

LEOTEK Electronics USA LLC

TEST REPORT

SCOPE OF WORK

Intertek Traffic Signal ITE Program Certification Testing
of 15yr 8" Clear and Tinted Green Balls.

REPORT NUMBER

106115748CRT-001G

ISSUE DATE

4-Apr-2025

PAGES

19

DOCUMENT CONTROL NUMBER

NA
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Test Report			
Company Name	LEOTEK Electronics USA LLC	Test Location	Intertek Testing Services NA
Address	1955 Lundy Avenue San Jose, CA 95131	Address	3933 US Rt 11 Cortland, NY 13045 USA
Client Contact	Frank Saltani	Quote Number	Qu-01514894-1
Phone	408-380-1788 Ext. 202	Test Start Date	February 21, 2025
Email	frank@leotek.com	Completion Date	April 4, 2025

Standard(s)
ITE, Circular Signal Supplement, dated June 27, 2005.

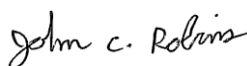
Spec.	Test name	Clause	Tinted	Clear
			Result	
ITE	Conditioning	6.4.2	Pass	Pass
ITE	Mechanical Vibration	6.4.3.1	Pass**	
ITE	Temperature Cycling	6.4.3.2	Pass	Pass
ITE	Moisture Resistance	6.4.3.3	Pass**	
ITE	Luminous Intensity	6.4.4.1, 2,3,4	Pass	Pass
ITE	Luminance Uniformity	6.4.4.5	Pass	Pass
ITE	Chromaticity	6.4.4.6	Pass	Pass
ITE	Color Uniformity	6.4.4.7	Pass	Pass
ITE	Lens Abrasion	6.4.5.2	Pass	Pass
ITE	Current Consumption	6.4.6.1	Pass	Pass
ITE	Low Voltage Turn Off	6.4.6.2	Pass***	
ITE	Turn-on/Turn-off Times	6.4.6.3	Pass***	
ITE	Transient Voltage Immunity	6.4.6.4	Pass***	
ITE	Electronic Noise	6.4.6.5	Pass***	
ITE	Power Factor	6.4.6.6	Pass	Pass*
ITE	Total Harmonic Distortion	6.4.6.7	Pass	Pass*
ITE	Load Switch Compatibility	6.4.7.1	Pass***	
ITE	Off State Voltage Decay	6.4.7.2	Pass***	
ITE	Failed State Impedance	6.4.8	Pass***	

*The client states the clear lens model is exactly the same as the tinted model with the exception of the lens. As a result, the electrical testing for the clear is covered by the tinted results.

**Covered under test report 106115748CRT-001Y.

***Covered under Dialight test report 105587577CRT-002G.

Results Key	
Pass	Compliant
Fail	Non-compliant
TBD	Compliance not determined
NT	Not tested in this project
NA	Test not applicable



John C. Robins
Engineer
Lighting



Christopher W. Metcalf
Engineering Supervisor
Lighting

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Sample Information				
Date Rec.	Intertek ID	Description	Condition	Model No.
2/17/25	CRT2502170837-013	15yr 8" Green Tinted Ball	Engineering	433-2120-001XL15

Note: Clear lenses provided.

Further Sample Description

Intertek Sample Number	Description	Model Number	Serial Number
CRT2502170837-013-1	8" Green Ball Tinted	433-2120-001XL15	A2412011890
CRT2502170837-013-2	8" Green Ball Tinted	433-2120-001XL15	A2412011891
CRT2502170837-013-3	8" Green Ball Tinted	433-2120-001XL15	A2412011892
CRT2502170837-013-4	8" Green Ball Clear	433-2170-001XL15	A2412011893
CRT2502170837-013-5	8" Green Ball Clear	433-2170-001XL15	A2412011894
CRT2502170837-013-6	8" Green Ball Clear	433-2170-001XL15	A2412011895

