



Report of Test LLI-19244-10

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 53 X 3G2H 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	7140 lm	Min Power Factor	0.96 @ 277 V
Luminaire Power	57.8 W	Max THD(i)*	9.2 % @ 277 V
Luminous Efficacy	123.5 lm/W	0-90° Zonal Flux %	100.0 %
CCT	3000 K	80-90° Zonal Flux %	0.7 %
CIE(x,y) 1931	(0.438, 0.405)	BUG Rating*	B2-U0-G2
CRI	71	Street Classification*	Type II Short

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



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LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 53 X 3G2H XXXX XXXX

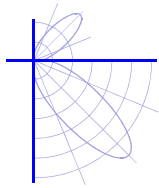
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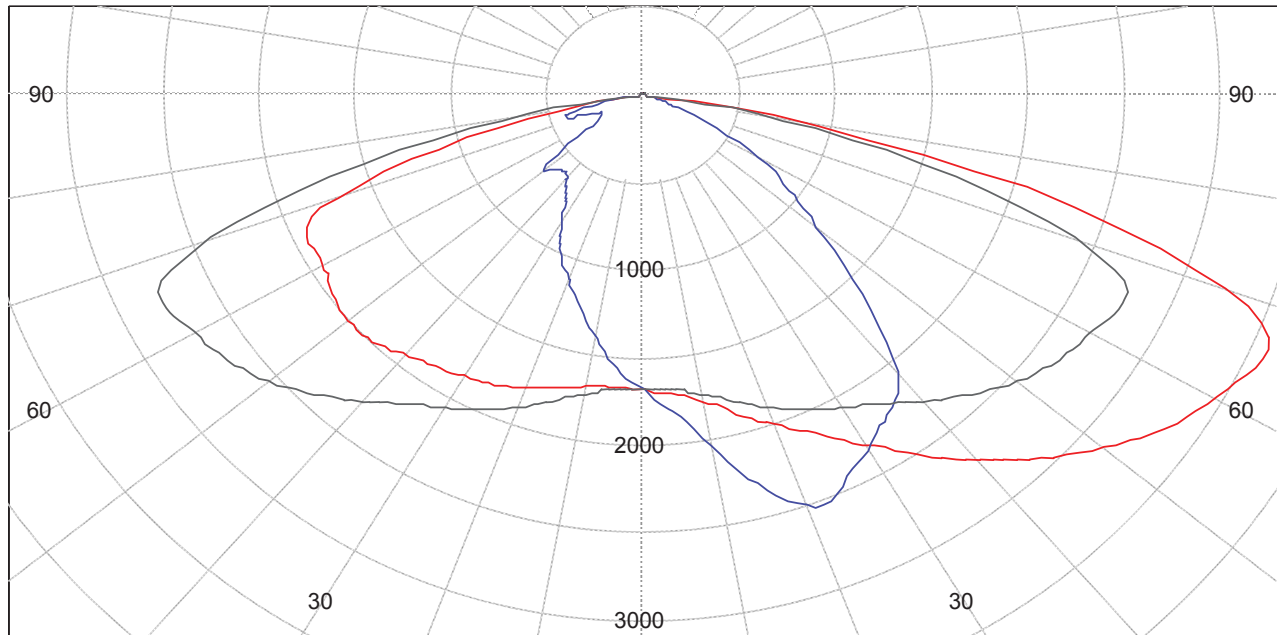
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Polar Light Distribution Curves



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 %	67.3 %	67.3 %
House Side	0.0 %	32.7 %	32.7 %
	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

