



FOR THE SCOPE OF  
ACCREDITATION UNDER NVLAP LAB  
CODE 100402-0.

# REPORT

3933 US ROUTE 11 CORTLAND, NEW YORK 13045

Project No. G100082487

Date: February 22, 2011

REPORT NO. 100082487CRT-004C

TEST OF ONE MODEL OF LED LAMPS

MODEL NO. AG10R163060

RENDERED TO

NEXXUS LIGHTING INC.  
124 FLOYD SMITH DRIVE  
SUITE 300  
CHARLOTTE, NC 28262

**TEST:** Distribution, Minimum Light Output, Electrical Measurements, Color, Color Spatial Uniformity, Rapid Cycle Stress Test, Transient, Lumen and Color Maintenance to 6000 hours, and In-Situ Maximum Temperature Measurements as required to the Energy Star Integral LED Lamp Criteria: Version 1.3.

**LABORATORY NOTE:** The laboratory that conducted the testing detailed in this report has been Qualified, Verified, and Recognized for LM-79 Testing for ENERGY STAR for SSL by US DOE's CALiPER program.

**STATEMENT OF LIMITATION:** This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

**AUTHORIZATION:** The testing performed was authorized by signed quote number 500222294.

**STANDARDS USED:** The following American National Standards or Illuminating Engineering Society of North America Test Guides were used in part or totally to test each specimen:

ANSI/IEEE C62.41: 1991 Recommended Practice on Surge Voltages in Low – Voltage AC Circuits

IESNA LM-79: 2008 Approved Method for Electrical and Photometric Measurements of Solid-State Lighting Products

ANSI NEMA ANSLG C78.377: 2008 Specifications of the Chromaticity of Solid State Lighting Products

UL 1598: 2008 Standard for Safety: Luminaires

ANSI C79.1: 2002 Nomenclature for Glass Bulbs Intended for Use with Electric Lamps

ANSI C78.20: 2003 A, G, PS and Similar Shapes with E26 Medium Screw Bases

ANSI C78.21: 2003 PAR and R Shapes

ANSI C78.24: 2001 Two-inch Integral-Reflector Lamps with Front Covers and GU5.3 or GX5.3 Bases

**DESCRIPTION OF SAMPLE:** The client submitted 28 samples of model number AG10R163060. The samples were received by Intertek on April 9, 2010, in undamaged condition, and 27 samples were tested as received. The sample designations were N4837LP through N4856LP, and N4858LP through N4864LP.

**DATES OF TESTS:** April 13, 2010 through February 17, 2011.

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## SUMMARY

Model Number :	AG10R163060
Model Description Category :	Directional – R
Intended to Replace:	16W – R16*
Rated Life on Packaging:	50,000 Hours

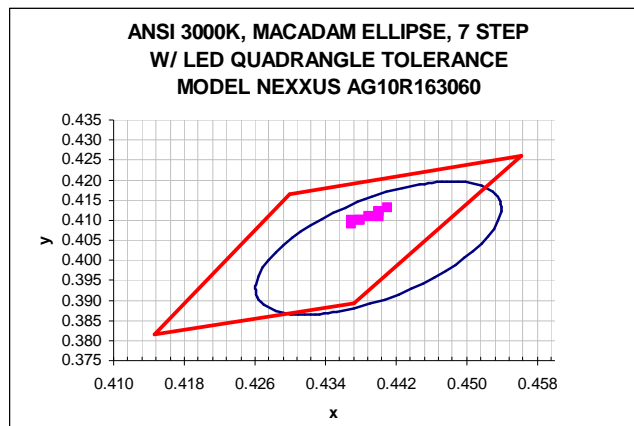
Criteria	Result	Status
Operating Voltage	120.0Vac	Complies
Minimum Light Output	169.3 Lumens	N/A*
Lumen Efficacy	62.95	Complies
Power Factor	0.923	Complies
LED Operating Frequency	120 Hz	Complies
Noise	20.5 dBA	Complies
Maximum Lamp Diameter	1.962 In.	N/A*
Maximum Overall Length (MOL)	1.848 In.	N/A*
Color Spatial Uniformity – for directional lamps only	Max $\Delta = 0.003$	Complies
Maximum In-Situ Source Temperature	63.1°C	Complies
Lumen Maintenance at 3000 Hours Life	97.87%	Complies
Color Maintenance at 3000 Hours Life	max $\Delta = 0.001$	N/A
Lumen Maintenance at 6000 Hours Life	99.06%	Complies
Color Maintenance at 6000 Hours Life	max $\Delta = 0.003$	Complies
Lumen Maintenance at 12500 Hours Life	TBD	TBD
Color Maintenance at 12500 Hours Life	TBD	N/A

Criteria	Status
Transient Protection	Complies
Rapid Cycle Stress Test for 25,000 Hour Rating	Complies
Rapid Cycle Stress Test for 50,000 Hour Rating	Complies

\*Note: Not a standard lamp in ANSI C78.21:2003

### Additional Color Information

Property	Result	Status
Color Rendering Index (Ra)	83.98	Complies
CRI - R9	40.45	Complies
Duv	0.002	Complies
Correlated Color Temperature	3019K	Complies for 3000K
Chromaticity Coordinate - x	0.439	Complies
Chromaticity Coordinate - y	0.411	Complies
Chromaticity Coordinate – u'	0.249	--
Chromaticity Coordinate – v'	0.524	--



