



Report of Test LLI-19275-7

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 50 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 1000ma.
Operating at 120v AC and 60 Hz.



Performance Summary

Total Light Output	6719 lm	Min Power Factor	0.96 @ 277 V
Luminaire Power	54.9 W	Max THD(i)*	8.9 % @ 277 V
Luminous Efficacy	122.4 lm/W	0-90° Zonal Flux %	100.0 %
CCT	2990 K	80-90° Zonal Flux %	0.6 %
CIE(x,y) 1931	(0.439, 0.406)	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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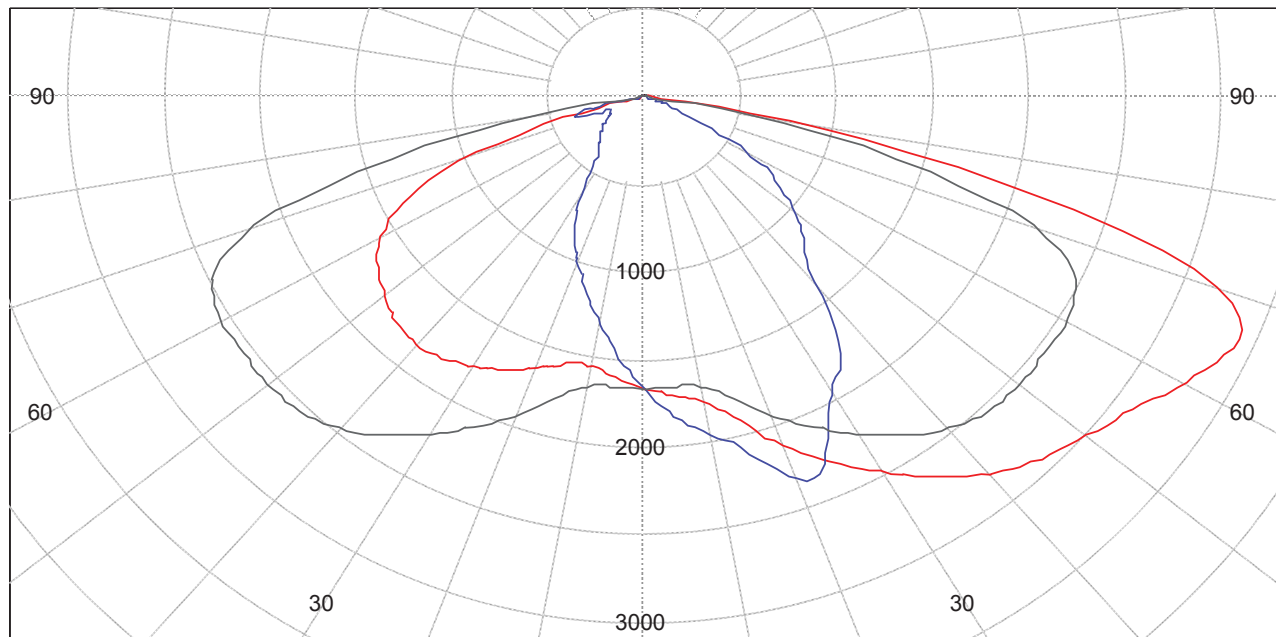
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Polar Light Distribution Curves



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 %	67.7 %	67.7 %
House Side	0.0 %	32.3 %	32.3 %
	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