General Requirements

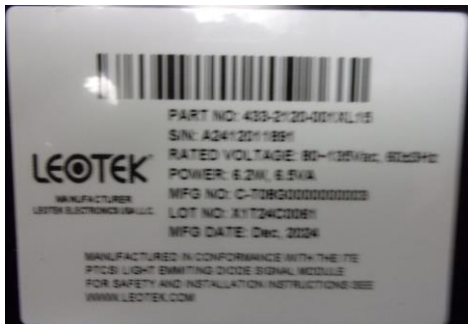
Intertek Sample Number	ETL Cert. Number	Label Identification	Lens Orientation	Color Coded Wires
CRT2502170837-013-1	NA	Pass	Pass	Brown/White
CRT2502170837-013-2	NA	Pass	Pass	Brown/White
CRT2502170837-013-3	NA	Pass	Pass	Brown/White
CRT2502170837-013-4	NA	Pass	Pass	Brown/White
CRT2502170837-013-5	NA	Pass	Pass	Brown/White
CRT2502170837-013-6	NA	Pass	Pass	Brown/White

General Requirements

Intertek Sample Number	600V / 20 AWG Min.	Wire Length $\geq$ 39"	Service Rating +105°C
CRT2502170837-013-1	600V / 18 AWG	Pass	Pass
CRT2502170837-013-2	600V / 18 AWG	Pass	Pass
CRT2502170837-013-3	600V / 18 AWG	Pass	Pass
CRT2502170837-013-4	600V / 18 AWG	Pass	Pass
CRT2502170837-013-5	600V / 18 AWG	Pass	Pass
CRT2502170837-013-6	600V / 18 AWG	Pass	Pass

Sample Modification Log	
Date	Modification description
2/21/25	AC Cable: Browne/White_C-G000000018
	Waterproof Cable Gland : NYLCGL-H203BM
	Back Cover: C-A000000098
	Heat Sink: C-A000000093
	Metal PCB: C-E000000013
	Connector: CNRP4-A2001WRBS04P
	LED: LEDLXG-NCSE219BT
	Thermistor: C-F000000023
	2nd Lens: PPCTSL-LENS004B
	SPS: _15y SPS_C-D000000001
	Power Clip_C-A000000092
	Fresnel Lens:PPCTSL-FL12C
	O-ring: _8" _PRBTSL-LG0806
	Gasket: _8" Gasket_AF1040100001
	Front Cover Tinted: PPCTSL-FC08GN1Z
	Front Cover Clear:PPCTSL-FC08WN1Z

Picture(s)



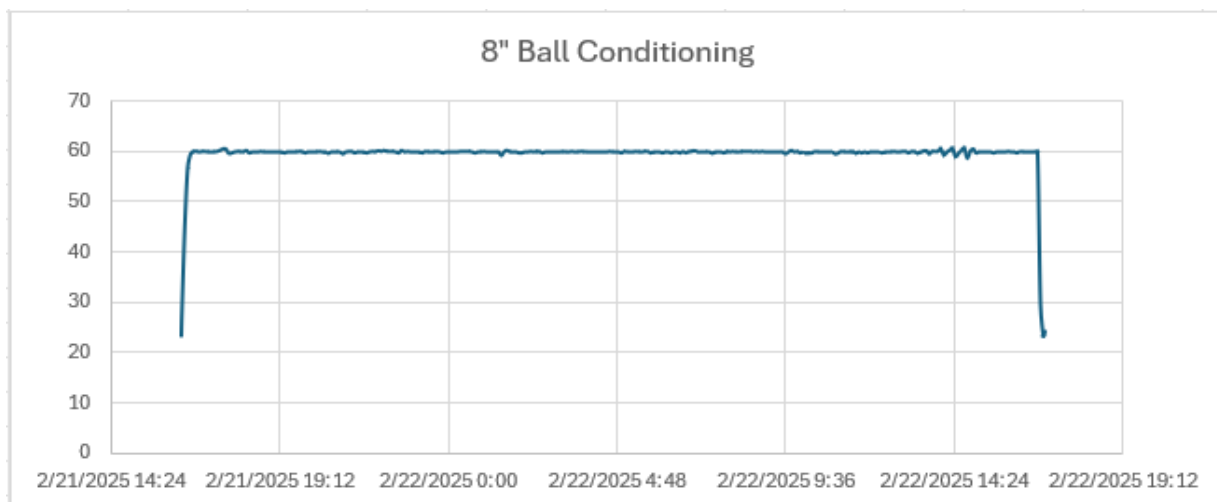
Note: The client supplied clear lenses for the modules, The clear lens model number is 433-2170-001XL15.