23-Sep-2019
24-Sep-2019

RT



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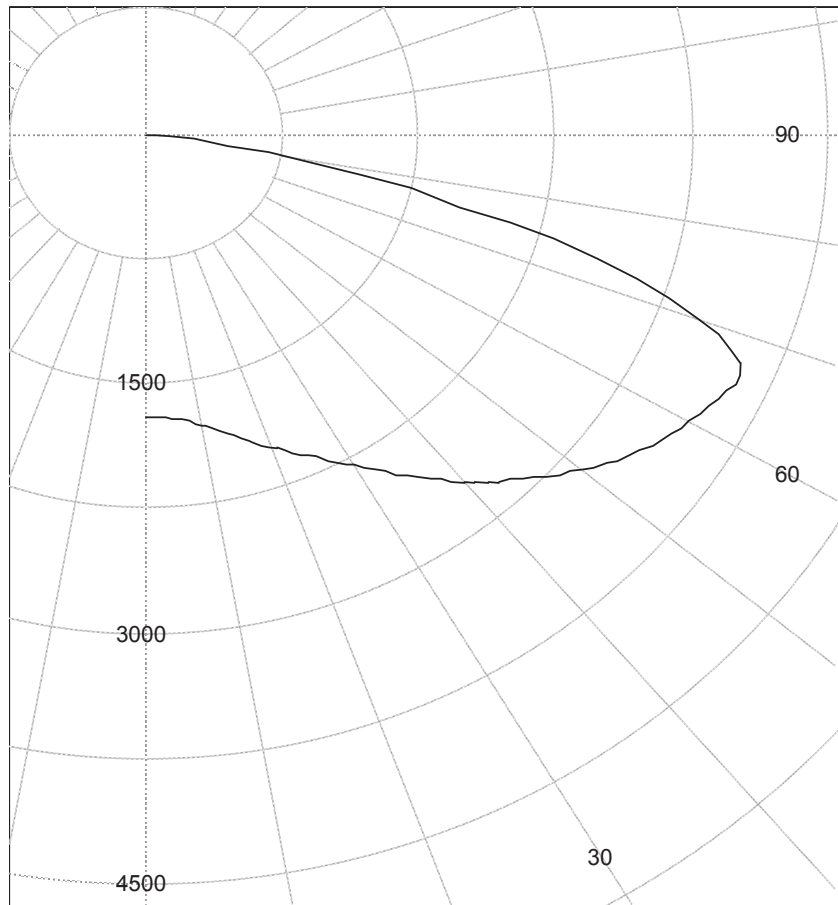
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Operating at 120v AC and 60 Hz.

Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (cd)
0.0	1690.0
10.0	1775.5
20.0	2001.1
30.0	2301.8
35.0	2502.7
40.0	2726.4
45.0	2929.4
47.5	3032.2
50.0	3134.4
52.5	3228.5
55.0	3317.2
57.5	3389.3
60.0	3450.3
62.5	3509.4
65.0	3576.1
67.5	3511.5
70.0	3228.1
72.5	2716.3
75.0	2066.9
77.5	1349.3
80.0	692.0
82.5	197.3
85.0	16.6
87.5	4.2
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
2762.0 cd @ (90.0°, 65.0°)

Street side max intensity
3578.5 cd @ (80.0°, 65.5°)

Coordinates expressed in the C Type coordinate system

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



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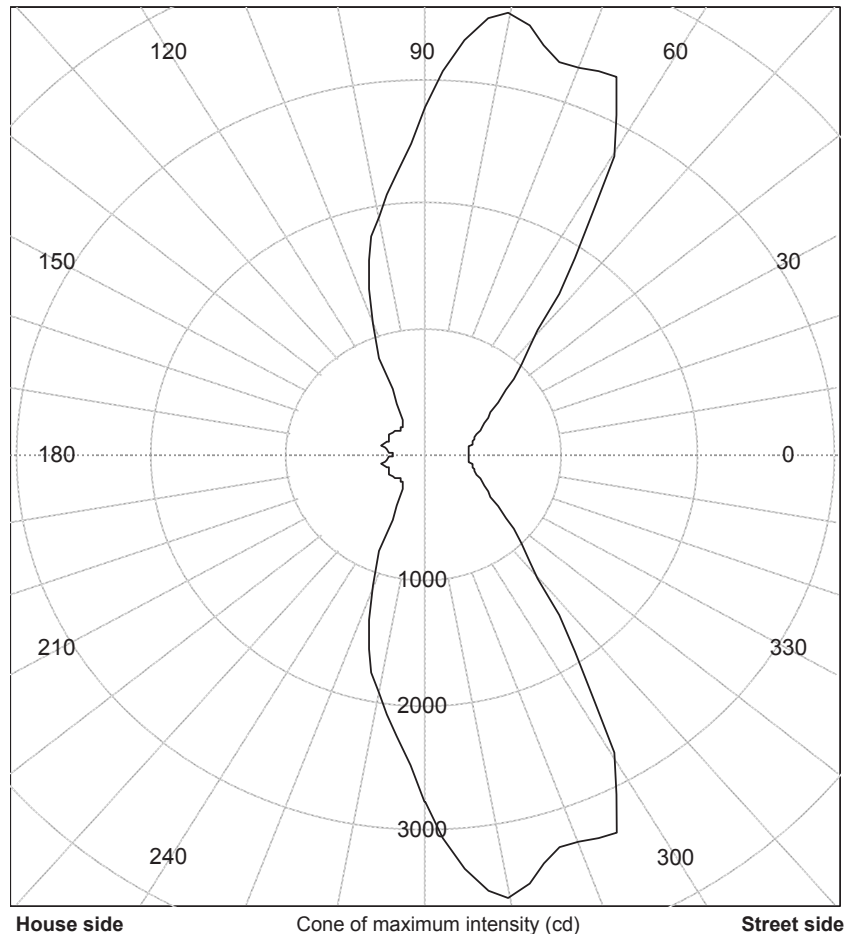
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Operating at 120v AC and 60 Hz.

Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V65.5) (cd)
0	321.5
15	358.0
30	497.2
40	768.6
45	1001.7
50	1284.4
55	1910.3
60	2753.0
65	3323.1
70	3295.2
75	3372.2
80	3578.5
85	3313.4
90	2759.8
95	2248.3
100	1926.6
105	1592.7
110	1110.8
115	580.0
120	317.7
125	276.1
130	267.6
135	279.0
140	292.1
150	297.5
165	315.7
180	230.8

Principal Conical Surface



House side max intensity
2762.0 cd @ (90.0°, 65.0°)

Street side max intensity
3578.5 cd @ (80.0°, 65.5°)

Coordinates expressed in the C Type coordinate system
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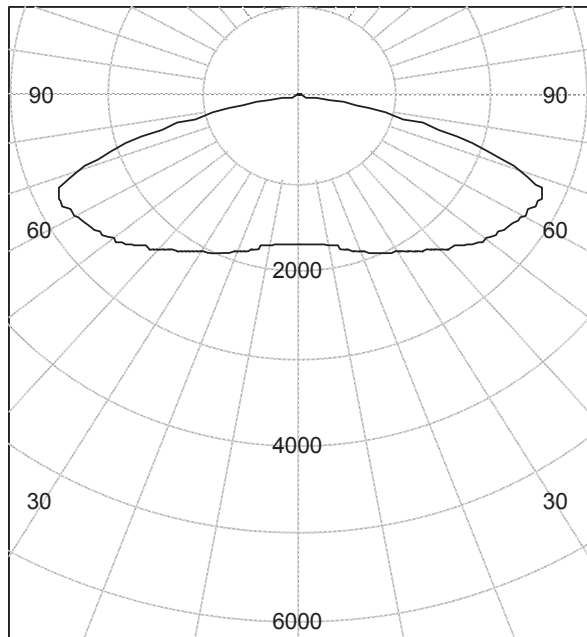
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Polar curve through L90 / L270

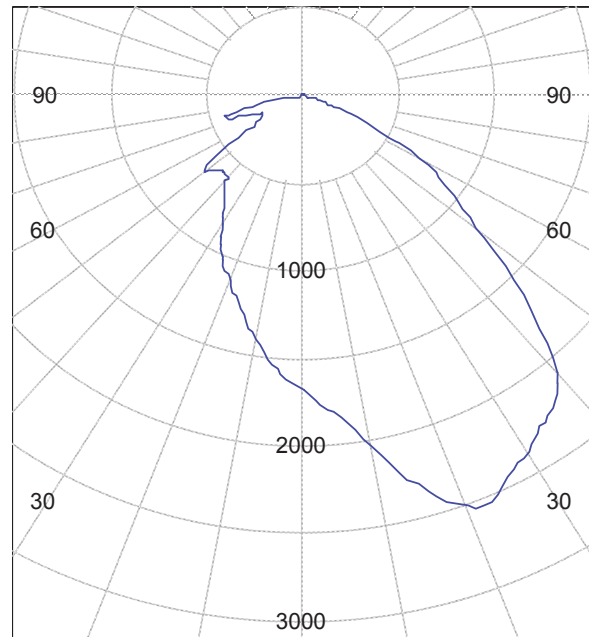


(L90)