16-Oct-2019
16-Oct-2019



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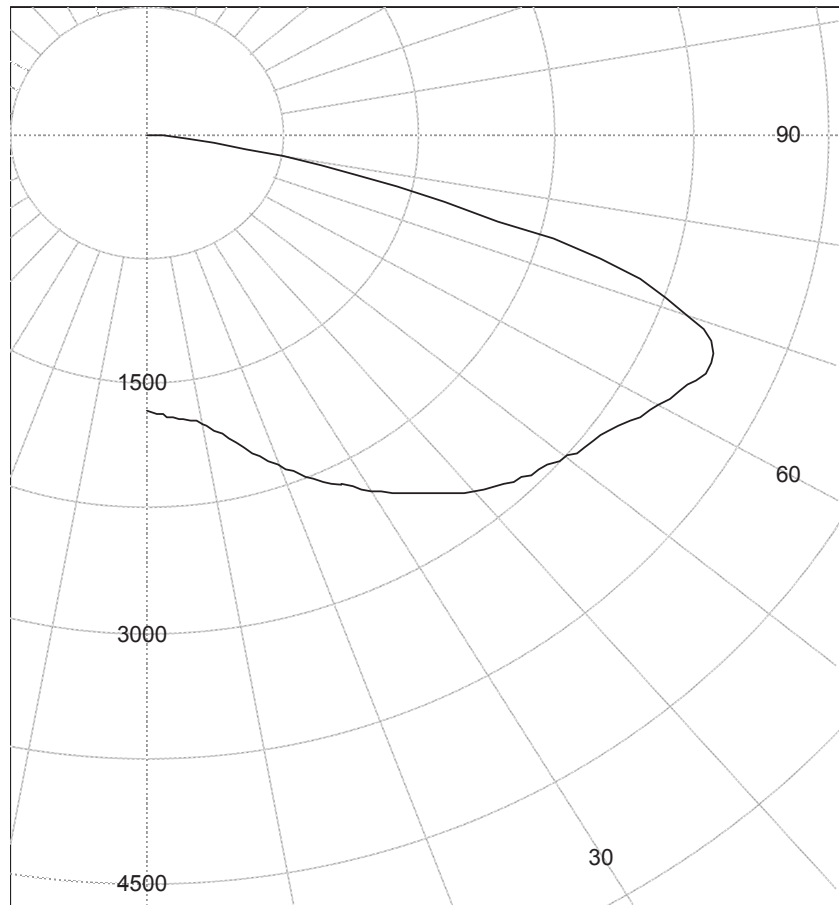
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Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (L72.5) (cd)
0.0	1664.2
10.0	1769.5
20.0	2116.0
30.0	2470.5
35.0	2642.6
40.0	2802.2
45.0	2917.2
47.5	2961.1
50.0	3009.1
52.5	3058.8
55.0	3102.6
57.5	3178.2
60.0	3252.3
62.5	3322.3
65.0	3385.4
67.5	3370.3
70.0	3165.6
72.5	2736.5
75.0	2003.7
77.5	1286.3
80.0	773.2
82.5	302.1
85.0	13.9
87.5	5.8
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
2557.7 cd @ (90.0°, 58.0°)

Street side max intensity
3395.0 cd @ (72.5°, 66.0°)

Coordinates expressed in the C Type coordinate system

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



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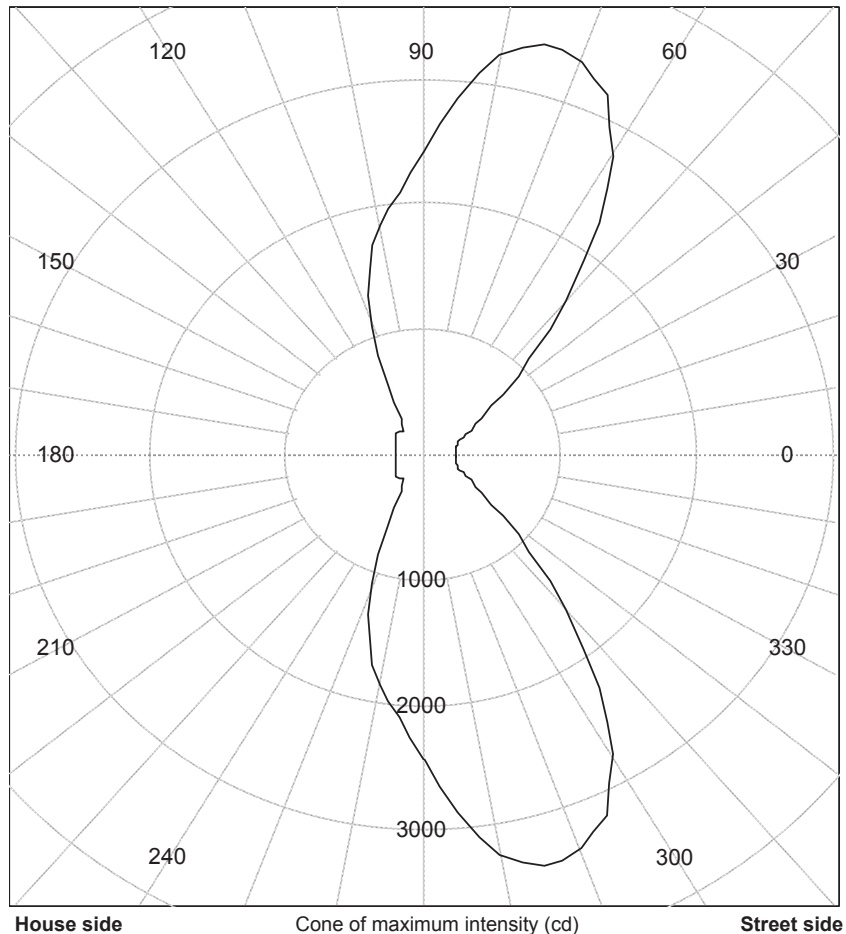
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Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V66.0) (cd)
0	225.0
15	240.3
30	390.8
40	757.7
45	1090.2
50	1612.4
55	2257.6
60	2774.0
65	3167.3
70	3353.4
75	3392.8
80	3244.5
85	2859.6
90	2436.0
95	2107.4
100	1853.2
105	1542.1
110	1096.5
115	626.3
120	330.4
125	244.8
130	252.0
135	263.9
140	254.8
150	224.3
165	211.1
180	201.1