**ENERGY STAR REQUIREMENTS**

**For All Lamp Types**

Criteria Measured	Quantity	Specified Value		
Correlated Color Temperature (CCT) and Duv	10 samples per model (5 base up, 5 base down) 9 of 10 must pass	Rated CCT	Target CCT (K) and tolerance	Target Duv and tolerance
		2700K	2725 ± 145	0.000 ± 0.006
		3000K	3045 ± 175	0.000 ± 0.006
		3500K	3465 ± 245	0.000 ± 0.006
		4000K	3985 ± 275	0.000 ± 0.006
Color Rendering Index (CRI)	10 samples per model (5 base up, 5 base down) 9 of 10 must pass	Minimum Ra = 80 R9 > 0		
Power Factor	10 samples per model (5 base up, 5 base down) average must pass	≤ 5W and low voltage lamps, no minimum > 5W, ≥ 0.70 minimum		
LED Operating Frequency	1 sample	≥ 120 Hz		
Audible Noise	1 sample	Class A sound rating		
Transient	5 samples	Survive 7 strikes of a 2.5kV, 100kHz Ringwave		
Operating Voltage	all	Ac: 120V, 240V, 277V, 12V or 24Vac Dc: 12V or 24V		
Color Maintenance	10 samples per model (5 base up, 5 base down) 9 of 10 must pass	At 6000 hours, u'v' cannot vary more than 0.007		
Rapid Cycle Stress Test	10 samples per model (5 base up, 5 base down) 9 of 10 must pass	Survive minimum amount of cycles		
Lumen Maintenance at 3000 Hours – Interim Qualification	10 samples per model (5 base up, 5 base down)	Average of 10 lamps ≥ 95.8% (Note: Decorative category ≥ 93.1%)		
Maximum In-Situ Temperature (for early initial qualification only)	1 sample	Measured maximum temperature in-situ must be below LED chip manufacturer's specifications		

**For All Lamp Types – Additional Optional Lumen Maintenance Requirements for Life Claims over 25,000 Hours**

Minimum Test Period (hours)	Minimum Lumen Maintenance (%)	Maximum L70 Life Claim Hours
7500	91.2	30,000
8750	91.5	35,000
10000	91.5	40,000
12500	91.8	50,000

**For Directional Lamp Types - BR, ER, K, MR, PAR, R or any lamp having ≥ 80% of light output within 120° cone**

Criteria Measured	Quantity	Specified Value
Minimum Luminous Efficacy - Directional	10 samples per model (5 base up, 5 base down) 9 of 10 must pass	≤ 20/8 inch diameter = 40 lm/W minimum > 20/8 inch diameter = 45 lm/W minimum
Minimum Light Output – BR, ER, K, R	10 samples per model (5 base up, 5 base down) 9 of 10 must pass	Minimum Lumens = target wattage x 10
Minimum Center Beam Intensity – PAR and MR-16	1 sample	Must use Energy Star's Center Beam Tool
Color Spatial Uniformity	1 sample	≤ 0.006 of average weighted u' v'
Maximum Lamp Diameter	1 sample	Not to exceed target lamp diameter
Maximum Overall Length (MOL)	1 sample	Not to exceed target lamp length
Lumen Maintenance <10W at 25°C Lumen Maintenance ≥10W at 45°C	10 samples per model (5 base up, 5 base down) average must pass	≥ 95.8% at 3000 Hours for optional early qual. ≥ 91.8% at 6000 Hours (25000 Hour Rating) ≥ 91.8% at 12500 Hours (50000 Hour Rating)

EQUIPMENT LIST

Equipment Used	Model Number	Control Number	Last Calibration Date	Calibration Due Date
Xitron Power Analyzer	2503H	E235	04/09/10	04/09/11
Yokogawa Power Analyzer	WT1600	E462	06/11/10	06/11/11
Labsphere Diode Array	DAS 1100	N714	Before Use	Before Use
Labsphere CDS 1100 CCD Spectroradiometer	CDS1100	--	Before Use	Before Use
LSI High Speed Mirror Goniophotometer	6440	--	Before Use	Before Use
Data Precision Digital Voltmeter	3600	V124	02/17/11	02/17/12
Fluke Multimeter	45	M133	02/17/11	02/17/12
Lecroy Oscilloscope	WAVEACE 232	E461	04/09/10	04/09/11
Fluke Temperature Meter	52	T801	06/11/10	06/11/11
Kikusui DC Power Supply	35-10L	E160	---	---
Sorenson DC Power Supply	DLM150-20E	--	---	---
Elgar AC Power Supply	CW1251	---	---	---
UDT Optometer	S370	N301	Before Use	Before Use
Keytek ECAT Surge Test System including:				
100kHz Ring Wave Module	E503	W147	4/21/10	04/21/11
Coupler/Decoupler Module	E551	W148	4/21/10	04/21/11
ITS Two Meter Diameter Integrating Sphere	---	N308	Before Use	Before Use
NIST Luminous Flux Standard Sources	---	150-14, 8043, 8830	03/17/10	03/17/11
NIST Spectral Flux Standard Source	RF0605	---	11/29/06	100 hours of use
Intertek CFL Life Facility including:				
Fluke Multimeter	87III	M145	03/12/10	03/12/11
Hourmeter	Cramer	Q087	07/08/10	07/08/11
SSAC Programmable Timers	RS4A33	---	---	---
Bruel & Kjaer Mediator Sound Level Meter	2238	A228	03/25/10	03/25/11
Bruel & Kjaer Calibrator	4231	A227	03/22/10	03/22/11

## TEST METHODS

### Seasoning in Sample Orientation – LED Products

No seasoning was performed in accordance with IESNA LM-79

### Photometric and Electrical measurements – Distribution Method

A LSI Type C High Speed Model 6440 Mirror Goniometer was used to measure the intensity (candelas) at each angle of distribution for each sample.

