



Report of Test LLI-19244-9

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 53 X 3G3W 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 1050ma.
Operating at 120v AC and 60 Hz.



Performance Summary

Total Light Output	7164 lm	Min Power Factor	0.96 @ 277 V
Luminaire Power	57.4 W	Max THD(i)*	9.3 % @ 277 V
Luminous Efficacy	124.8 lm/W	0-90° Zonal Flux %	100.0 %
CCT	3060 K	80-90° Zonal Flux %	0.3 %
CIE(x,y) 1931	(0.433, 0.402)	BUG Rating*	B2-U0-G2
CRI	72	Street Classification*	Type III Very Short

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



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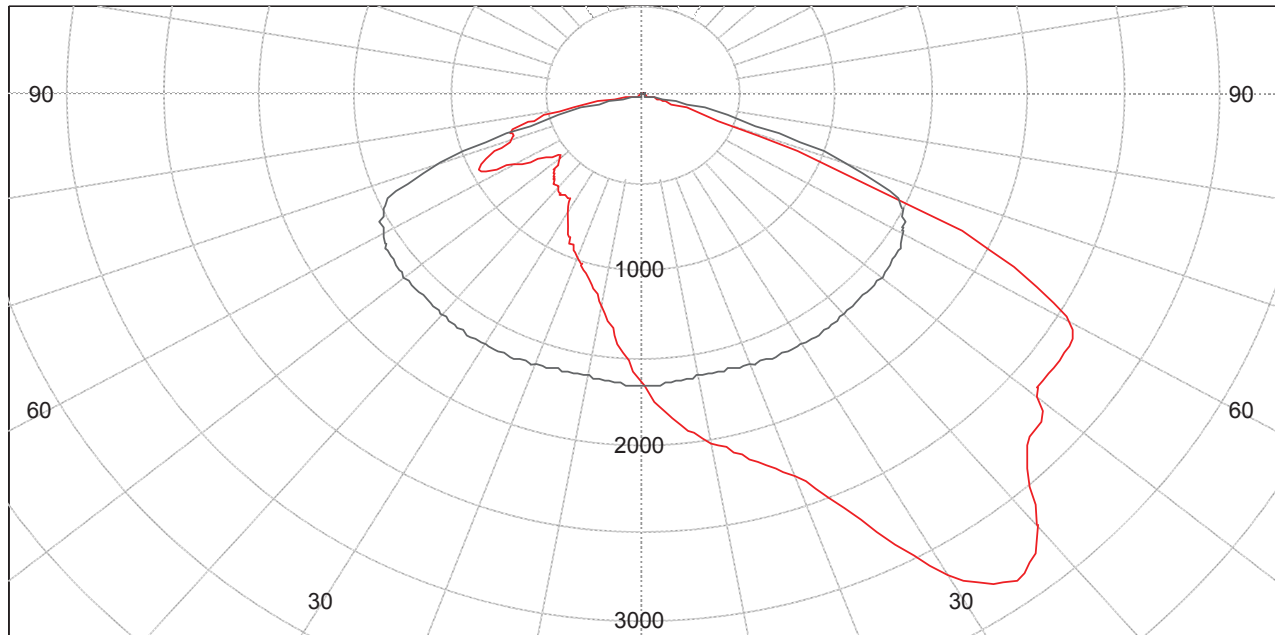




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Polar Light Distribution Curves



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 %	72.1 %	72.1 %
House Side	0.0 %	27.9 %	27.9 %
	0.0 %	100.0 %	100.0 %

Report data based on absolute values as measured.

Signed:

Ryder Tunney
Ryder Tunney
Authorized Signatory

Date of test
Date of report

20-Sep-2019
24-Sep-2019



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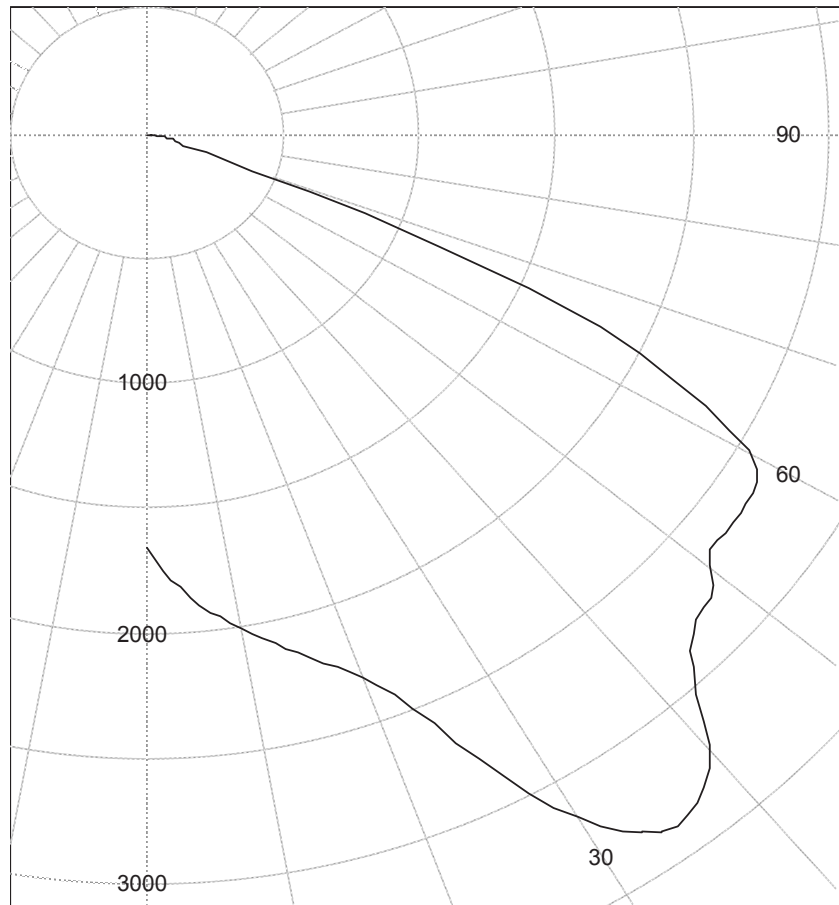
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Operating at 120v AC and 60 Hz.

Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (cd)
0.0	1651.0
10.0	2011.8
20.0	2312.2
30.0	3162.0
35.0	3379.5
40.0	3194.2
45.0	2822.9
47.5	2777.8
50.0	2686.8
52.5	2646.6
55.0	2649.1
57.5	2642.1
60.0	2540.7
62.5	2246.3
65.0	1828.8
67.5	999.9
70.0	416.0
72.5	130.7
75.0	111.8
77.5	76.0
80.0	40.8
82.5	22.7
85.0	11.3
87.5	5.5
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
1656.4 cd @ (90.0°, 0.5°)

Street side max intensity
3379.5 cd @ (0.0°, 35.0°)

Coordinates expressed in the C Type coordinate system

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



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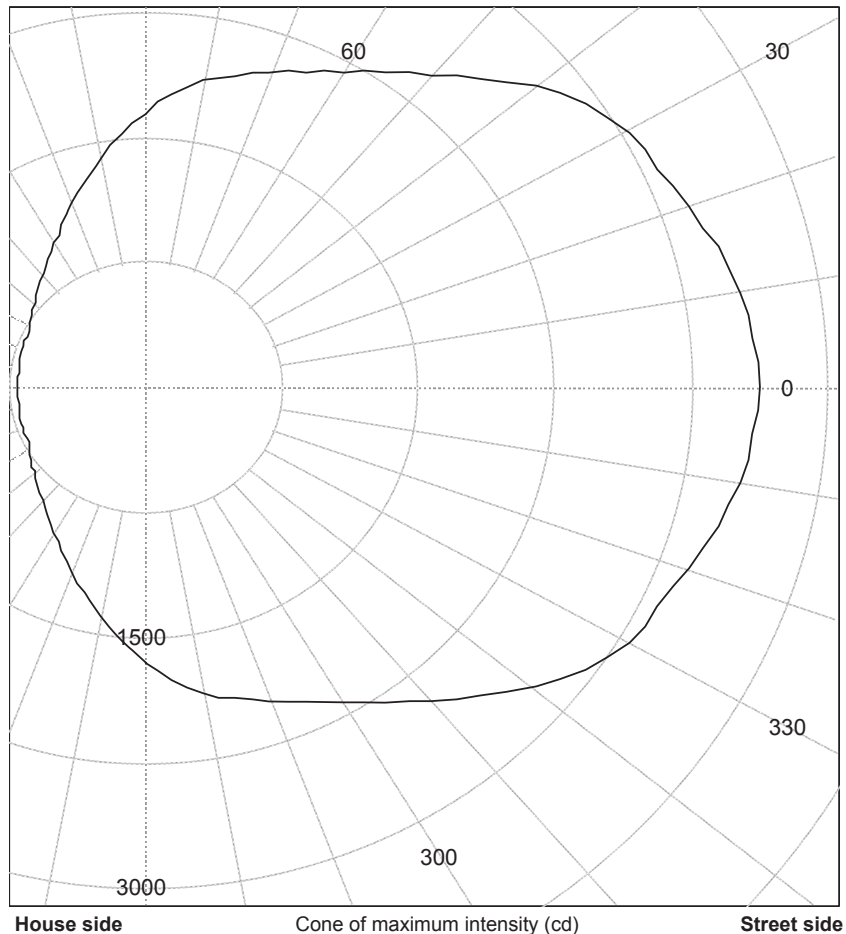
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Operating at 120v AC and 60 Hz.

Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V35.0) (cd)
0	3379.5
15	3248.7
30	3054.8
40	2794.3
45	2613.7
50	2443.9
55	2305.5
60	2184.3
65	2087.6
70	2012.1
75	1937.3
80	1865.1
85	1768.3
90	1644.7
95	1527.4
100	1391.6
105	1277.4
110	1172.8
115	1078.6
120	1001.7
125	937.5
130	884.3
135	834.8
140	792.6
150	731.7
165	711.0
180	700.9

Principal Conical Surface



House side max intensity
1656.4 cd @ (90.0°, 0.5°)

Street side max intensity
3379.5 cd @ (0.0°, 35.0°)

Coordinates expressed in the C Type coordinate system

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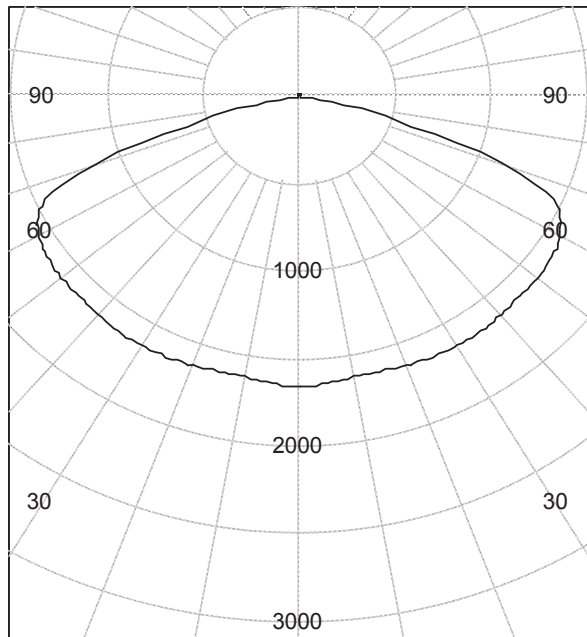
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Polar curve through L90 / L270

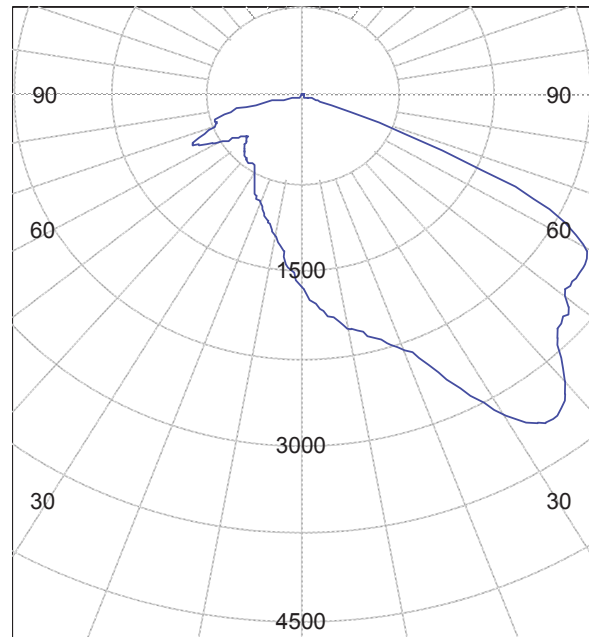


(L90)

