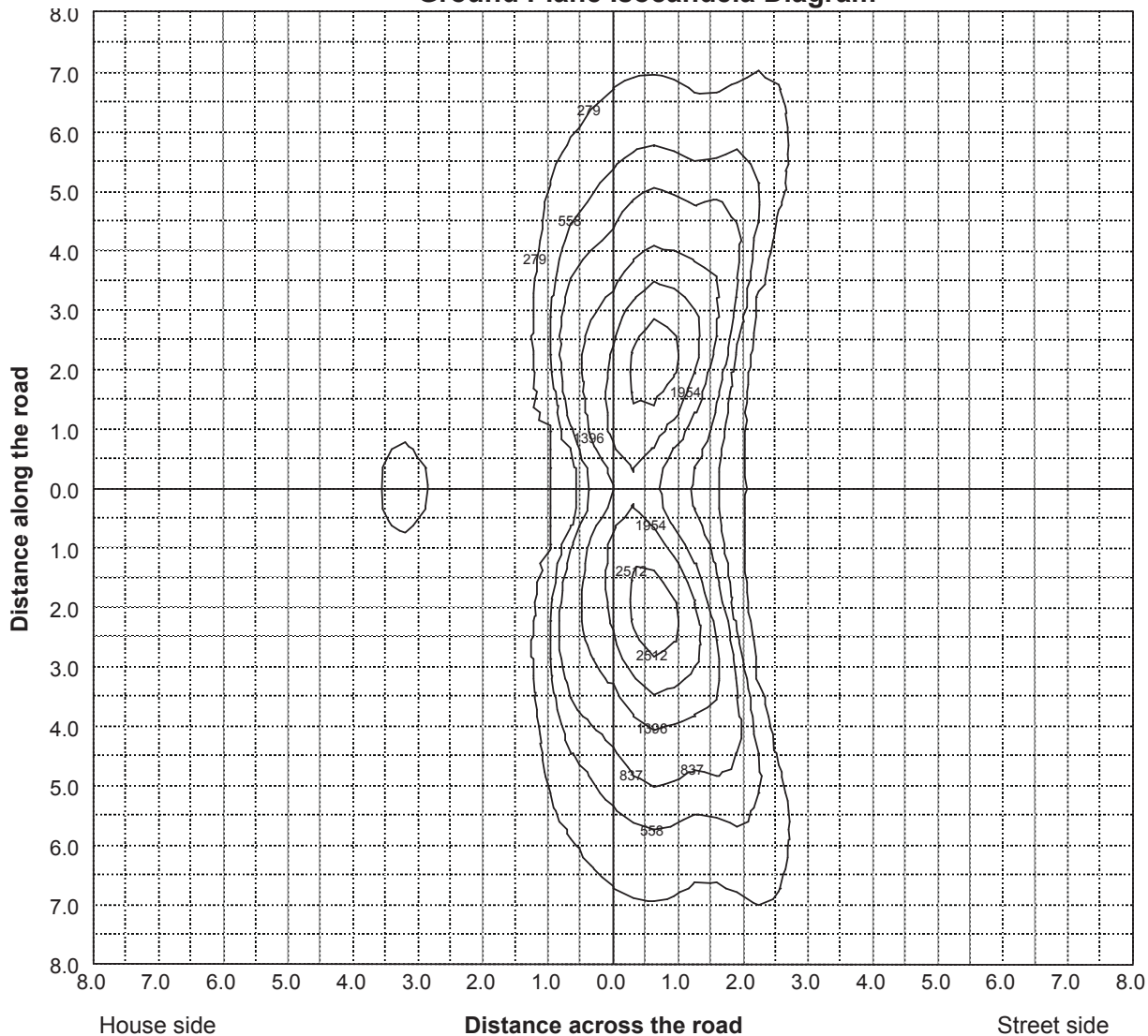
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Ground Plane Isocandela Diagram