Ambient temperature was measured equal to the height of the sample mounted on the Goniometer equipment. Each sample was operated at input rated voltage in its designated orientation. Each sample was allowed to stabilize for at least thirty minutes before measurements were made. Electrical measurements including voltage, current, and power were measured using the Xitron or Yokogawa Power Analyzer.

Some graphics were created with Photometrics Plus software.

### Photometric and Electrical Measurements – Integrating Sphere Method

A Labsphere Model DAS 1100 Diode Array Spectroradiometer and Two Meter or Ten Foot Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation. Each SSL unit was allowed to stabilize for at least thirty minutes before measurements were made. Electrical measurements including voltage, current, and power were measured using the Xitron or Yokogawa Power Analyzer.

The calibration of the sphere photometer-spectroradiometer system is traceable to the National Institute of Standards and Technology.

### Transient Protection Test at Ambient Temperature (25°C +/- 1°C)

The transient protection tests at ambient temperature were performed on five lamp samples. The Lecroy Oscilloscope was used to measure the transient surge pulse. Each lamp was operated at rated input voltage in the base - up orientation during the tests. A Model Keytek ECAT Surge Test System with an 100kHz Ring Wave Module and a Coupler/Decoupler Module was used to generate the 2500 volt ring wave transient strike across the lamp base contacts. Each wave consisted of a 0.5 microsecond rise time. Seven strikes were performed on each lamp sample in accordance with ANSI/IEEE C62.41 (Category A): Recommended Practice on Surge Voltages in Low – Voltage AC Circuits.



## TEST METHODS (cont'd)

### Operating Frequency

Operating frequency was measured on one lamp sample with an oscilloscope. The measurement was taken at the LED source. The AC ripple on the output DC line was measured and recorded by the oscilloscope according to Energy Star directions.

### Sound Level Test

Each test sample was operated at rated input voltage for one and one half hours prior to testing for sound. A Type 2238 Bruel and Kjaer Sound Level Meter was used to measure the overall dBA Sound Level from the ballast at a distance of 12 inches.

Note: There are no current industry standards for sound ratings of ballasts/drivers. However, the major ballast manufacturers assign a letter rating of A (quietest) through F (noisiest) to their products. The table below can be used to estimate ballast noise. If many identical ballasts are in the same space, the combined sound level can be found by adding ten times the logarithm of the number of ballasts to the intensity level of one ballast (in dB). Therefore 20 B-rated ballasts in a space may have an intensity level of 25 dB + 10 log (20) = 38 dB.

<u>Fluorescent Ballast Sound Ratings</u>	
<u>Sound Ratings</u>	<u>Average Noise Rating (dBA)</u>
A	20-24
B	25-30
C	31-36
D	37-42
E	43-48
F	49 and up

### Rapid Cycle Stress Test

Ten lamps were placed on the life test racks for a period of 25000 cycles. Each cycle consisted of a two-minutes-on/two-minutes-off time period. The lamps were cycled once for every two hours of rated (L70) life. Additional cycling periods may be requested by the client for higher life ratings.

### In-Situ Maximum LED Source Point Temperature

Led source operating temperature measurements were taken on one test sample per model with a thermocouple and Fluke 87 temperature meter. The SSL sample was allowed to reach thermal equilibrium for seven hours before measurements were taken. Source temperature measurements were measured at the TMP<sub>PS</sub> or T<sub>S</sub> point as indicated by the included diagram in accordance with manufacturers declared hot spot location. The maximum temperature was recorded for the sample. A simulated ceiling or other enclosure may be used in accordance to UL 1598 as applicable.