Conditioning 6.4.2

The submitted LED signal modules were subjected to conditioning prior to the environmental tests. The samples were energized for a minimum of 24 hours, at 100% duty cycle in an ambient temperature of +60°C (+140°F). At the conclusion of the test, the modules shall be visually inspected for damage and checked for proper operation.

Results

Intertek Sample Number	Description	Visual Inspection		Operational Check	
		Pre	Post	Pre	Post
CRT2502170837-013-1	8" Green Ball Tinted	Pass	Pass	Pass	Pass
CRT2502170837-013-2	8" Green Ball Tinted	Pass	Pass	Pass	Pass
CRT2502170837-013-3	8" Green Ball Tinted	Pass	Pass	Pass	Pass
CRT2502170837-013-4	8" Green Ball Clear	Pass	Pass	Pass	Pass
CRT2502170837-013-5	8" Green Ball Clear	Pass	Pass	Pass	Pass
CRT2502170837-013-6	8" Green Ball Clear	Pass	Pass	Pass	Pass



Measured Voltage: 120.1 Vac

Complies: ☒ YES ☐ NO

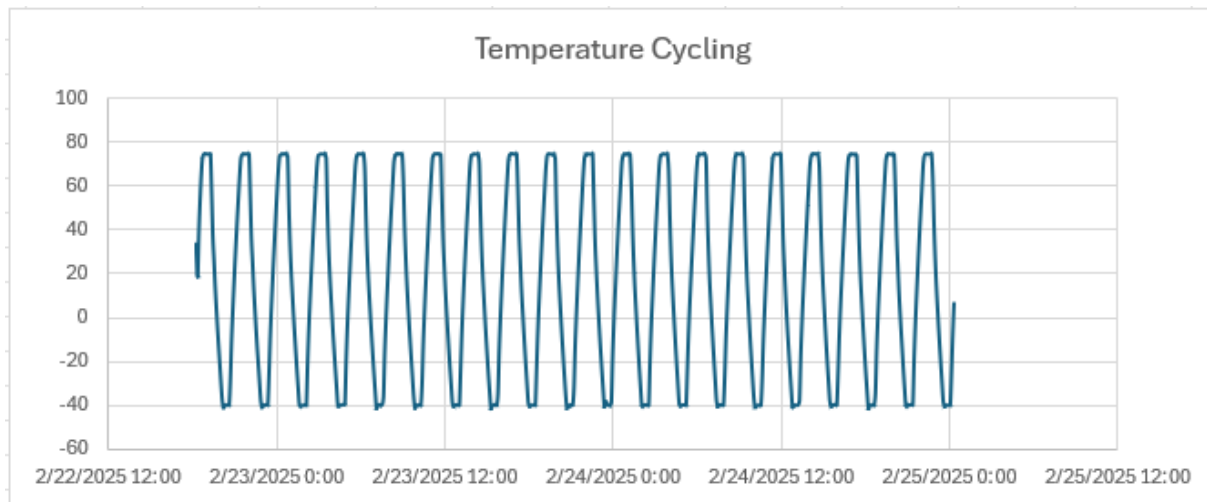
Tested By:	John Robins	Signature or initials:	
Engineer:	John Robins	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	
Equipment Used:	8,9	Completion Date:	22-Feb-2025
Amb (°C):	NA	RH%	NA

Temperature Cycling 6.4.3.2

The submitted tinted and clear LED signal modules were subjected to temperature cycling according to MIL-STD-883, Method 1010. Twenty cycles were performed with a 30 minute transfer time between temperature extremes and a 30 minute dwell time at the extremes. The temperature cycled between -40°C and +74°C. The samples were non-operating. At the conclusion of the test, the module shall be free of damage and moisture and be fully operational.