(cd)

(L270)

Polar curve through L0 / L180



House side (L180)

(cd)

Street side (L0)



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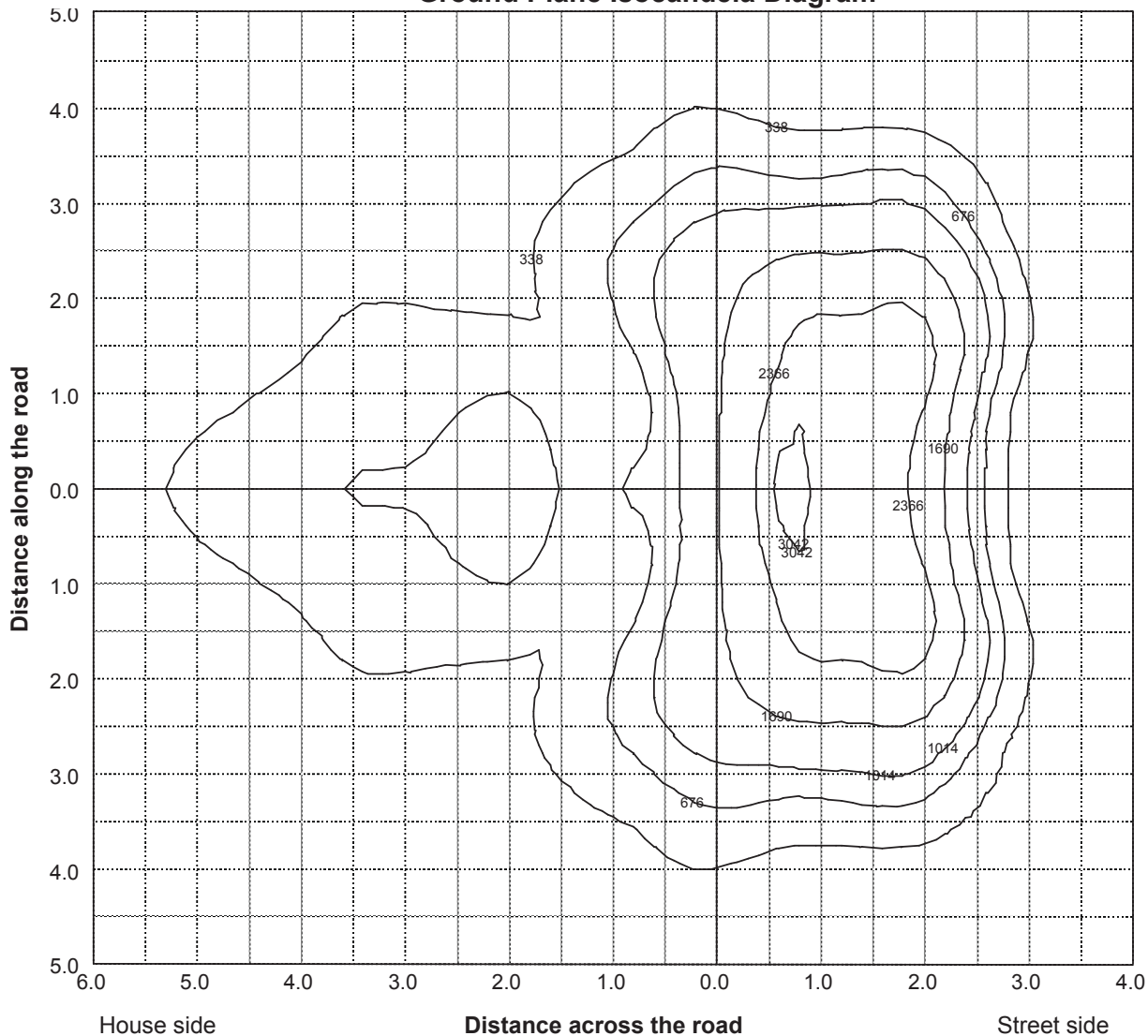
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Ground Plane Isocandela Diagram