(cd)

(L270)

Polar curve through L0 / L180



House side (L180)

(cd)

Street side (L0)



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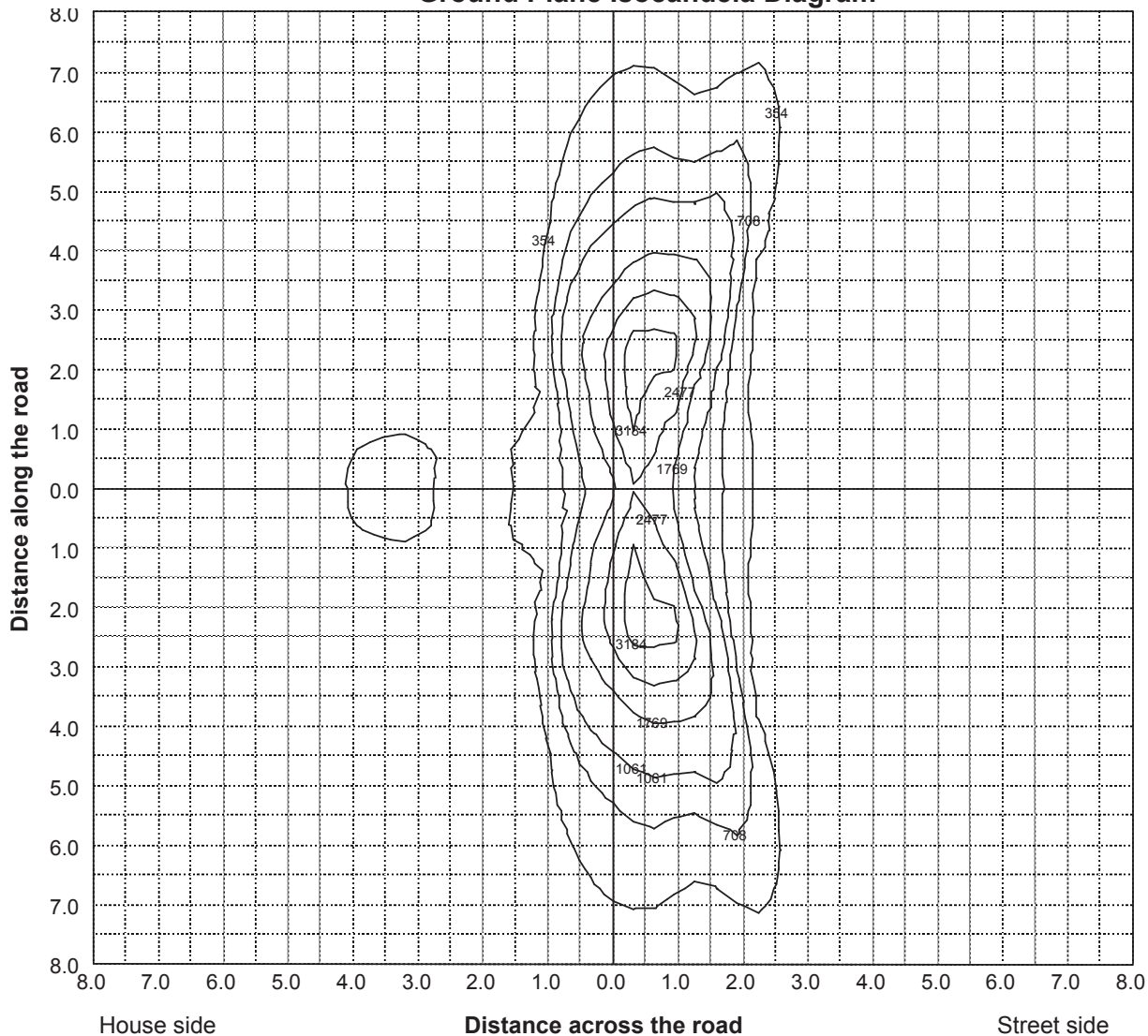
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Ground Plane Isocandela Diagram