Results

Intertek Sample Number	Description	Visual Inspection	Operational Check
CRT2502170837-013-1	8" Green Ball Tinted	Pass	Pass
CRT2502170837-013-2	8" Green Ball Tinted	Pass	Pass
CRT2502170837-013-3	8" Green Ball Tinted	Pass	Pass
CRT2502170837-013-4	8" Green Ball Clear	Pass	Pass
CRT2502170837-013-5	8" Green Ball Clear	Pass	Pass
CRT2502170837-013-6	8" Green Ball Clear	Pass	Pass



Complies: ☒ YES ☐ NO			
Tested By:	John Robins	Signature or initials:	
Engineer:	John Robins	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	
Equipment Used:	8	Completion Date:	25-Feb-2025
Amb (°C):	NA	RH%	NA

Luminous Intensity 6.4.4.1 through 6.4.4.4

The intensity distribution tests on the submitted LED traffic signal modules were performed with the Intertek 25 meter Gonio photometer. The Gonio photometer was in accordance with the goniometer described in Section 11.02 (Test Apparatus) of the Institute of Transportation Engineers' Vehicle Traffic Control Signal Heads Standard Test Method. The calibration of the Gonio photometer is traceable to the National Institute of Standards and Technology. The LED modules were operated at 120 volts AC. The alignment of the LED module was performed in accordance with Section 11.03 (Alignment of Optical Unit for Test) of the Institute of Transportation Engineers' Vehicle Traffic Control Signal Heads Standard Test Method. The submitted LED signal modules were tested for maintained minimum luminous intensity at each of 78 points indicated in Table 1, of the referenced specification. These measurements were recorded at an ambient temperature of 25°C. The green LED signal modules were energized at nominal operating voltage, at a 100% duty cycle for 60 minutes.

A relative luminous intensity measurement is taken in a region from 0 to 7.5° down, and from 7.5° left to 7.5° right. The measurement is taken at 80 Vac, 120 Vac and 135 Vac. When the 80 Vac and 135 Vac factors are applied to the photometric data the units shall still meet the photometric requirements of each model.

A diminution factor was measured by using the submitted samples. The modules were mounted in a dual compartment temperature chamber with the lensed portion in one compartment and all portions behind the lens within the other compartment. At room ambient temperature (both inside and outside the chamber) and in calm air outside the chamber, the modules were energized per the conditions described above and a single on-axis reading (IA) taken and recorded. With the modules off, the chamber was heated to 74°C behind the lens and 49°C in front of the lens, and allowed to stabilize. Following stabilization, the modules were energized per the above cycle and the single on-axis reading (IH) taken and recorded. A diminution factor was calculated (IH/IA). The readings recorded initially were factored by the diminution factor.