The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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Intensity data (cd)

Vertical	L-Plane								
	L0	L15	L30	L40	L45	L50	L55	L60	L65
0.0	1651	1651	1651	1651	1651	1651	1651	1651	1651
10.0	2012	1991	1959	1920	1895	1874	1852	1823	1793
20.0	2312	2274	2224	2153	2114	2076	2036	1987	1943
30.0	3162	3010	2721	2498	2388	2306	2222	2134	2055
35.0	3380	3249	3055	2794	2614	2444	2305	2184	2088
40.0	3194	3149	3169	3040	2864	2642	2426	2243	2120
45.0	2823	2861	3023	3084	2990	2814	2584	2363	2185
47.5	2778	2779	2936	3031	2986	2856	2656	2428	2230
50.0	2687	2739	2873	2960	2954	2867	2708	2483	2276
52.5	2647	2681	2828	2889	2905	2870	2744	2534	2323
55.0	2649	2661	2797	2825	2857	2862	2765	2582	2359
57.5	2642	2673	2801	2781	2810	2830	2768	2610	2392
60.0	2541	2638	2852	2779	2761	2759	2717	2602	2400
62.5	2246	2452	2905	2818	2719	2653	2602	2523	2362
65.0	1829	2072	2804	2858	2683	2524	2419	2346	2245
67.5	1000	1378	2398	2735	2618	2409	2223	2103	2031
70.0	416	590	1728	2235	2333	2227	2006	1800	1655
72.5	131	154	724	1388	1552	1643	1567	1361	1145
75.0	112	110	214	366	507	672	787	780	650
77.5	76	85	94	135	162	200	227	233	211
80.0	41	49	64	65	70	72	75	79	76
82.5	23	24	27	26	26	27	26	26	22
85.0	11	11	10	9	9	8	8	7	7
87.5	5	5	5	5	5	4	4	4	3
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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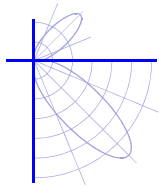
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Operating at 120v AC and 60 Hz.

Intensity data (cd)

Vertical	L-Plane								
	L70	L75	L80	L85	L90	L95	L100	L105	L110
0.0	1651	1651	1651	1651	1651	1651	1651	1651	1651
10.0	1761	1729	1701	1668	1628	1592	1560	1516	1484
20.0	1892	1834	1776	1714	1637	1560	1483	1398	1322
30.0	1988	1921	1848	1757	1647	1534	1414	1307	1210
35.0	2012	1937	1865	1768	1645	1527	1392	1277	1173
40.0	2031	1951	1872	1764	1630	1502	1365	1247	1128
45.0	2070	1974	1876	1757	1618	1485	1345	1204	1058
47.5	2098	1988	1881	1757	1616	1482	1337	1184	1032
50.0	2128	2003	1883	1754	1615	1479	1328	1170	1014
52.5	2155	2015	1888	1751	1610	1471	1317	1157	1001
55.0	2176	2024	1886	1748	1602	1457	1302	1142	990
57.5	2192	2022	1877	1737	1589	1439	1282	1126	976
60.0	2195	2013	1859	1717	1567	1415	1260	1110	960
62.5	2167	1987	1829	1687	1532	1379	1230	1091	939
65.0	2091	1925	1766	1632	1479	1326	1183	1052	904
67.5	1929	1787	1629	1504	1368	1229	1100	984	840
70.0	1537	1390	1264	1198	1121	1030	918	810	691
72.5	1001	874	811	813	798	742	636	532	470
75.0	506	404	383	414	468	437	350	293	282
77.5	182	167	170	186	202	180	160	139	136
80.0	63	55	56	60	63	49	44	49	52
82.5	18	15	14	15	16	13	13	15	16
85.0	6	6	5	5	5	4	5	5	5
87.5	3	3	2	2	2	2	2	2	2
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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Intensity data (cd)