The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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Vertical	Intensity data (cd)								
	L-Plane								
	L0	L15	L30	L40	L45	L50	L55	L60	L65
0.0	1372	1372	1372	1372	1372	1372	1372	1372	1372
10.0	1618	1602	1584	1566	1554	1541	1526	1507	1487
20.0	1918	1890	1847	1825	1805	1798	1794	1789	1777
30.0	1616	1658	1870	2073	2126	2137	2113	2088	2063
35.0	1479	1523	1691	1945	2087	2197	2242	2240	2221
40.0	1137	1271	1550	1807	1968	2140	2286	2355	2358
45.0	970	1044	1361	1688	1868	2064	2244	2379	2435
47.5	919	992	1276	1620	1826	2032	2218	2367	2454
50.0	857	930	1205	1553	1779	2000	2188	2358	2464
52.5	778	843	1138	1478	1737	1976	2176	2356	2485
55.0	689	744	1042	1390	1688	1944	2166	2356	2496
57.5	611	644	918	1287	1611	1913	2176	2387	2538
60.0	479	526	782	1154	1485	1863	2180	2418	2581
62.5	348	382	606	985	1284	1716	2115	2413	2619
65.0	225	246	401	747	1027	1468	1949	2335	2628
67.5	142	155	221	460	715	1120	1701	2206	2542
70.0	100	118	135	218	404	722	1314	1942	2343
72.5	75	94	106	112	172	348	809	1510	1962
75.0	61	74	83	82	85	128	323	939	1502
77.5	48	60	58	63	59	63	86	409	940
80.0	39	47	36	41	41	39	43	131	470
82.5	17	24	18	20	20	22	22	35	135
85.0	6	7	8	8	8	9	9	9	13
87.5	3	3	4	4	4	4	4	5	5
90.0	0	0	0	0	0	0	0	0	0
92.5	0	0	0	0	0	0	0	0	0
95.0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0
100.0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0
105.0	0	0	0	0	0	0	0	0	0
120.0	0	0	0	0	0	0	0	0	0
135.0	0	0	0	0	0	0	0	0	0
150.0	0	0	0	0	0	0	0	0	0
165.0	0	0	0	0	0	0	0	0	0
180.0	0	0	0	0	0	0	0	0	0



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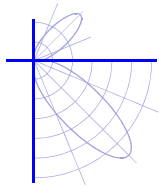
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Operating at 120v AC and 60 Hz.

Intensity data (cd)

Vertical	L-Plane								
	L70	L75	L80	L85	L90	L95	L100	L105	L110
0.0	1372	1372	1372	1372	1372	1372	1372	1372	1372
10.0	1470	1450	1429	1406	1383	1357	1329	1304	1275
20.0	1757	1723	1683	1644	1595	1538	1475	1402	1323
30.0	2048	2021	1972	1903	1831	1746	1640	1528	1412
35.0	2192	2163	2114	2031	1946	1840	1713	1580	1441
40.0	2330	2287	2231	2138	2038	1912	1759	1608	1451
45.0	2424	2375	2308	2203	2085	1933	1761	1596	1431
47.5	2459	2412	2335	2221	2093	1930	1746	1576	1411
50.0	2496	2450	2367	2241	2103	1925	1727	1548	1377
52.5	2533	2493	2400	2258	2098	1906	1702	1526	1347
55.0	2559	2533	2437	2278	2095	1885	1674	1498	1306
57.5	2614	2599	2495	2314	2104	1878	1659	1476	1260
60.0	2674	2661	2549	2339	2094	1844	1623	1434	1186
62.5	2724	2723	2600	2352	2071	1809	1590	1377	1080
65.0	2763	2781	2657	2361	2034	1763	1551	1308	956
67.5	2729	2781	2657	2315	1943	1666	1459	1187	799
70.0	2547	2641	2544	2172	1775	1506	1301	997	596
72.5	2194	2296	2252	1885	1491	1265	1076	729	377
75.0	1637	1714	1757	1481	1124	956	783	439	194
77.5	1119	1047	1117	1022	785	632	477	211	90
80.0	688	556	579	589	476	355	219	75	44
82.5	243	195	160	192	170	112	51	21	20
85.0	14	11	10	10	10	10	10	10	9
87.5	5	5	5	5	5	5	5	5	4
90.0	0	0	0	0	0	0	0	0	0
92.5	0	0	0	0	0	0	0	0	0
95.0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0
100.0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0
105.0	0	0	0	0	0	0	0	0	0
120.0	0	0	0	0	0	0	0	0	0
135.0	0	0	0	0	0	0	0	0	0
150.0	0	0	0	0	0	0	0	0	0
165.0	0	0	0	0	0	0	0	0	0
180.0	0	0	0	0	0	0	0	0	0



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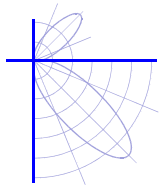
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Operating at 120v AC and 60 Hz.