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample	CRT2502170837-013-1				Target Input voltage		Measured Input Voltage			H, V Lum. Intensity		Vac Variation Factor		MMLI Factor
Module	8" Ball				80Vac		80.0		Vac		388.6	Candela	0.975	0.877
Color:	Green				120Vac		120.1		Vac		398.6	Candela	1.000	
Lens Type:	Tinted				135Vac		135.1		Vac		385.1	Candela	0.966	
Photometric Test Distance: 25 meters														
Max	645	25°C		25°C		25°C		74°C/49°C		74°C/49°C		74°C/49°C		
Vertical	Horizontal	Rated 80Vac		Measured 120Vac		Rated 135Vac		Rated 80Vac		Measured 120Vac		Rated 135Vac		Table 1
Angle	Angle	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Minimum
Up/Down	Left/Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Candela
12.5U	2.5	89	91	92	94	88	91	78	80	80	82	78	79	22
12.5U	7.5	74	78	76	80	73	77	65	69	67	70	64	68	17
7.5U	2.5	155	158	160	162	154	157	136	139	140	142	135	137	41
7.5U	7.5	129	137	133	141	128	136	113	120	116	123	112	119	32
7.5U	12.5	96	105	99	107	95	104	84	92	86	94	84	91	24
2.5U	2.5	369	374	378	384	365	371	324	328	332	337	321	325	88
2.5U	7.5	295	317	302	325	292	314	258	278	265	285	256	275	73
2.5U	12.5	216	239	222	245	214	237	190	209	195	215	188	208	49
2.5U	17.5	140	160	144	164	139	159	123	140	126	144	122	139	28
2.5U	22.5	67	81	69	83	67	80	59	71	61	73	59	70	15
2.5D	2.5	432	435	443	447	428	432	379	382	389	392	376	379	211
2.5D	7.5	370	391	379	401	366	388	324	343	333	352	321	340	172
2.5D	12.5	275	308	282	316	272	306	241	271	247	278	239	268	118
2.5D	17.5	173	201	177	207	171	200	152	177	155	181	150	175	69
2.5D	22.5	102	125	105	129	101	124	90	110	92	113	89	109	37
2.5D	27.5	48	63	49	64	47	62	42	55	43	57	42	55	19
7.5D	2.5	389	387	399	397	385	383	341	339	350	348	338	336	166
7.5D	7.5	353	354	362	363	350	351	310	310	318	318	307	308	138
7.5D	12.5	276	292	283	300	274	290	242	256	249	263	240	254	92
7.5D	17.5	191	197	196	202	189	195	167	173	172	177	166	171	54
7.5D	22.5	125	135	129	138	124	134	110	118	113	121	109	117	28
7.5D	27.5	62	70	63	72	61	69	54	61	55	63	54	61	15
12.5D	2.5	192	190	197	195	190	188	168	167	173	171	167	165	65
12.5D	7.5	173	172	178	176	171	170	152	151	156	155	150	149	52
12.5D	12.5	141	140	145	143	140	138	124	123	127	126	123	121	37
12.5D	17.5	98	97	101	100	97	96	86	85	89	88	86	85	22
12.5D	22.5	63	65	65	66	62	64	55	57	57	58	55	56	11
12.5D	27.5	35	38	36	38	35	37	31	33	32	34	31	33	6
17.5D	2.5	92	91	95	93	92	90	81	80	83	82	80	79	30
17.5D	7.5	81	84	83	86	80	83	71	73	73	75	71	73	24
17.5D	12.5	65	69	67	71	65	68	57	61	59	62	57	60	17
17.5D	17.5	50	52	51	54	49	52	43	46	45	47	43	45	9
17.5D	22.5	34	38	35	39	34	37	30	33	31	34	30	33	4
22.5D	2.5	67	67	68	69	66	67	58	59	60	60	58	58	22
22.5D	7.5	62	64	63	65	61	63	54	56	56	57	54	55	17
22.5D	12.5	52	54	53	55	51	54	46	47	47	49	45	47	13
22.5D	17.5	38	41	39	42	37	41	33	36	34	37	33	36	6
27.5D	2.5	38	38	39	39	37	37	33	33	34	34	33	33	15
27.5D	7.5	35	36	36	37	34	36	30	31	31	32	30	31	11