### Color and Lumen Maintenance at 3000 Hours and 6000 Hours

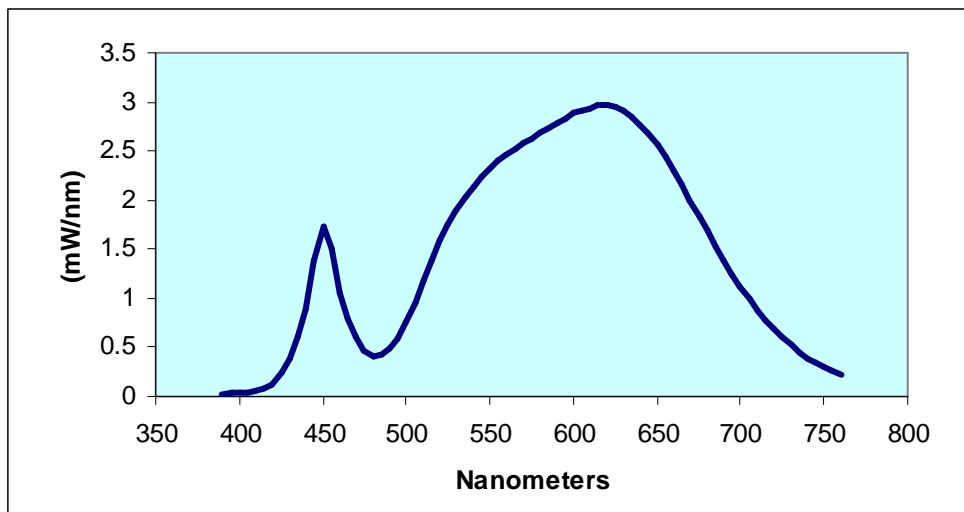
Ten lamps were placed on the life racks in their designated positions for an elapsed period of 3000 hours. Lamps were operated steady state (no cycling) for a period of 3000 hours. Lamps under 10 watts and decorative type lamps were operated at 25°C. The lamps were then re-measured for lumens at ambient temperature (25°C +/- 1°C). The lamps were placed back on the life racks in their designated positions for an elapsed period equal to 6000 hours. The lamps were then re-measured for lumens. Additional lumen maintenance periods may be requested by the client for higher life ratings.

**RESULTS OF TESTS**

Spectral Distribution over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
NEXXUS							
390	0.0255	500	0.7565	610	2.9354	720	0.6885
395	0.0348	505	0.9572	615	2.9621	725	0.6003
400	0.0401	510	1.1730	620	2.9662	730	0.5285
405	0.0356	515	1.3825	625	2.9475	735	0.4538
410	0.0648	520	1.5785	630	2.9126	740	0.3950
415	0.0752	525	1.7522	635	2.8515	745	0.3428
420	0.1275	530	1.9001	640	2.7726	750	0.3058
425	0.2341	535	2.0249	645	2.6817	755	0.2622
430	0.3938	540	2.1357	650	2.5735	760	0.2286
435	0.6081	545	2.2331	655	2.4403		
440	0.9043	550	2.3207	660	2.3023		
445	1.3824	555	2.3983	665	2.1512		
450	1.7293	560	2.4684	670	1.9980		
455	1.5030	565	2.5274	675	1.8378		
460	1.0599	570	2.5840	680	1.6846		
465	0.8018	575	2.6336	685	1.5303		
470	0.6130	580	2.6795	690	1.3898		
475	0.4697	585	2.7362	695	1.2497		
480	0.4152	590	2.7943	700	1.1177		
485	0.4268	595	2.8354	705	0.9952		
490	0.4795	600	2.8865	710	0.8804		
495	0.5915	605	2.9134	715	0.7789		

**NEXXUS**  
**Sample No. N4837LP**  
**Model No. AG10MR16WW6**  
**Spectral Data Over Visible Wavelengths**



RESULTS OF TESTS (cont'd)

Photometric Measurements at 25°C – Integrating Sphere Method

Intertek Sample No.	Base Orientation	Input Voltage (Vac)	Input Current (ma)	Input Power (W)	Input Power Factor	Current ATHD (%)	Luminous Flux (Lumens)	Lumen Efficacy (Lumens per Watt)
AG10MR16WW6								
N4837LP	Up	120.0	24.23	2.68	0.923	38.50	172.0	64.18
N4838LP	Up	120.0	24.20	2.68	0.923	38.50	169.2	63.13
N4839LP	Up	120.0	24.64	2.73	0.923	38.50	171.0	62.64
N4840LP	Up	120.0	24.06	2.67	0.924	38.60	169.5	63.48
N4841LP	Up	120.0	24.27	2.69	0.924	38.55	172.0	63.94
Average	Up	120.0	24.28	2.69	0.923	38.53	170.7	63.47
N4842LP	Down	120.0	24.25	2.69	0.924	38.65	171.1	63.61
N4843LP	Down	120.0	24.50	2.71	0.924	38.60	168.5	62.18
N4844LP	Down	120.0	24.20	2.68	0.923	38.70	166.4	62.09
N4845LP	Down	120.0	24.22	2.68	0.923	38.70	167.0	62.31
N4846LP	Down	120.0	24.21	2.68	0.924	38.70	166.0	61.94
Average	Down	120.0	24.28	2.69	0.923	38.67	167.8	62.43
Average	All	120.0	24.28	2.69	0.923	38.60	169.3	62.95

Intertek Sample No.	Base Position	Correlated Color Temperature (K)	CRI - Ra	CRI - R9	Duv	CIE 31' Chromaticity Coordinate (x)	CIE 31' Chromaticity Coordinate (y)	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')
AG10R163060									
N4837LP	Up	3034	84.00	41.90	0.002	0.438	0.410	0.249	0.524
N4838LP	Up	3000	84.00	39.50	0.003	0.441	0.413	0.249	0.526
N4839LP	Up	3030	84.00	41.90	0.002	0.438	0.410	0.249	0.524
N4840LP	Up	3024	84.00	38.60	0.002	0.439	0.411	0.249	0.524
N4841LP	Up	3037	84.00	41.50	0.002	0.437	0.410	0.248	0.524
Average	Up	3025	84.00	40.68	0.002	0.439	0.411	0.249	0.524
N4842LP	Down	3045	83.80	41.00	0.002	0.437	0.409	0.248	0.523
N4843LP	Down	3001	84.00	40.30	0.002	0.440	0.411	0.250	0.525
N4844LP	Down	3006	84.00	39.70	0.003	0.440	0.412	0.249	0.525
N4845LP	Down	3005	84.00	40.50	0.002	0.440	0.411	0.250	0.525
N4846LP	Down	3010	84.00	39.60	0.003	0.440	0.412	0.249	0.525
Average	Down	3013	83.96	40.22	0.002	0.439	0.411	0.249	0.524
Average	All	3019	83.98	40.45	0.002	0.439	0.411	0.249	0.524