Principal Conical Surface



House side

Cone of maximum intensity (cd)

Street side

House side max intensity
2557.7 cd @ (90.0°, 58.0°)

Street side max intensity
3395.0 cd @ (72.5°, 66.0°)

Coordinates expressed in the C Type coordinate system

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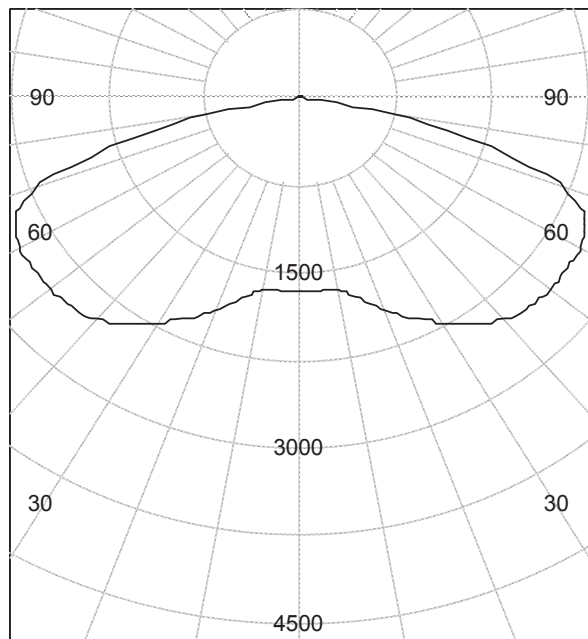
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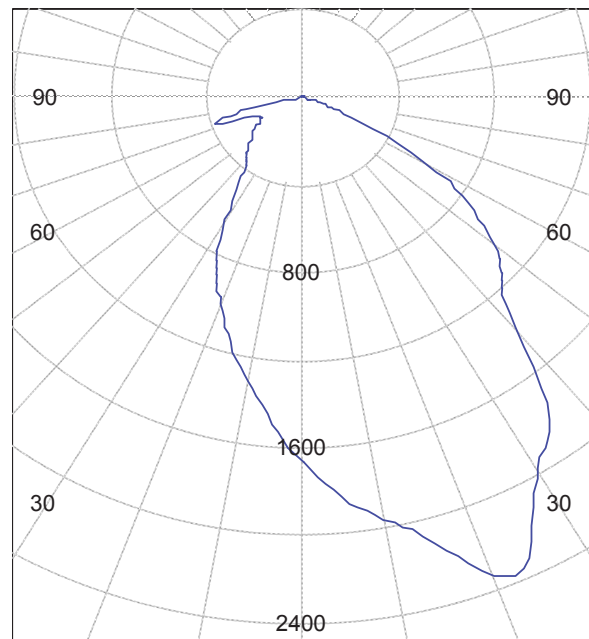
Operating at 120v AC and 60 Hz.