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-013-2				Target Input voltage		Measured Input Voltage			H, V Lum. Intensity		Vac Variation Factor		MMLI Factor
Module	8" Ball				80Vac		80.0	Vac		382.5	Candela	0.965		0.930
Color:	Green				120Vac		120.1	Vac		396.5	Candela	1.000		
Lens Type:	Tinted				135Vac		135.1	Vac		405.4	Candela	1.022		
Photometric Test Distance: 25 meters														
Max	645	25°C		25°C		25°C		74°C/49°C		74°C/49°C		74°C/49°C		
Vertical	Horizontal	Rated 80Vac		Measured 120Vac		Rated 135Vac		Rated 80Vac		Measured 120Vac		Rated 135Vac		Table 1
Angle	Angle	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Minimum
Up/Down	Left/Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Candela
12.5U	2.5	88	90	91	93	93	95	82	83	85	86	87	88	22
12.5U	7.5	74	77	76	80	78	81	68	72	71	74	72	76	17
7.5U	2.5	151	153	157	158	160	162	140	142	146	147	149	151	41
7.5U	7.5	126	134	131	138	134	142	117	124	122	129	124	132	32
7.5U	12.5	94	103	97	107	100	110	87	96	91	100	93	102	24
2.5U	2.5	360	364	374	378	382	386	335	339	348	351	355	359	88
2.5U	7.5	288	310	298	321	305	329	268	288	277	299	284	306	73
2.5U	12.5	211	236	219	245	224	250	196	220	203	228	208	233	49
2.5U	17.5	136	157	141	163	145	167	127	146	132	152	135	155	28
2.5U	22.5	67	80	70	83	71	85	63	74	65	77	66	79	15
2.5D	2.5	426	430	442	445	452	455	397	400	411	414	420	424	211
2.5D	7.5	364	385	378	399	386	408	339	358	351	371	359	380	172
2.5D	12.5	272	305	282	316	289	323	253	284	263	294	268	301	118
2.5D	17.5	172	198	178	206	182	210	160	184	166	191	170	195	69
2.5D	22.5	102	123	106	128	108	131	95	115	98	119	101	122	37
2.5D	27.5	48	62	50	64	51	66	45	58	47	60	48	61	19
7.5D	2.5	392	395	407	409	416	418	365	367	378	381	387	389	166
7.5D	7.5	360	361	373	375	382	383	335	336	347	349	355	356	138
7.5D	12.5	281	302	291	313	297	320	261	281	271	291	277	298	92
7.5D	17.5	193	204	200	212	204	216	179	190	186	197	190	201	54
7.5D	22.5	127	139	132	144	134	148	118	130	122	134	125	137	28
7.5D	27.5	63	73	66	76	67	77	59	68	61	70	62	72	15
12.5D	2.5	196	195	203	202	207	207	182	181	189	188	193	192	65
12.5D	7.5	177	177	184	184	188	188	165	165	171	171	175	175	52
12.5D	12.5	144	147	149	152	153	155	134	136	139	141	142	145	37
12.5D	17.5	101	101	104	105	107	107	94	94	97	98	99	100	22
12.5D	22.5	65	68	68	71	69	72	61	63	63	66	65	67	11
12.5D	27.5	37	39	38	40	39	41	34	36	35	38	36	38	6
17.5D	2.5	92	91	95	94	98	97	86	85	89	88	91	90	30
17.5D	7.5	82	83	85	86	87	88	76	78	79	80	81	82	24
17.5D	12.5	66	69	68	71	70	73	61	64	64	66	65	68	17
17.5D	17.5	50	52	52	54	53	55	47	48	48	50	49	51	9
17.5D	22.5	35	38	37	39	38	40	33	35	34	36	35	37	4
22.5D	2.5	67	67	69	69	71	71	62	62	64	64	66	66	22
22.5D	7.5	62	64	64	66	65	67	57	59	59	61	61	63	17
22.5D	12.5	52	54	54	56	55	58	48	50	50	52	51	54	13
22.5D	17.5	38	41	39	42	40	43	35	38	37	39	37	40	6
27.5D	2.5	37	37	39	39	39	40	35	35	36	36	37	37	15
27.5D	7.5	35	36	36	37	37	38	32	33	33	34	34	35	11