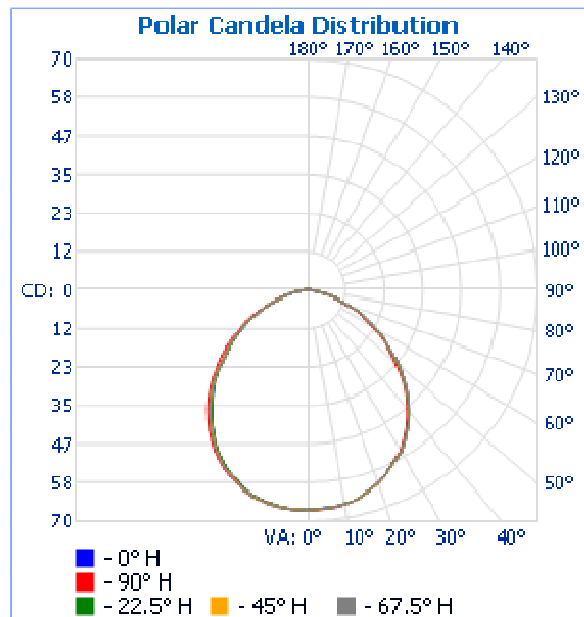
**RESULTS OF TESTS** (cont'd)

**Photometric and Electrical Measurements – Distribution Method**

Intertek Sample No.	Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (Watts)	Input Power Factor	Absolute Luminous Flux (Lumens)	Lumen Efficacy (Lumens Per Watt)
AG10R163060							
N4837LP	UP	120.0	24.202	2.683	0.9238	169.2	63.06

**Intensity (Candlepower) Summary at 25°C - Candelas**

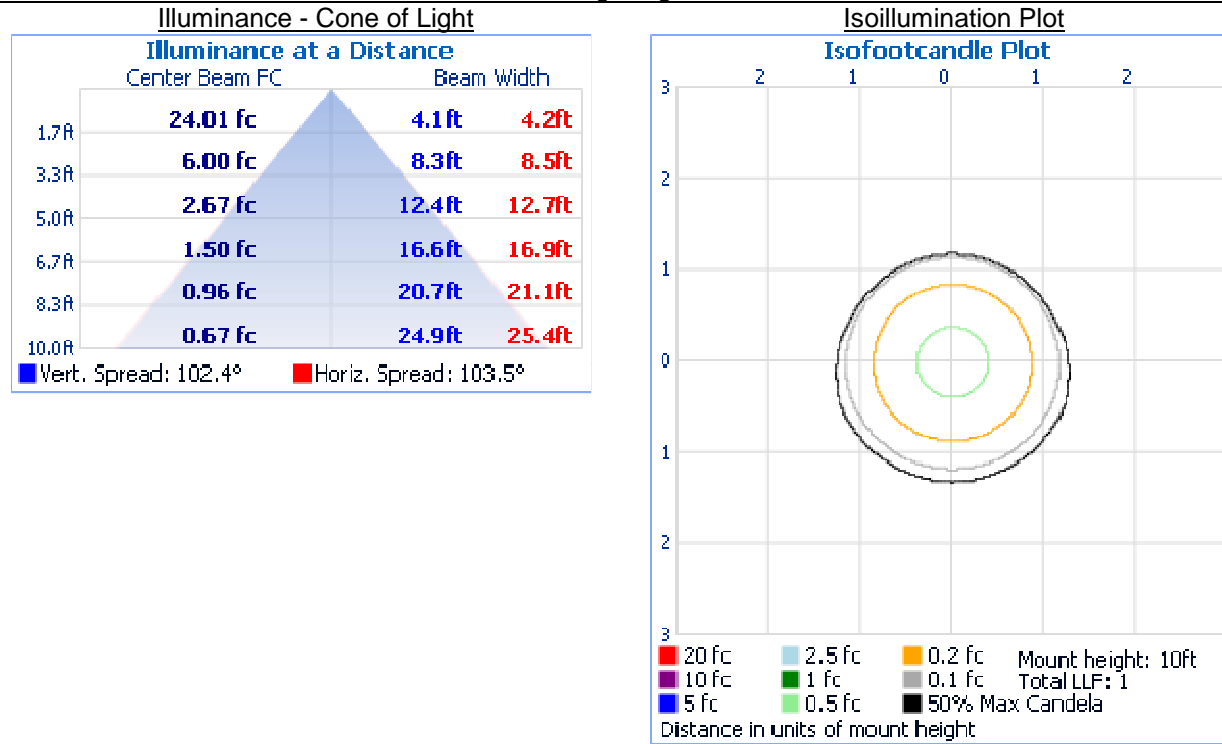
Angle	0	22.5	45	67.5	90
AG10R163060					
0	67	67	67	67	67
5	66	66	66	66	66
10	66	66	66	66	66
15	64	64	64	64	64
20	62	62	62	62	62
25	59	59	60	60	60
30	57	57	57	57	56
35	52	52	52	52	52
40	48	48	48	48	47
45	42	42	42	42	42
50	37	36	36	37	35
55	31	30	30	30	30
60	25	24	24	24	24
65	19	19	19	19	18
70	14	14	14	13	13
75	9	9	8	8	8
80	4	4	4	4	4
85	1	1	1	1	1
90	0	0	0	0	0



## RESULTS OF TESTS (cont'd)

### Illumination Plots

Model No.: AG10R163060  
Mounting Height: 10 ft.