Intensity data (cd)

Vertical	L-Plane								
	L115	L120	L125	L130	L135	L140	L150	L165	L180
0.0	1372	1372	1372	1372	1372	1372	1372	1372	1372
10.0	1250	1223	1198	1175	1156	1138	1112	1088	1082
20.0	1247	1176	1107	1041	985	940	886	839	826
30.0	1301	1191	1081	969	865	775	656	562	527
35.0	1308	1178	1048	912	777	649	487	389	364
40.0	1306	1155	985	809	626	472	342	309	303
45.0	1271	1087	874	625	418	317	290	273	261
47.5	1234	1038	788	513	340	287	280	256	242
50.0	1191	970	680	414	293	276	267	246	230
52.5	1140	872	565	340	276	270	257	238	221
55.0	1066	747	449	288	265	264	246	230	202
57.5	967	621	358	258	257	257	234	206	180
60.0	846	504	293	241	250	247	219	189	170
62.5	708	395	244	227	239	232	204	180	161
65.0	568	305	211	213	225	217	189	176	161
67.5	424	226	187	198	202	197	177	176	184
70.0	293	170	163	183	179	179	164	207	256
72.5	179	129	139	155	150	152	139	270	318
75.0	108	98	113	118	119	121	146	231	256
77.5	69	71	80	79	81	88	111	176	206
80.0	40	42	44	44	46	51	58	82	110
82.5	19	18	17	16	17	16	11	20	34
85.0	8	6	5	4	3	3	3	2	1
87.5	3	3	2	2	1	1	0	0	0
90.0	0	0	0	0	0	0	0	0	0
92.5	0	0	0	0	0	0	0	0	0
95.0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0
100.0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0
105.0	0	0	0	0	0	0	0	0	0
120.0	0	0	0	0	0	0	0	0	0
135.0	0	0	0	0	0	0	0	0	0
150.0	0	0	0	0	0	0	0	0	0
165.0	0	0	0	0	0	0	0	0	0
180.0	0	0	0	0	0	0	0	0	0



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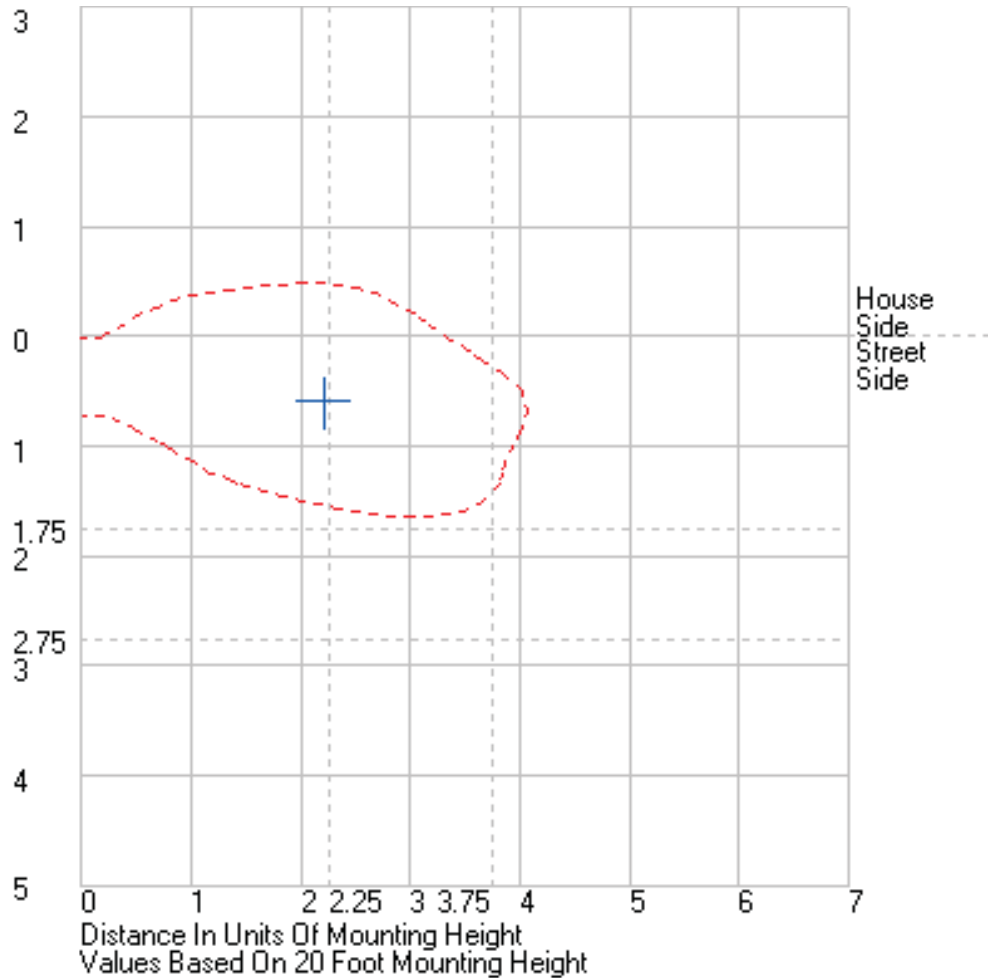
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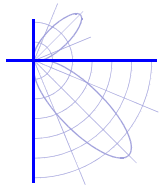
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LM-79 Performance Data