Polar curve through L90 / L270



(L90) (cd) (L270)

Polar curve through L0 / L180



House side (L180) (cd) Street side (L0)

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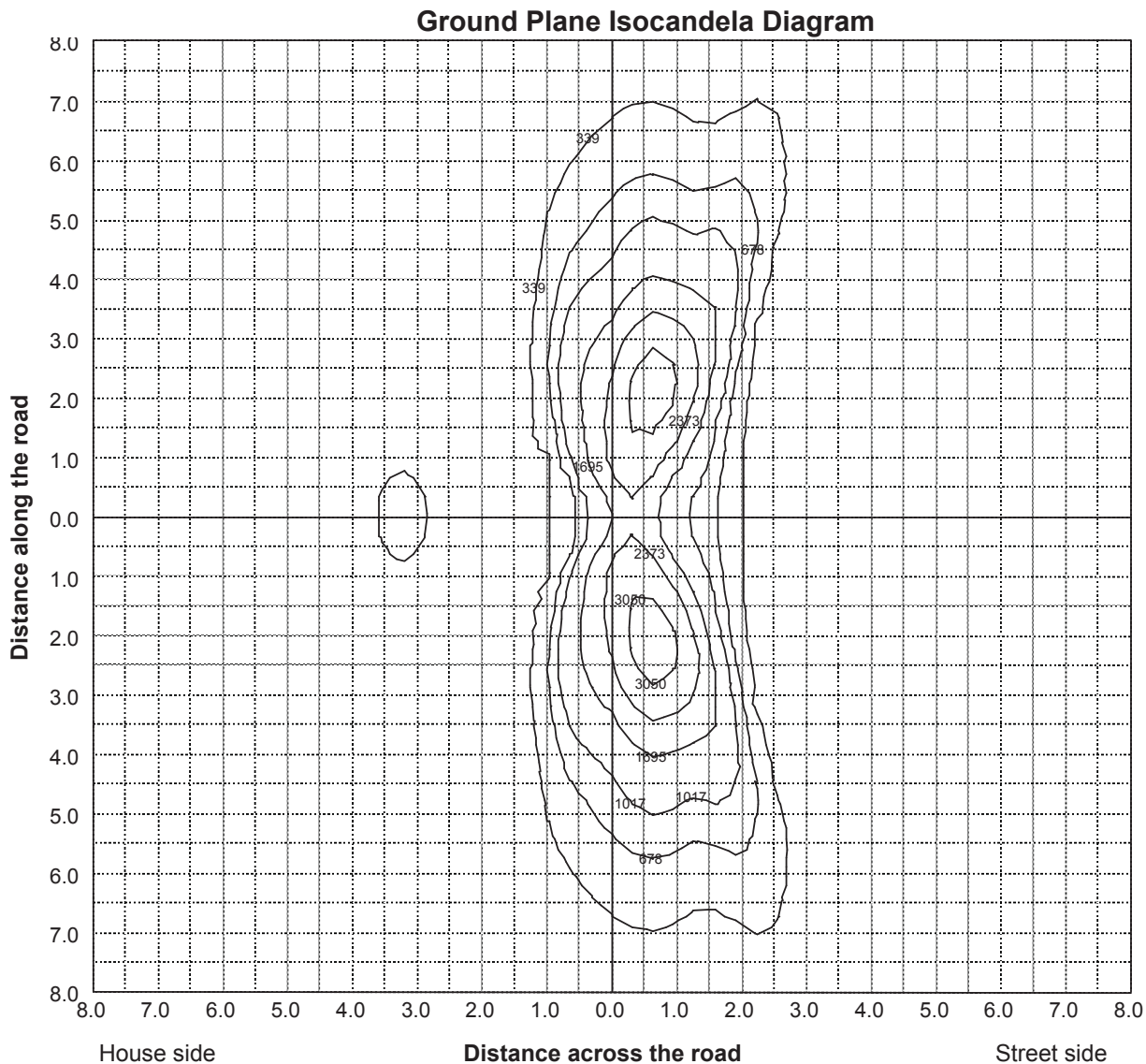
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The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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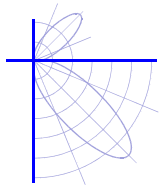
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Intensity data (cd)