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-013-3				Target Input voltage		Measured Input Voltage		H, V Lum. Intensity		Vac Variation Factor		MMLI Factor					
Module	8" Ball				80Vac		79.9		Vac		378.4		Candela		0.980		0.914	
Color:	Green				120Vac		120.1		Vac		386.0		Candela		1.000			
Lens Type:	Tinted				135Vac		135.1		Vac		392.2		Candela		1.016			
Photometric Test Distance: 25 meters																		
Max	645	25°C		25°C		25°C		74°C/49°C		74°C/49°C		74°C/49°C						
Vertical	Horizontal	Rated 80Vac		Measured 120Vac		Rated 135Vac		Rated 80Vac		Measured 120Vac		Rated 135Vac		Table 1				
Angle	Angle	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Minimum			
Up/Down	Left/Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Candela		
12.5U	2.5	90	95	91	97	93	98	82	87	83	88	85	90	22				
12.5U	7.5	74	83	76	85	77	86	68	76	69	77	70	78	17				
7.5U	2.5	154	162	158	165	160	168	141	148	144	151	146	153	41				
7.5U	7.5	127	143	130	146	132	149	116	131	119	134	121	136	32				
7.5U	12.5	94	112	96	114	98	116	86	102	88	105	89	106	24				
2.5U	2.5	348	355	355	363	360	368	318	325	324	331	329	336	88				
2.5U	7.5	281	310	286	316	291	321	256	283	262	289	266	293	73				
2.5U	12.5	199	242	203	247	206	251	182	221	185	225	188	229	49				
2.5U	17.5	127	163	129	166	131	169	116	149	118	152	120	154	28				
2.5U	22.5	61	87	63	89	64	91	56	80	57	81	58	83	15				
2.5D	2.5	423	442	431	451	438	458	386	404	394	412	400	419	211				
2.5D	7.5	358	413	365	421	371	428	327	377	333	384	339	391	172				
2.5D	12.5	258	341	263	348	268	353	236	311	241	318	244	323	118				
2.5D	17.5	159	232	162	236	165	240	145	212	148	216	151	219	69				
2.5D	22.5	93	155	95	158	96	161	85	142	87	145	88	147	37				
2.5D	27.5	44	79	44	81	45	82	40	72	41	74	41	75	19				
7.5D	2.5	389	392	397	400	404	406	356	358	363	365	369	371	166				
7.5D	7.5	358	362	365	369	371	375	327	330	333	337	339	343	138				
7.5D	12.5	276	297	281	303	286	308	252	272	257	277	261	282	92				
7.5D	17.5	191	205	195	209	198	212	175	187	178	191	181	194	54				
7.5D	22.5	126	135	129	138	131	140	116	124	118	126	120	128	28				
7.5D	27.5	61	72	63	73	64	75	56	66	57	67	58	68	15				
12.5D	2.5	192	186	196	190	199	193	176	170	179	173	182	176	65				
12.5D	7.5	177	169	180	172	183	175	161	154	165	157	167	160	52				
12.5D	12.5	144	133	147	136	149	138	132	121	134	124	137	126	37				
12.5D	17.5	105	93	107	95	109	97	96	85	98	87	99	88	22				
12.5D	22.5	68	60	69	62	70	63	62	55	63	56	64	57	11				
12.5D	27.5	37	37	38	37	38	38	34	33	35	34	35	35	6				
17.5D	2.5	91	91	93	93	94	94	83	83	85	85	86	86	30				
17.5D	7.5	80	84	82	86	83	87	73	77	75	79	76	80	24				
17.5D	12.5	64	71	66	72	67	73	59	65	60	66	61	67	17				
17.5D	17.5	49	54	50	55	50	56	44	49	45	50	46	51	9				
17.5D	22.5	34	39	35	40	36	41	31	36	32	36	32	37	4				
22.5D	2.5	66	67	67	68	68	69	60	61	61	62	62	63	22				
22.5D	7.5	60	63	61	65	62	66	54	58	56	59	56	60	17				
22.5D	12.5	50	54	51	55	52	56	46	49	47	50	47	51	13				
22.5D	17.5	37	41	38	42	39	42	34	37	35	38	35	39	6				
27.5D	2.5	37	37	38	38	38	38	34	34	34	34	35	35	15				
27.5D	7.5	34	35	35	36	36	36	31	32	32	33	32	33	11				