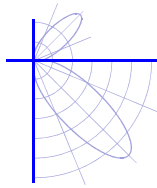
Spectral	CIE 1931 (x, y)	(0.439, 0.406)	
	CIE 1976 (u', v')	(0.251, 0.522)	
	Correlated Color Temperature (CCT)	2980	K
	Spatial Δ (u', v') Uniformity	2.52E-03	
	Color Rendering Index (Ra)	71.1	
	Special CRI 9 (R ₉)	-41.6	
	Distance from Planckian Locus (Duv)	4.92E-04	
	Scotopic/Photopic Ratio	1.21	
Electrical	Voltage	120.0	V (Setpoint 1)
	Frequency	60.0	Hz
	Current	0.366	A
	Power	43.4	W
	Power Factor	0.99	
	Current THD	3.8	%
	Voltage	277.0	V (Setpoint 2)
	Frequency	60.0	Hz
	Current	0.165	A
	Power	42.8	W
	Power Factor	0.94	
	Current THD	9.8	%

Performance data in accordance with IESNA LM-79-08. Spectral calculations are for a CIE 2° observer
Photometric and spectral values were measured at Setpoint 1

(1) Value is computed from the weighted average of the spatial measurements

(2) Value is the maximum deviation of the spatial u' and v' measurements from the weighted average

(3) Quantity is in addition to the scope of IESNA LM-79-08



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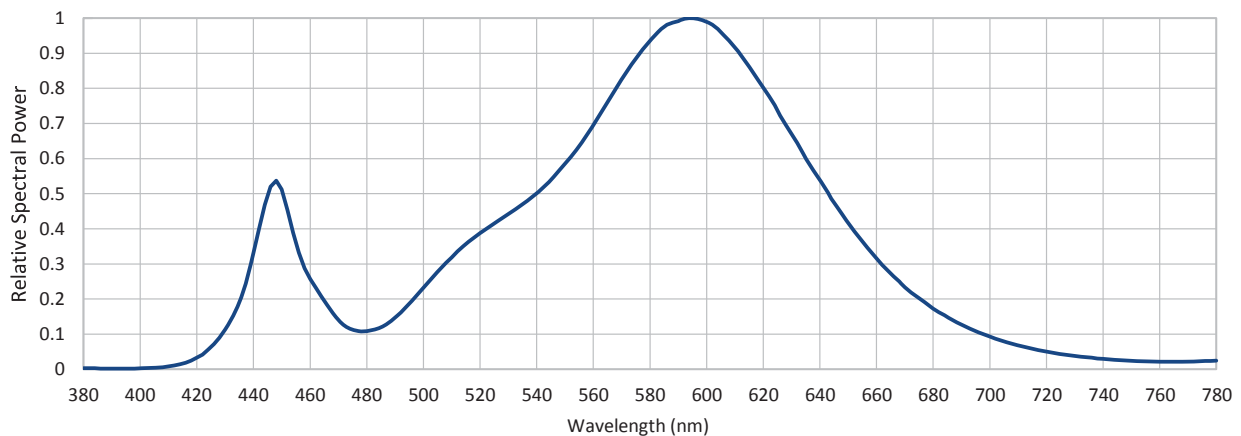
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LM-79 Performance Data

Relative spectral power distribution

(Relative to peak = 1, weighted average of spatial measurements)