Vertical	L-Plane								
	L0	L15	L30	L40	L45	L50	L55	L60	L65
0.0	1664	1664	1664	1664	1664	1664	1664	1664	1664
10.0	1957	1939	1916	1894	1881	1866	1848	1827	1802
20.0	2324	2292	2237	2210	2187	2177	2173	2169	2156
30.0	1954	2008	2264	2513	2578	2592	2562	2532	2505
35.0	1788	1843	2049	2356	2531	2663	2720	2717	2695
40.0	1369	1536	1875	2187	2383	2594	2770	2855	2861
45.0	1174	1264	1647	2042	2262	2498	2722	2885	2954
47.5	1112	1202	1546	1962	2208	2460	2686	2871	2977
50.0	1036	1125	1459	1880	2154	2421	2650	2855	2989
52.5	938	1019	1377	1789	2101	2390	2635	2852	3013
55.0	833	899	1260	1682	2042	2353	2620	2853	3028
57.5	737	777	1109	1556	1948	2316	2633	2892	3076
60.0	575	633	944	1395	1793	2253	2637	2928	3129
62.5	417	458	728	1188	1550	2073	2555	2920	3175
65.0	270	294	481	898	1237	1769	2357	2827	3187
67.5	171	186	263	551	857	1344	2052	2670	3080
70.0	121	142	162	259	480	862	1579	2345	2837
72.5	91	113	128	134	203	411	962	1810	2364
75.0	73	89	100	99	102	150	377	1120	1807
77.5	58	73	69	76	71	76	99	478	1126
80.0	47	57	43	49	49	46	52	149	555
82.5	21	29	21	24	25	26	26	40	156
85.0	8	8	9	9	10	10	11	11	15
87.5	4	4	4	5	5	5	5	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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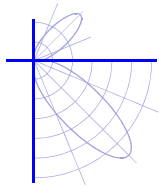
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Operating at 120v AC and 60 Hz.

Intensity data (cd)

Vertical	L-Plane								
	L70	L75	L80	L85	L90	L95	L100	L105	L110
0.0	1664	1664	1664	1664	1664	1664	1664	1664	1664
10.0	1781	1758	1731	1703	1676	1646	1611	1580	1546
20.0	2132	2093	2044	1994	1938	1868	1791	1703	1606
30.0	2485	2454	2395	2311	2224	2120	1992	1857	1718
35.0	2660	2624	2567	2464	2364	2235	2081	1920	1752
40.0	2828	2776	2709	2594	2475	2322	2137	1954	1765
45.0	2942	2883	2801	2673	2531	2348	2140	1940	1741
47.5	2984	2926	2834	2695	2542	2345	2122	1915	1715
50.0	3029	2974	2874	2721	2553	2340	2099	1882	1675
52.5	3072	3025	2914	2740	2549	2317	2067	1853	1638
55.0	3104	3074	2959	2767	2543	2290	2033	1818	1588
57.5	3173	3155	3031	2810	2556	2282	2016	1792	1532
60.0	3245	3232	3096	2841	2542	2242	1973	1741	1444
62.5	3307	3306	3161	2860	2516	2199	1933	1674	1316
65.0	3353	3380	3230	2871	2472	2145	1887	1590	1165
67.5	3310	3378	3228	2813	2360	2026	1775	1443	975
70.0	3086	3202	3089	2635	2150	1823	1583	1212	727
72.5	2650	2776	2730	2287	1804	1529	1307	887	460
75.0	1974	2065	2128	1798	1359	1153	951	534	237
77.5	1356	1260	1351	1239	948	765	578	257	110
80.0	839	672	698	716	580	436	268	92	54
82.5	294	239	192	235	208	139	63	26	24
85.0	15	13	12	12	12	12	12	11	10
87.5	6	6	6	6	6	6	6	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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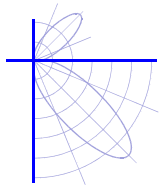
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Intensity data (cd)