### Zonal Lumen Summary and Percentages at 25°C

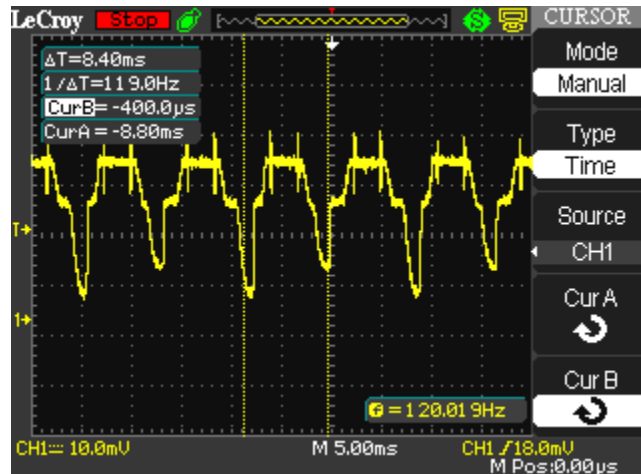
Zone	Lumens	% Luminaire
AG10R163060		
0-30	51.8	30.6
0-40	84.0	49.6
0-60	141.8	83.8
60-90	27.4	16.2
0-90	169.2	100.0
90-180	0.0	0.0
0-180	169.2	100.0

### Reflector Summary

	Efficiency (%)	Lumens	Horizontal Spread (°)	Vertical Spread (°)
AG10R163060				
Field (10%):	98.1	166.0	152.9	152.6
Beam (50%):	70.9	119.9	103.5	102.4
Total:	100.0	169.2		

## RESULTS OF TESTS (cont'd)

### Operating Frequency Measurements at 25°C



Intertek Sample No.	Base Orientation	Operating Frequency (Hz)
AG10R163060		
N4858LP	Base Up	120

### Transient Protection Tests

Intertek Sample No.	Transient Protection Test - Seven Strikes
AG10R163060	
N4859LP	Pass
N4860LP	Pass
N4861LP	Pass
N4862LP	Pass
N4863LP	Pass

### Noise to Class A

Intertek Sample No	Measured Noise Level (dBA)
AG10R163060	
N4864LP	20.5

### Maximum Dimensions

Client declaration: intended to replace: R16 – 16W

Dimension	AG10MR16WW6	Standard Lamp
Maximum Diameter	1.962 in.	N/A
Maximum Overall Length (MOL)	1.848 in.	N/A

RESULTS OF TESTS (cont'd)

In-Situ Maximum Measured LED Source Point Temperature

Manufacturer Supplied Documentation:

LED identified as: Citizen Electronics NL-L261-MU1L1-A-T

4. Performance

(1) Absolute Maximum Rating

Parameter	Symbol	Rating Value	Unit
Power Dissipation	$P_d$	108	mW
Forward Current	$I_f$	30	mA
Forward Pulse Current *	$I_{fp}$	100 *	mA
Reverse Voltage	$V_R$	5	V
Operating Temperature	$T_{op}$	-30 ~ +85	°C
Storage Temperature	$T_{st}$	-40 ~ +100	°C
Junction Temperature	$T_j$	120	°C

\*Duty  $\leq$  1/10, Pulse width  $\leq$  0.1 msec

\* $T_j = T_c + R_{j-c} \times P_d$  (D.C.driving) \* $T_c$ : Temperature of Thermal terminal

(2) Electro-optical Characteristic

( $T_s=25^\circ\text{C}$ )

Parameter	Symbol	Condition	MIN	TYP	MAX	Unit
Forward Voltage	$V_f$	$I_f=20\text{mA}$	2.8	3.2	3.6	V
Reverse Current	$I_R$	$V_R=5\text{V}$	-	-	100	$\mu\text{A}$
Luminous Flux	$\Phi_v$	$I_f=20\text{mA}$	5.25	6.00	6.75	lm
General Color Rendering Index	$R_a$ *	$I_f=20\text{mA}$	80	85	-	-

\*[CIE13.3-1995]

$V_f$ Rank	Min	Max
Q	2.80	3.20
R	3.20	3.60

(3) Thermal Resistance (Junction-Solder terminal)  $R_{j-s}=160^\circ\text{C/W}$

## RESULTS OF TESTS (cont'd)

### In-Situ Maximum Measured LED Source Point Temperature

Maximum Junction Temperature from LED specification ( $T_j$ ) = 120°C  
 Thermal Resistance Formula from LED specification = 160 C/W  
 Maximum Forward Voltage ( $V_f$ ) from LED specification = 3.6V  
 Measured LED Current = 16 ma  
 Calculated LED Wattage =  $V_f \times \text{Measured LED Current} = 0.0576\text{W}$   
 Maximum Source Temperature ( $T_s$ ) =  $T_j - (\text{LED Wattage} \times \text{Thermal Resistance}) = 111\text{C}^\circ$