The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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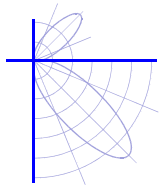
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Intensity data (cd)

Vertical	L-Plane								
	L0	L15	L30	L40	L45	L50	L55	L60	L65
0.0	1690	1690	1690	1690	1690	1690	1690	1690	1690
10.0	2036	2010	1968	1929	1910	1892	1873	1854	1837
20.0	2501	2485	2476	2449	2422	2384	2334	2281	2213
30.0	2338	2364	2492	2677	2751	2787	2783	2742	2672
35.0	2221	2256	2401	2540	2647	2773	2869	2916	2892
40.0	2054	2159	2330	2470	2538	2632	2782	2944	3047
45.0	1614	1708	2135	2464	2554	2598	2658	2811	3029
47.5	1380	1467	1885	2391	2567	2647	2656	2751	2970
50.0	1176	1242	1634	2180	2501	2694	2716	2731	2902
52.5	1033	1088	1356	1894	2288	2665	2806	2788	2867
55.0	936	956	1174	1617	2020	2497	2873	2890	2863
57.5	831	845	1037	1330	1755	2258	2816	3021	2935
60.0	693	717	901	1178	1450	1994	2606	3081	3068
62.5	529	555	727	1033	1234	1640	2322	3007	3208
65.0	353	388	532	824	1047	1339	1977	2804	3315
67.5	222	257	351	544	768	1060	1665	2527	3266
70.0	149	169	224	338	473	682	1294	2148	2961
72.5	116	132	161	200	281	378	714	1601	2365
75.0	84	97	113	129	163	198	262	871	1747
77.5	56	66	74	86	95	95	105	303	1042
80.0	34	39	44	51	57	59	60	101	464
82.5	17	19	22	25	27	29	30	40	121
85.0	7	7	8	9	9	10	10	11	17
87.5	3	3	3	3	3	4	4	4	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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Intensity data (cd)

Vertical	L-Plane								
	L70	L75	L80	L85	L90	L95	L100	L105	L110
0.0	1690	1690	1690	1690	1690	1690	1690	1690	1690
10.0	1818	1797	1775	1754	1733	1710	1688	1663	1635
20.0	2138	2064	2001	1947	1895	1839	1780	1720	1655
30.0	2581	2455	2302	2162	2059	1961	1856	1754	1648
35.0	2801	2674	2503	2316	2154	2022	1887	1762	1633
40.0	3027	2904	2726	2503	2282	2102	1938	1774	1610
45.0	3171	3117	2929	2687	2415	2185	1985	1783	1575
47.5	3187	3212	3032	2770	2482	2223	2000	1774	1549
50.0	3159	3281	3134	2854	2543	2250	2002	1763	1529
52.5	3115	3321	3229	2930	2593	2265	1992	1747	1515
55.0	3053	3330	3317	3010	2639	2268	1976	1725	1491
57.5	3021	3312	3389	3091	2671	2257	1948	1702	1445
60.0	3045	3299	3450	3170	2706	2247	1929	1677	1370
62.5	3133	3316	3509	3246	2742	2248	1924	1646	1267
65.0	3268	3366	3576	3310	2762	2250	1927	1606	1143
67.5	3375	3366	3511	3252	2688	2198	1889	1511	944
70.0	3252	3196	3228	2939	2395	1966	1694	1251	672
72.5	2719	2719	2716	2443	1978	1623	1343	851	393
75.0	2057	2073	2067	1844	1498	1235	939	468	202
77.5	1473	1375	1349	1237	1019	825	534	208	116
80.0	869	737	692	734	611	460	239	84	78
82.5	285	279	197	260	249	158	61	37	35
85.0	25	26	17	16	17	15	12	12	11
87.5	4	4	4	4	4	4	4	4	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

RT



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Intensity data (cd)