Vertical	L-Plane								
	L115	L120	L125	L130	L135	L140	L150	L165	L180
0.0	1651	1651	1651	1651	1651	1651	1651	1651	1651
10.0	1455	1415	1380	1346	1318	1298	1264	1233	1224
20.0	1256	1204	1156	1119	1086	1062	1027	995	986
30.0	1131	1072	1020	975	936	906	851	813	779
35.0	1079	1002	937	884	835	793	732	711	701
40.0	1016	926	836	768	713	663	622	670	693
45.0	929	814	718	632	557	512	509	612	655
47.5	893	773	665	565	490	453	473	572	615
50.0	871	740	617	509	434	408	447	541	567
52.5	853	710	574	459	397	381	440	537	557
55.0	835	681	533	424	373	369	486	568	619
57.5	816	655	505	407	367	395	522	632	709
60.0	801	638	494	403	380	417	533	718	819
62.5	783	626	487	398	382	414	562	829	942
65.0	748	599	469	381	365	403	608	856	933
67.5	693	554	435	353	339	392	587	768	820
70.0	592	485	388	318	302	353	501	655	719
72.5	424	369	315	272	254	288	420	570	714
75.0	261	249	219	199	200	232	359	448	622
77.5	139	156	124	109	127	170	249	322	480
80.0	57	66	46	50	68	91	140	171	238
82.5	17	18	17	17	22	26	29	36	47
85.0	5	4	4	3	3	3	3	2	3
87.5	2	2	1	1	1	1	1	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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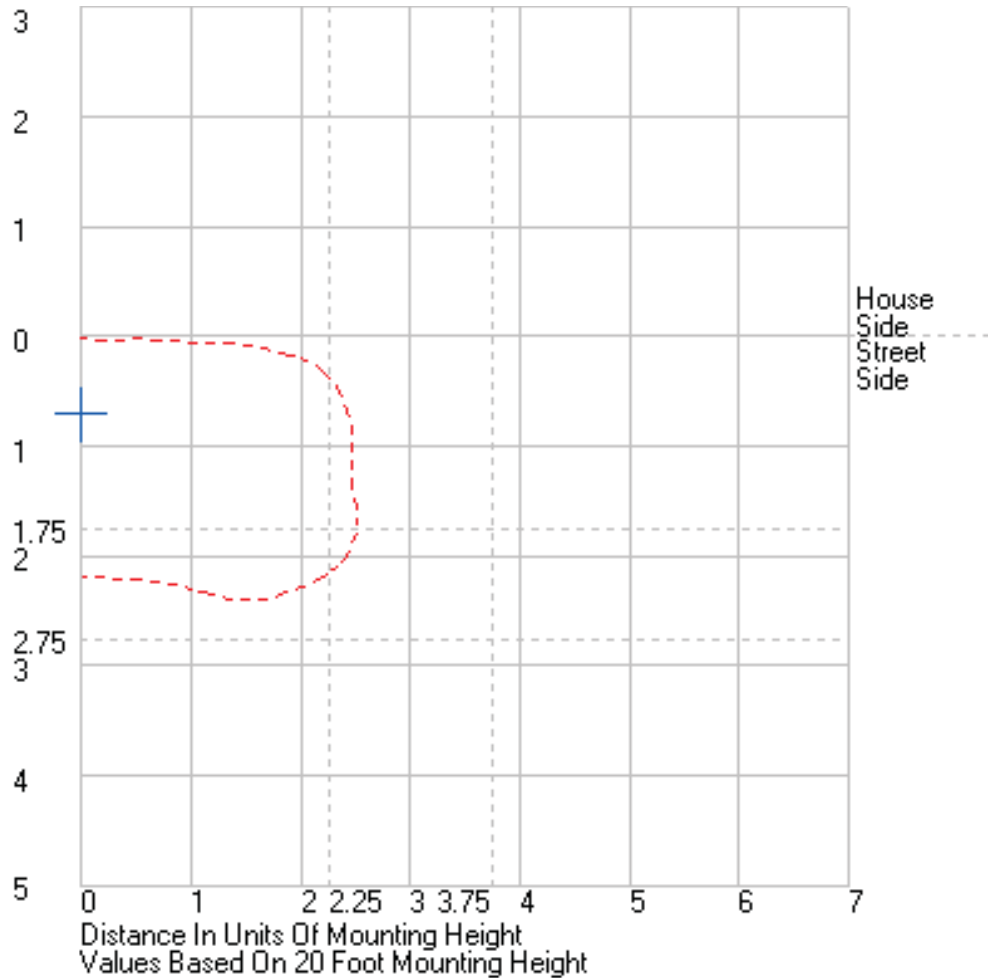
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.433, 0.402)
	CIE 1976 (u', v') ⁽¹⁾	(0.248, 0.520)
	Correlated Color Temperature (CCT) ⁽¹⁾	3060 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	2.25E-03
	Color Rendering Index (Ra) ⁽¹⁾	71.5
	Special CRI 9 (R ₉) ^{(1),(3)}	-39.9
	Distance from Planckian Locus (Duv) ^{(1),(3)}	-4.80E-05
	Scotopic/Photopic Ratio ^{(1),(3)}	1.25