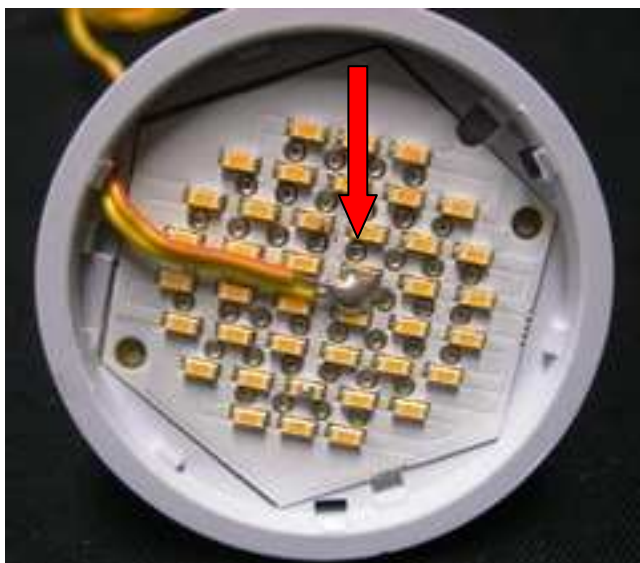
### Maximum Measured Manufacturer Designated Source Temperature

Sample No.	Model	Maximum Measured Source Temperature (C°)	Location	Maximum Rated Source Temperature(C°)
N4861LP	AG10R163060	63.1	At solder point	111

### In-Situ Picture – $T_s$



### In-Situ Picture – $T_s$ Location



RESULTS OF TESTS (cont'd)

Color Spatial Uniformity

Sample No: AG10R163060

Model No.: N4837LP

Vertical Angle (°)	Horizontal Angle = 0°			Horizontal Angle = 90°		
	Candlepower (cd)	CIE' 1976 Chromaticity u'	CIE' 1976 Chromaticity v'	Candlepower (cd)	CIE' 1976 Chromaticity u'	CIE' 1976 Chromaticity v'
0	67	0.2472	0.5213	67	0.2472	0.5213
10	66	0.2474	0.5212	66	0.2473	0.5216
20	62	0.2473	0.5220	62	0.2475	0.5219
30	56	0.2478	0.5230	57	0.2479	0.5230
40	47	0.2486	0.5234	48	0.2465	0.5241
50	35	0.2483	0.5244	37	0.2492	0.5254
60	24	0.2482	0.5247	25	0.2491	0.5262
70	13	0.2476	0.5250	14	0.2486	0.5264

Weighted Average

u'	v'
0.2480	0.5238

Vertical Angle (°)	Horz. 0 Δu'	Horiz. 0 Δv'	Horz. 90 Δu'	Horiz. 90 Δv'
0	-0.0008	-0.0025	-0.0008	-0.0025
10	-0.0006	-0.0026	-0.0007	-0.0022
20	-0.0007	-0.0018	-0.0005	-0.0019
30	-0.0002	-0.0008	-0.0001	-0.0008
40	0.0006	-0.0004	-0.0015	0.0003
50	0.0003	0.0006	0.0012	0.0016
60	0.0002	0.0009	0.0011	0.0024
70	-0.0004	0.0012	0.0006	0.0026

Rapid Cycle Stress Test

Intertek Sample No.	Base Position	Number of Cycles Required	Cycles Endured
AG10R163060			
N4847LP	Up	25000	25000
N4848LP	Up	25000	25000
N4849LP	Up	25000	25000
N4850LP	Up	25000	25000
N4851LP	Up	25000	25000
N4852LP	Down	25000	25000
N4853LP	Down	25000	25000
N4854LP	Down	25000	25000
N4855LP	Down	25000	25000
N4856LP	Down	25000	25000

RESULTS OF TESTS (cont'd)

Lumen Maintenance Measurements at 25°C after 3000 H ours of Life (Life Test Operated at 25°C)

Intertek Sample No.	Base Orientation	Luminous Flux (Lumens)	Initial Lumens Retained (%)
AG10R163060			
N4837LP	Base Up	165.5	96.22
N4838LP	Base Up	166.2	98.23
N4839LP	Base Up	165.7	96.90
N4840LP	Base Up	163.3	96.34
N4841LP	Base Up	166.6	96.86
Average	Base Up	165.5	96.91
N4842LP	Base Down	165.1	96.49
N4843LP	Base Down	167.0	99.11
N4844LP	Base Down	165.6	99.52
N4845LP	Base Down	166.3	99.58
N4846LP	Base Down	165.1	99.46
Average	Base Down	165.8	98.83
Average	All Samples	165.6	97.87

Lumen Maintenance Measurements at 25°C after 3000 H ours of Life (Life Test Operated at 25°C)