Vertical	L-Plane								
	L115	L120	L125	L130	L135	L140	L150	L165	L180
0.0	1690	1690	1690	1690	1690	1690	1690	1690	1690
10.0	1606	1579	1556	1535	1514	1493	1459	1424	1416
20.0	1589	1524	1460	1402	1347	1295	1211	1142	1124
30.0	1548	1455	1367	1283	1206	1129	990	876	844
35.0	1513	1402	1303	1202	1105	1003	826	726	708
40.0	1463	1334	1215	1085	953	824	661	621	619
45.0	1397	1249	1090	911	745	623	545	586	601
47.5	1358	1189	998	799	634	538	518	582	617
50.0	1316	1106	883	677	530	471	503	601	666
52.5	1268	995	743	546	445	432	474	593	601
55.0	1193	850	587	428	392	395	455	476	415
57.5	1088	688	440	358	353	369	411	360	290
60.0	941	525	348	320	341	340	345	313	249
62.5	777	401	307	298	325	322	308	324	237
65.0	614	329	282	274	286	298	299	309	230
67.5	462	280	250	241	257	272	287	311	267
70.0	325	233	215	210	226	239	260	338	351
72.5	217	184	176	175	186	202	250	357	422
75.0	150	139	131	133	142	162	266	329	389
77.5	106	97	89	90	104	149	213	238	297
80.0	66	58	54	59	79	102	117	150	206
82.5	29	28	27	31	38	45	36	40	81
85.0	11	10	9	8	7	6	4	3	3
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
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180.0	0	0	0	0	0	0	0	0	0



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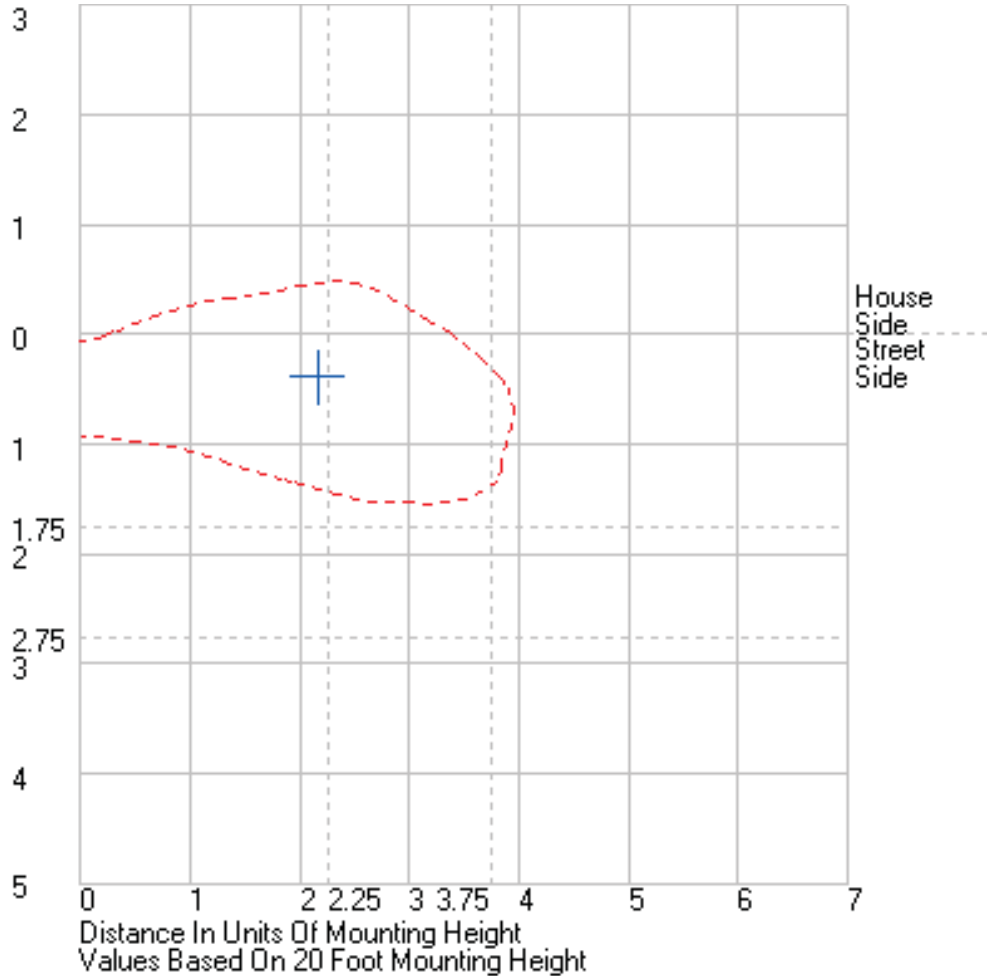
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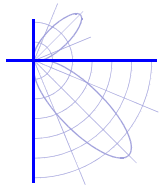
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.438, 0.405)
	CIE 1976 (u', v') ⁽¹⁾	(0.250, 0.522)
	Correlated Color Temperature (CCT) ⁽¹⁾	3000 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	3.25E-03
	Color Rendering Index (Ra) ⁽¹⁾	71.2
	Special CRI 9 (R ₉) ^{(1),(3)}	-40.7
	Distance from Planckian Locus (Duv) ^{(1),(3)}	4.24E-04
	Scotopic/Photopic Ratio ^{(1),(3)}	1.22