Vertical	L-Plane								
	L115	L120	L125	L130	L135	L140	L150	L165	L180
0.0	1664	1664	1664	1664	1664	1664	1664	1664	1664
10.0	1514	1482	1450	1424	1401	1378	1346	1319	1314
20.0	1513	1427	1341	1263	1196	1142	1075	1020	1005
30.0	1581	1448	1314	1180	1053	942	798	685	642
35.0	1590	1433	1274	1110	946	790	593	474	443
40.0	1588	1405	1198	985	763	576	417	376	368
45.0	1545	1323	1065	763	511	386	353	332	318
47.5	1499	1263	960	626	415	349	340	312	294
50.0	1448	1181	829	506	357	335	324	300	279
52.5	1386	1062	690	414	334	329	312	290	270
55.0	1296	910	547	350	322	321	299	281	246
57.5	1177	757	436	314	312	313	284	250	220
60.0	1029	615	356	293	304	300	266	230	207
62.5	863	482	298	276	291	283	248	219	196
65.0	694	372	257	259	274	264	230	214	197
67.5	519	276	227	241	245	240	216	214	223
70.0	358	207	198	222	217	218	199	252	311
72.5	219	157	169	189	182	186	169	329	387
75.0	132	120	137	144	145	148	178	284	316
77.5	84	87	97	96	99	108	137	215	252
80.0	50	52	54	54	57	63	72	105	139
82.5	23	22	21	20	21	20	14	26	45
85.0	9	8	6	5	4	4	4	3	2
87.5	4	3	3	2	2	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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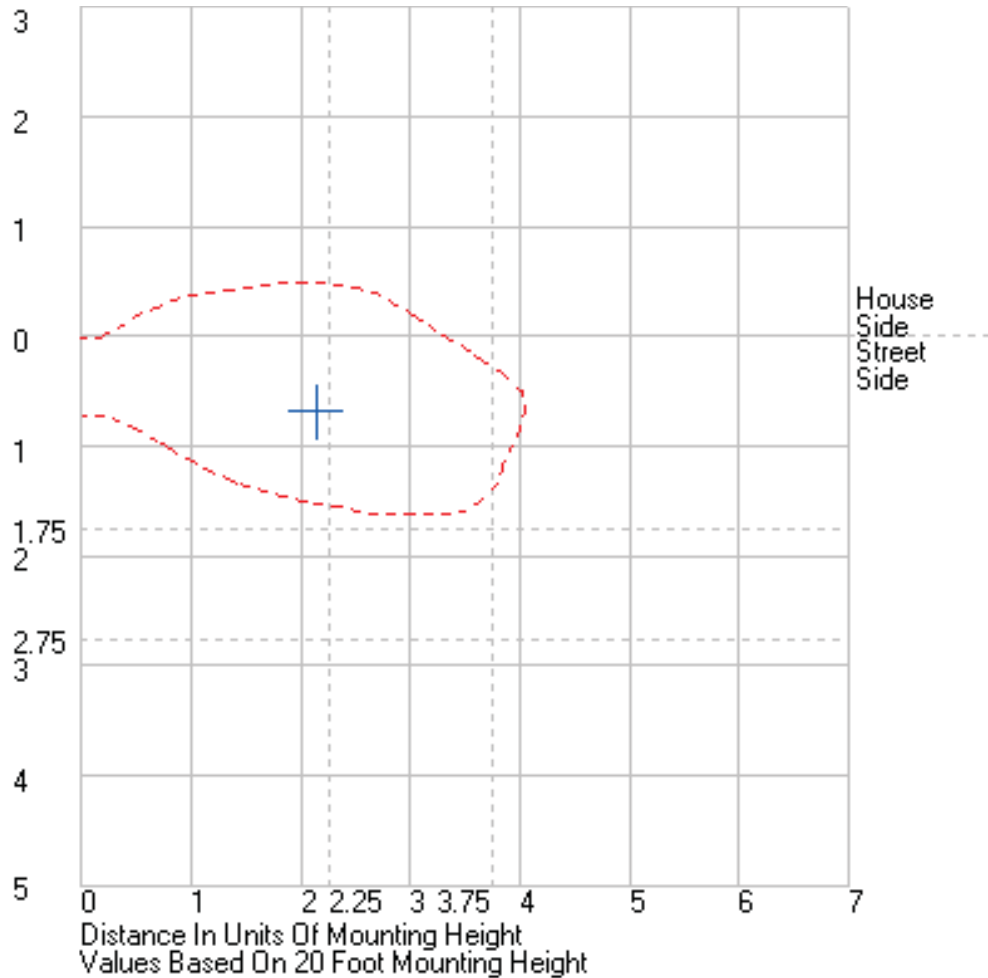
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.439, 0.406)
	CIE 1976 (u', v') ⁽¹⁾	(0.251, 0.522)
	Correlated Color Temperature (CCT) ⁽¹⁾	2990 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	2.51E-03
	Color Rendering Index (Ra) ⁽¹⁾	70.9
	Special CRI 9 (R ₉) ^{(1),(3)}	-41.9
	Distance from Planckian Locus (Duv) ^{(1),(3)}	5.77E-04
	Scotopic/Photopic Ratio ^{(1),(3)}	1.21