Electrical	Voltage	120.0 V	(Setpoint 1)
	Frequency	60.0 Hz	
	Current	0.494 A	
	Power	57.4 W	
	Power Factor	0.97	
	Current THD	3.5 %	
	Voltage	277.0 V	(Setpoint 2)
	Frequency	60.0 Hz	
	Current	0.212 A	
	Power	56.1 W	
	Power Factor	0.96	
	Current THD	9.3 %	

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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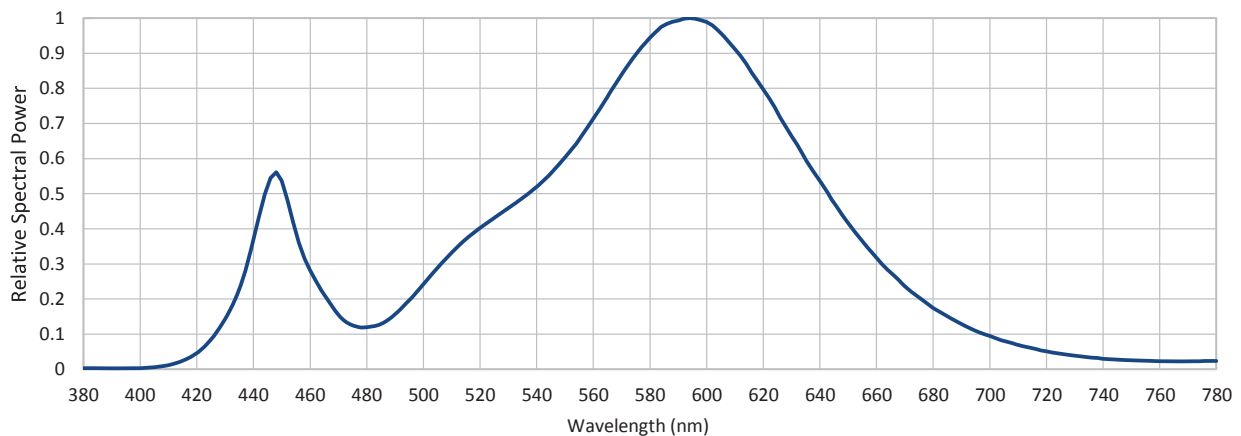
Operating at 120v AC and 60 Hz.

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	0.281	540	0.519	620	0.797	700	0.095
385	0.003	465	0.212	545	0.558	625	0.732	705	0.081
390	0.003	470	0.155	550	0.603	630	0.664	710	0.069
395	0.003	475	0.125	555	0.655	635	0.597	715	0.060
400	0.003	480	0.120	560	0.714	640	0.536	720	0.051
405	0.006	485	0.130	565	0.776	645	0.473	725	0.044
410	0.012	490	0.157	570	0.839	650	0.417	730	0.039
415	0.024	495	0.197	575	0.896	655	0.365	735	0.034
420	0.046	500	0.243	580	0.944	660	0.318	740	0.030
425	0.086	505	0.289	585	0.980	665	0.276	745	0.028
430	0.143	510	0.332	590	0.993	670	0.236	750	0.026
435	0.230	515	0.371	595	0.999	675	0.205	755	0.024
440	0.369	520	0.403	600	0.989	680	0.175	760	0.023
445	0.522	525	0.431	605	0.958	685	0.151	765	0.023
450	0.537	530	0.459	610	0.912	690	0.129	770	0.023
455	0.390	535	0.488	615	0.857	695	0.110	775	0.023
								780	0.024