Electrical	Voltage	120.0 V	(Setpoint 1)
	Frequency	60.0 Hz	
	Current	0.496 A	
	Power	57.8 W	
	Power Factor	0.97	
	Current THD	3.7 %	
	Voltage	277.0 V	(Setpoint 2)
	Frequency	60.0 Hz	
	Current	0.213 A	
	Power	56.5 W	
	Power Factor	0.96	
	Current THD	9.2 %	

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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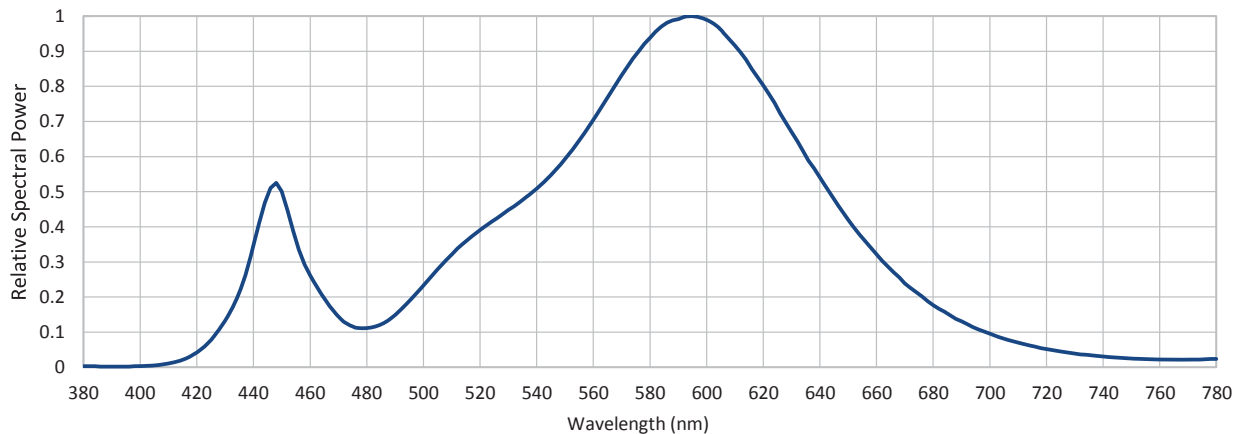
Operating at 120v AC and 60 Hz.

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	0.261	540	0.508	620	0.803	700	0.096
385	0.003	465	0.197	545	0.547	625	0.737	705	0.082
390	0.002	470	0.144	550	0.593	630	0.670	710	0.070
395	0.002	475	0.116	555	0.645	635	0.603	715	0.060
400	0.003	480	0.112	560	0.705	640	0.541	720	0.052
405	0.005	485	0.122	565	0.768	645	0.478	725	0.045
410	0.011	490	0.149	570	0.831	650	0.421	730	0.039
415	0.022	495	0.188	575	0.890	655	0.369	735	0.035
420	0.042	500	0.234	580	0.938	660	0.322	740	0.031
425	0.079	505	0.279	585	0.976	665	0.279	745	0.028
430	0.133	510	0.321	590	0.991	670	0.239	750	0.025
435	0.215	515	0.359	595	0.999	675	0.208	755	0.023
440	0.347	520	0.391	600	0.990	680	0.177	760	0.022
445	0.490	525	0.420	605	0.961	685	0.153	765	0.021
450	0.501	530	0.448	610	0.916	690	0.131	770	0.022
455	0.362	535	0.477	615	0.862	695	0.111	775	0.022
								780	0.024





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Operating at 120v AC and 60 Hz.