Electrical	Voltage	120.0 V	(Setpoint 1)
	Frequency	60.0 Hz	
	Current	0.474 A	
	Power	54.9 W	
	Power Factor	0.96	
	Current THD	3.2 %	
	Voltage	277.0 V	(Setpoint 2)
	Frequency	60.0 Hz	
	Current	0.203 A	
	Power	53.8 W	
	Power Factor	0.96	
	Current THD	8.9 %	

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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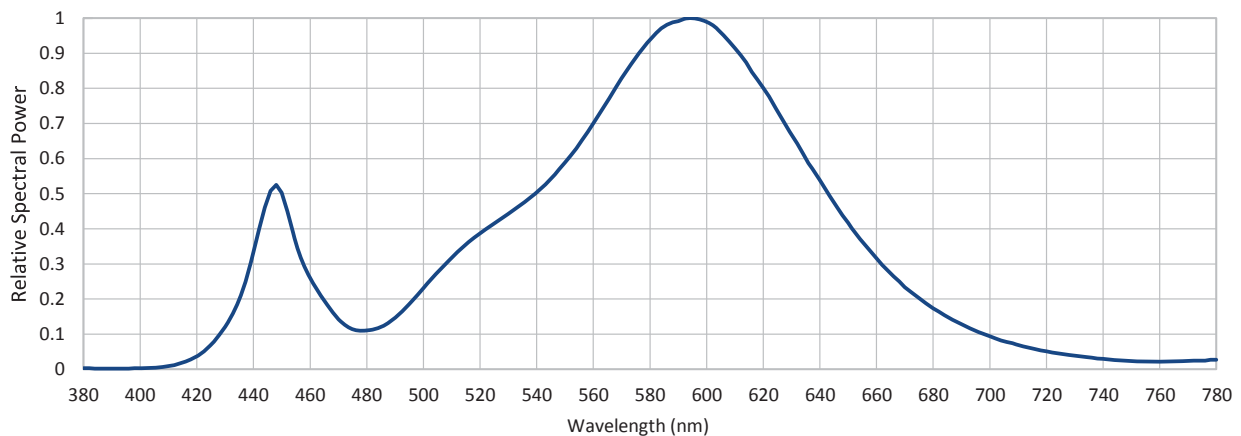
Operating at 120v AC and 60 Hz.