λ (nm)	Relative Power	λ (nm)	Relative Power	λ (nm)	Relative Power	λ (nm)	Relative Power	λ (nm)	Relative Power
380	0.003	460	0.257	540	0.501	620	0.802	700	0.093
385	0.003	465	0.195	545	0.539	625	0.737	705	0.079
390	0.002	470	0.140	550	0.585	630	0.670	710	0.068
395	0.002	475	0.113	555	0.636	635	0.602	715	0.059
400	0.003	480	0.109	560	0.696	640	0.539	720	0.050
405	0.004	485	0.120	565	0.760	645	0.474	725	0.044
410	0.008	490	0.147	570	0.825	650	0.417	730	0.038
415	0.017	495	0.187	575	0.885	655	0.364	735	0.033
420	0.033	500	0.233	580	0.936	660	0.316	740	0.030
425	0.064	505	0.278	585	0.975	665	0.273	745	0.026
430	0.113	510	0.319	590	0.991	670	0.233	750	0.024
435	0.192	515	0.357	595	0.999	675	0.202	755	0.023
440	0.331	520	0.388	600	0.990	680	0.173	760	0.021
445	0.494	525	0.415	605	0.960	685	0.149	765	0.021
450	0.512	530	0.442	610	0.916	690	0.127	770	0.022
455	0.360	535	0.470	615	0.862	695	0.108	775	0.023
								780	0.025





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LM-79 Performance Data

Spatial measurements

Vert. angle (°)	CIE 1976 (u',v') coordinates	
	Horiz. 0.0° plane	Horiz. ° plane
0.0	(0.249, 0.521)	(0.250, 0.521)
10.0	(0.250, 0.521)	(0.251, 0.522)
20.0	(0.250, 0.522)	(0.250, 0.521)
30.0	(0.251, 0.522)	(0.252, 0.523)
40.0	(0.251, 0.522)	(0.250, 0.522)
50.0	(0.251, 0.522)	(0.251, 0.523)
60.0	(0.252, 0.523)	(0.251, 0.524)
70.0	(0.252, 0.523)	I <= 10% peak
80.0	(0.251, 0.522)	I <= 10% peak
-	-	-

Spatial measurements

Vert. angle (°)	CIE 1976 (u',v') coordinates	
	Horiz. 0.0° plane	Horiz. ° plane
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

Test procedure

All measurements were performed in an environmentally controlled laboratory employing suitable baffling to minimize stray light. The sample was mounted in its normal operating orientation on a rotating mirror goniophotometer and operated from a stabilized supply. The photometric output was monitored and measurements were performed once stability was achieved.

The goniophotometer was used to measure the spatial distribution of both luminous intensity and, in conjunction with a spectroradiometer, spectral irradiance. The distribution locus comprises points in two or more planes (as indicated in the table above) at no more than 10° vertical intervals. The CIE (x,y) coordinates and other derived metrics (CIE (u', v'), CCT and CRI) are calculated from the weighted sum (weighted for intensity and represented solid angle) of the measured spectral irradiances.

Sample Orientation

Horizontal

Stabilization & total operation time 1.0 / 16.0 hours

Equipment and uncertainties

LightLab International R80A C-gamma rotating mirror goniophotometer with a test distance of 8 m.

Luminous Intensity ± 4 %
Luminous Flux ± 4 %
Horiz., Vert. Angles ± 0.25°

Temperature ± 1 °C
Luminous Efficacy ± 4.5 %

PhotoResearch PR-670 spectroradiometer (grating with 380 - 780 nm range, 2 nm / pixel, 5 nm bandwidth, incandescent/halogen calibration source). Measured at a distance from the sample deemed >5 times the maximum observed luminous opening dimension.

CIE (x, y) coordinates ± 0.003 CCT ± 100 K
CIE (u', v') coordinates ± 0.002 CRI (Ra) ± 2
Spatial Δ (u', v') uniformity ± 0.001 Scotopic / Photopic Ratio * ± 0.02
Rel. Spectral Irradiance * ± 2 % R9 * ± 2
Duv * ± 5E-04

Yokogawa WT210 power meter connected in circuit to the sample electrical supply

Voltage ± 0.5 % Frequency * ± 0.1 Hz
Current ± 0.5 % Power ± 0.5 %
Current THD * ± 3 % Power Factor ± 0.02

This report contains data that are not covered by the NVLAP accreditation. Quantities marked with * are not covered.