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, 0.521)	(0.249, 0.520)
30.0	(0.250, 0.521)	(0.252, 0.523)
40.0	(0.250, 0.522)	(0.248, 0.520)
50.0	(0.251, 0.522)	(0.250, 0.522)
60.0	(0.251, 0.522)	(0.250, 0.523)
70.0	(0.252, 0.523)	I <= 10% peak
80.0	(0.248, 0.521)	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 1.25 / 3.5 hours

Equipment and uncertainties

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

Luminous Intensity	± 4 %	Temperature	± 1 °C
Luminous Flux	± 4 %	Luminous Efficacy	± 4.5 %
Horiz., Vert. Angles	± 0.25°		

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-19244-10

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 53 X 3G2H XXXX XXXX

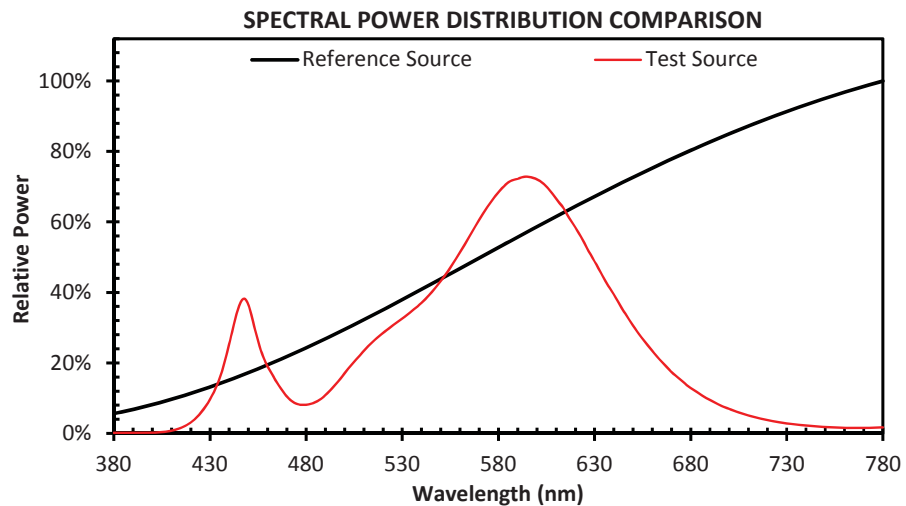
Grey cast aluminum top housing and white plastic bottom housing with clear flat glass lens.

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

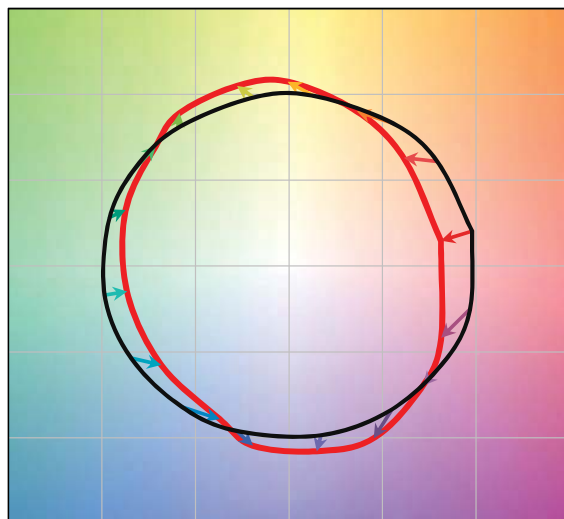
One Osram Optotronic LED driver. Model: QT50W/UNV/1250C/2DIMLT2/P6 set to 1050ma.

Operating at 120v AC and 60 Hz.

R_f	72
R_g	93



COLOR VECTOR GRAPHIC



— Test Source

→ Series1

COLOR DISTORTION GRAPHIC





Test Report No. LLI-19244-10

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 53 X 3G2H 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.