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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	(0.248, 0.520)	(0.248, 0.520)
10.0	(0.248, 0.520)	(0.249, 0.520)
20.0	(0.248, 0.520)	(0.249, 0.520)
30.0	(0.249, 0.521)	(0.248, 0.519)
40.0	(0.249, 0.521)	(0.248, 0.520)
50.0	(0.249, 0.520)	(0.250, 0.521)
60.0	(0.248, 0.519)	(0.247, 0.519)
70.0	(0.248, 0.520)	(0.247, 0.521)
80.0	I <= 10% peak	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 16.5 / 18.75 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
CIE (u', v') coordinates ± 0.002
Spatial Δ (u', v') uniformity ± 0.001
Rel. Spectral Irradiance * ± 2 %
Duv * ± 5E-04

CCT ± 100 K
CRI (Ra) ± 2
Scotopic / Photopic Ratio * ± 0.02
R9 * ± 2

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

Voltage ± 0.5 %
Current ± 0.5 %
Current THD * ± 3 %
Frequency * ± 0.1 Hz
Power ± 0.5 %
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-19244-9

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 53 X 3G3W XXXX XXXX

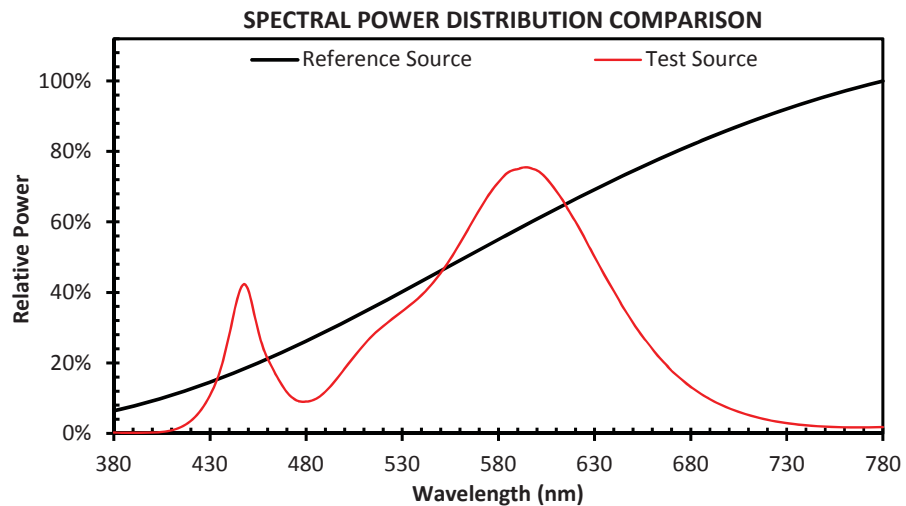
Grey cast aluminum top housing and white plastic bottom housing with clear flat glass lens.

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

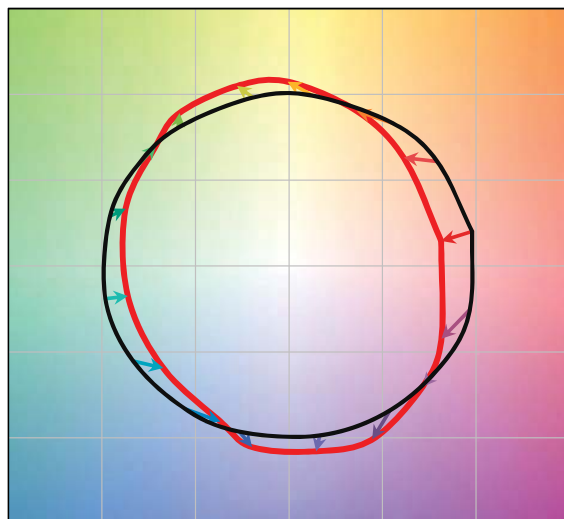
One Osram Optotronic LED driver. Model: QT50W/UNV/1250C/2DIMLT2/P6 set to 1050ma.

Operating at 120v AC and 60 Hz.

R_f	72
R_g	94



COLOR VECTOR GRAPHIC



— Test Source

→ Series1

COLOR DISTORTION GRAPHIC





Test Report No. LLI-19244-9

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 53 X 3G3W 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 1050ma.
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.