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	0.259	540	0.504	620	0.801	700	0.094
385	0.002	465	0.196	545	0.543	625	0.735	705	0.080
390	0.002	470	0.142	550	0.589	630	0.668	710	0.069
395	0.002	475	0.115	555	0.641	635	0.601	715	0.060
400	0.003	480	0.110	560	0.701	640	0.539	720	0.051
405	0.005	485	0.121	565	0.764	645	0.474	725	0.044
410	0.009	490	0.147	570	0.829	650	0.417	730	0.039
415	0.019	495	0.186	575	0.888	655	0.364	735	0.034
420	0.037	500	0.231	580	0.938	660	0.316	740	0.030
425	0.070	505	0.276	585	0.976	665	0.273	745	0.026
430	0.121	510	0.318	590	0.991	670	0.234	750	0.024
435	0.201	515	0.356	595	0.999	675	0.203	755	0.022
440	0.333	520	0.387	600	0.990	680	0.174	760	0.022
445	0.484	525	0.416	605	0.959	685	0.150	765	0.022
450	0.503	530	0.443	610	0.914	690	0.128	770	0.025
455	0.362	535	0.472	615	0.860	695	0.109	775	0.025
								780	0.027





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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)	(0.249, 0.521)
10.0	(0.250, 0.521)	(0.251, 0.522)
20.0	(0.250, 0.522)	(0.249, 0.521)
30.0	(0.251, 0.522)	(0.251, 0.523)
40.0	(0.251, 0.522)	(0.250, 0.522)
50.0	(0.251, 0.522)	(0.250, 0.523)
60.0	(0.251, 0.523)	(0.251, 0.524)
70.0	(0.252, 0.523)	I <= 10% peak
80.0	(0.250, 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 0.5 / 3.0 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-19275-7

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 50 X 3G2S XXXX XXXX

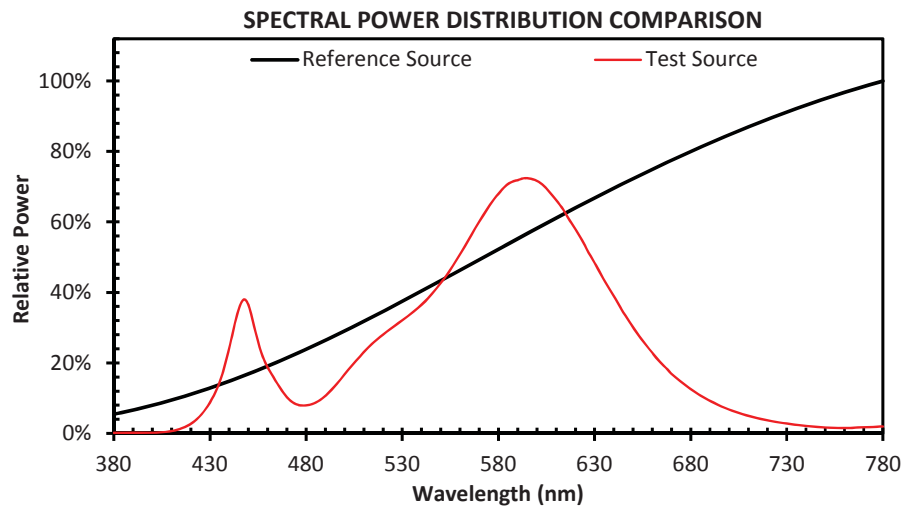
Grey cast aluminum top housing and white plastic bottom housing with clear flat glass lens.

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

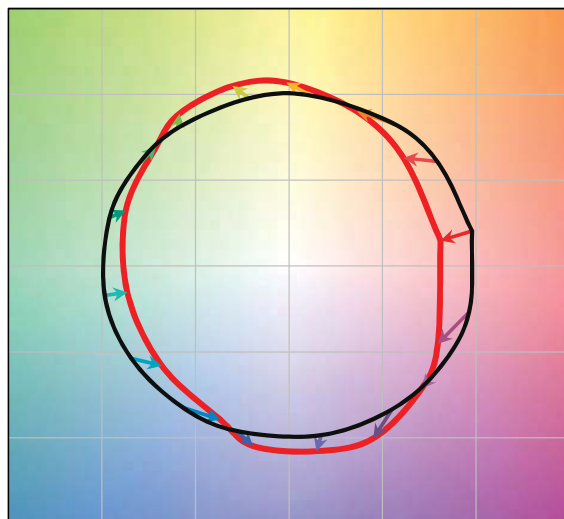
One Osram Optotronic LED driver. Model: QT50W/UNV/1250C/2DIMLT2/P6 set to 1000ma.

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-19275-7

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 50 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 1000ma.
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.