Intertek Sample No.	Base Orientation	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')	Δ CIE 76' Chromaticity Coordinate (u')	Δ CIE 76' Chromaticity Coordinate (v')
AG10R163060					
N4837LP	Base Up	0.247	0.523	-0.001	-0.001
N4838LP	Base Up	0.248	0.525	-0.001	-0.001
N4839LP	Base Up	0.247	0.523	-0.001	-0.001
N4840LP	Base Up	0.248	0.523	-0.001	-0.001
N4841LP	Base Up	0.247	0.523	-0.001	-0.001
Average	Base Up	0.248	0.524	-0.001	-0.001
N4842LP	Base Down	0.248	0.523	0.000	0.000
N4843LP	Base Down	0.249	0.525	-0.001	0.000
N4844LP	Base Down	0.249	0.525	-0.001	0.000
N4845LP	Base Down	0.249	0.525	0.000	0.000
N4846LP	Base Down	0.249	0.525	0.000	0.000
Average	Base Down	0.249	0.524	0.000	0.000
Average	All Samples	0.248	0.524	-0.001	0.000

RESULTS OF TESTS (cont'd)

Lumen Maintenance Measurements at 25°C after 6000 H ours of Life (Life Test Operated at 25°C)

Intertek Sample No.	Base Orientation	Luminous Flux (Lumens)	Initial Lumens Retained (%)
AG10R163060			
N4837LP	Base Up	167.1	97.62
N4838LP	Base Up	168.4	99.53
N4839LP	Base Up	167.9	98.19
N4840LP	Base Up	165.7	97.76
N4841LP	Base Up	168.9	98.20
Average	Base Up	167.7	98.26
N4842LP	Base Down	168.5	98.48
N4843LP	Base Down	167.5	99.41
N4844LP	Base Down	165.8	99.64
N4845LP	Base Down	169.2	101.3
N4846LP	Base Down	166.8	100.5
Average	Base Down	167.6	99.87
Average	All Samples	167.6	99.06

Lumen Maintenance Measurements at 25°C after 6000 H ours of Life (Life Test Operated at 25°C)

Intertek Sample No.	Base Orientation	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')	Δ CIE 76' Chromaticity Coordinate (u')	Δ CIE 76' Chromaticity Coordinate (v')
AG10R163060					
N4837LP	Base Up	0.245	0.523	-0.003	-0.001
N4838LP	Base Up	0.246	0.525	-0.003	-0.001
N4839LP	Base Up	0.246	0.523	-0.003	-0.001
N4840LP	Base Up	0.246	0.523	-0.003	-0.001
N4841LP	Base Up	0.246	0.523	-0.002	-0.001
Average	Base Up	0.246	0.524	-0.003	-0.001
N4842LP	Base Down	0.246	0.523	-0.002	0.000
N4843LP	Base Down	0.247	0.525	-0.003	0.000
N4844LP	Base Down	0.247	0.525	-0.002	0.000
N4845LP	Base Down	0.247	0.525	-0.003	0.000
N4846LP	Base Down	0.247	0.525	-0.002	0.000
Average	Base Down	0.247	0.525	-0.002	0.000
Average	All Samples	0.246	0.524	-0.003	-0.001

RESULTS OF TESTS (cont'd)

Lumen Maintenance Measurements at 25°C after 12500 Hours of Life (Life Test Operated at 25°C)

Intertek Sample No.	Base Orientation	Luminous Flux (Lumens)	Initial Lumens Retained (%)
AG10R163060			
N4837LP	Base Up	TBD	TBD
N4838LP	Base Up	TBD	TBD
N4839LP	Base Up	TBD	TBD
N4840LP	Base Up	TBD	TBD
N4841LP	Base Up	TBD	TBD
Average	Base Up	TBD	TBD
N4842LP	Base Down	TBD	TBD
N4843LP	Base Down	TBD	TBD
N4844LP	Base Down	TBD	TBD
N4845LP	Base Down	TBD	TBD
N4846LP	Base Down	TBD	TBD
Average	Base Down	TBD	TBD
Average	All Samples	TBD	TBD

Lumen Maintenance Measurements at 25°C after 12500 Hours of Life (Life Test Operated at 25°C)

Intertek Sample No.	Base Orientation	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')	$\Delta$ CIE 76' Chromaticity Coordinate (u')	$\Delta$ CIE 76' Chromaticity Coordinate (v')
AG10R163060					
N4837LP	Base Up	TBD	TBD	TBD	TBD
N4838LP	Base Up	TBD	TBD	TBD	TBD
N4839LP	Base Up	TBD	TBD	TBD	TBD
N4840LP	Base Up	TBD	TBD	TBD	TBD
N4841LP	Base Up	TBD	TBD	TBD	TBD
Average	Base Up	TBD	TBD	TBD	TBD
N4842LP	Base Down	TBD	TBD	TBD	TBD
N4843LP	Base Down	TBD	TBD	TBD	TBD
N4844LP	Base Down	TBD	TBD	TBD	TBD
N4845LP	Base Down	TBD	TBD	TBD	TBD
N4846LP	Base Down	TBD	TBD	TBD	TBD
Average	Base Down	TBD	TBD	TBD	TBD
Average	All Samples	TBD	TBD	TBD	TBD

Pictures (not to scale)



## CONCLUSION

The results tabulated in this report are representative of the actual test samples submitted for this report only. The data is provided to the client for further evaluation. Compliance to the referenced specification requirements was not determined in this report.

In Charge Of Tests:



Jeffrey Davis  
Associate Engineer  
Lighting Division

Report Reviewed By:



Jacki Swiernik  
Project Engineer  
Lighting Division

Attachment: None