Calculator / report version 1.0.10 / 5.9 (14th Dec 2017)

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Test Report No. LLI-19275-6

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 40 X 3G2S XXXX XXXX

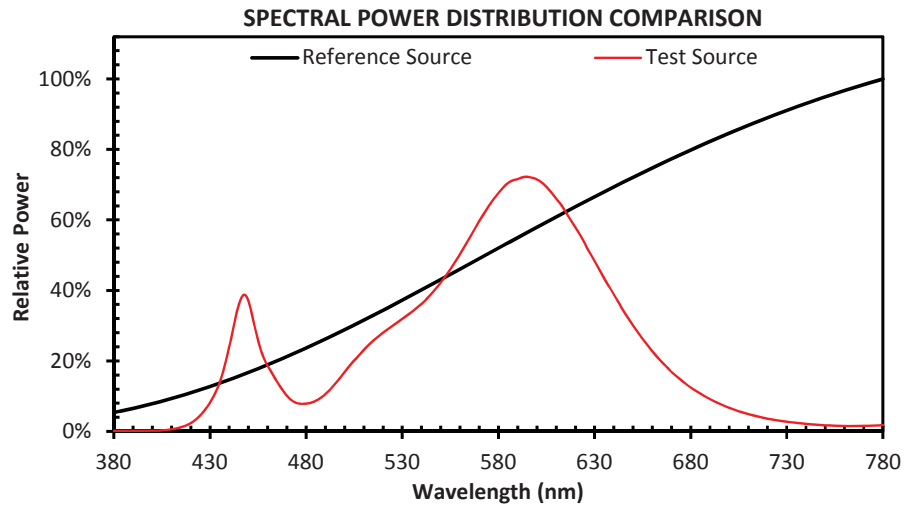
Grey cast aluminum top housing and white plastic bottom housing with clear flat glass lens.

16 LEDs in 4 x 4 array with clear plastic sheet of individual lenses.

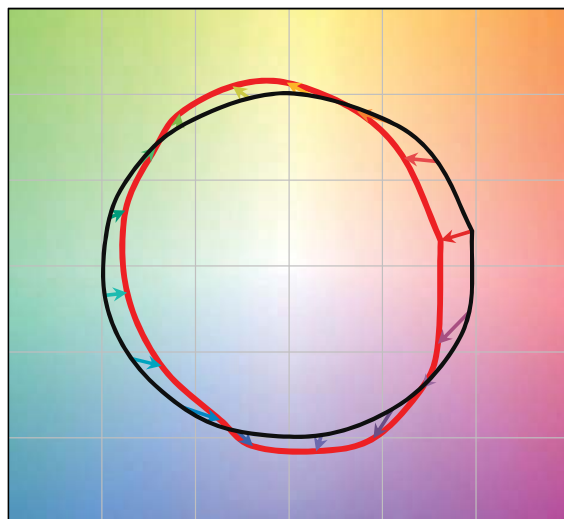
One Osram Optotronic LED driver. Model: QT50W/UNV/1250C/2DIMLT2/P6 set to 800ma.

Operating at 120v AC and 60 Hz.

R_f	72
R_g	93



COLOR VECTOR GRAPHIC



— Test Source

→ Series1

COLOR DISTORTION GRAPHIC





Test Report No. LLI-19275-6

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 40 X 3G2S XXXX XXXX
Grey cast aluminum top housing and white plastic bottom housing with clear flat glass lens.
16 LEDs in 4 x 4 array with clear plastic sheet of individual lenses.
One Osram Optotronic LED driver. Model: QT50W/UNV/1250C/2DIMLT2/P6 set to 800ma.
Operating at 120v AC and 60 Hz.

Test Distance 8.0 m
Test Temperature 25.3 °C

Notes The laboratory has not participated in the selection of samples to be tested. All testing is performed on the understanding that the significance of the report is limited to the extent that the test sample is representative of production units.

Tested in accordance with the applicable sections of publications: IES LM-79-08 (Sec. 12), IES LM-16-93, IES LM-58-13, CIE 13.3:1995, CIE 15:2004, ANSI C78.377:2015, ANSI C82.77-10:2014.

The luminous intensity values, and other derived quantities, contained in this report are based on the absolute data, as measured.

Prorating the performance of the sample for the use of other component combinations (such as lamp / LED / Ballast / driver), or for use in different environmental conditions than that tested, may produce erroneous results.

This report is free of erasures and corrections.

Photometric intensity values are reported using the IESNA Type C coordinate system (L, V) as defined in IESNA publication LM-75.

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This report must not be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the Federal Government.