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-013-4			Target Input voltage		Measured Input Voltage				H, V Lum. Intensity		Vac Variation Factor		MMLI Factor	
Module:	8" Ball			80Vac		80.0		Vac		402.2		Candela		0.983	0.922
Color:	Green			120Vac		120.1		Vac		409.3		Candela		1.000	
Lens Type:	Clear			135Vac		135.0		Vac		412.8		Candela		1.009	
Photometric Test Distance: 25 meters															
Max	645	25°C		25°C		25°C		74°C/49°C		74°C/49°C		74°C/49°C			
Vertical	Horizontal	Rated 80Vac		Measured 120Vac		Rated 135Vac		Rated 80Vac		Measured 120Vac		Rated 135Vac		Table 1	
Angle	Angle	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Minimum	
Up/Down	Left/Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Candela	
12.5U	2.5	96	100	98	102	99	102	89	92	90	94	91	94	22	
12.5U	7.5	81	87	82	88	83	89	74	80	76	81	76	82	17	
7.5U	2.5	164	169	167	172	169	174	152	156	154	159	156	160	41	
7.5U	7.5	137	148	140	151	141	152	126	137	129	139	130	140	32	
7.5U	12.5	103	115	105	117	106	118	95	106	97	108	97	109	24	
2.5U	2.5	375	382	382	388	385	392	346	352	352	358	355	361	88	
2.5U	7.5	304	330	309	336	312	339	280	304	285	310	288	312	73	
2.5U	12.5	221	253	224	257	226	259	203	233	207	237	209	239	49	
2.5U	17.5	143	171	145	174	146	175	132	158	134	160	135	162	28	
2.5U	22.5	71	91	72	92	73	93	65	84	66	85	67	86	15	
2.5D	2.5	453	462	461	471	465	475	418	426	425	434	429	438	211	
2.5D	7.5	388	423	395	431	398	434	358	390	364	397	367	400	172	
2.5D	12.5	287	342	292	348	294	351	264	315	269	321	271	323	118	
2.5D	17.5	179	230	182	235	184	237	165	212	168	216	169	218	69	
2.5D	22.5	107	150	109	153	110	154	98	139	100	141	101	142	37	
2.5D	27.5	51	78	52	79	52	80	47	72	48	73	48	74	19	
7.5D	2.5	421	417	428	424	432	428	388	384	395	391	398	395	166	
7.5D	7.5	386	381	393	388	396	391	356	352	362	358	365	361	138	
7.5D	12.5	303	311	309	317	311	319	280	287	285	292	287	294	92	
7.5D	17.5	212	215	216	219	218	221	196	198	199	202	201	204	54	
7.5D	22.5	141	145	143	148	145	149	130	134	132	136	133	137	28	
7.5D	27.5	70	77	71	79	72	79	65	71	66	73	66	73	15	
12.5D	2.5	209	203	212	206	214	208	192	187	196	190	197	192	65	
12.5D	7.5	193	183	196	186	198	187	177	168	181	171	182	173	52	
12.5D	12.5	159	145	162	148	163	149	147	134	149	136	150	137	37	
12.5D	17.5	114	102	116	104	117	105	105	94	107	96	108	97	22	
12.5D	22.5	74	67	76	68	76	69	68	62	70	63	70	63	11	
12.5D	27.5	41	40	42	41	43	41	38	37	39	38	39	38	6	
17.5D	2.5	99	97	101	99	101	100	91	90	93	91	94	92	30	
17.5D	7.5	87	90	89	92	89	92	80	83	82	84	82	85	24	
17.5D	12.5	71	74	72	76	72	76	65	68	66	70	67	70	17	
17.5D	17.5	54	57	55	58	56	58	50	52	51	53	51	54	9	
17.5D	22.5	38	41	39	42	39	43	35	38	36	39	36	39	4	
22.5D	2.5	72	72	73	73	74	74	66	66	67	68	68	68	22	
22.5D	7.5	66	68	68	69	68	70	61	63	62	64	63	64	17	
22.5D	12.5	56	58	57	59	58	60	52	54	53	55	53	55	13	
22.5D	17.5	41	44	42	45	43	45	38	40	39	41	39	42	6	
27.5D	2.5	41	40	41	41	42	41	37	37	38	38	38	38	15	
27.5D	7.5	38	38	38	39	38	39	35	35	35	36	35	36	11	

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-013-5				Target Input voltage		Measured Input Voltage				H, V Lum. Intensity		Vac Variation Factor		MMLI Factor	
Module	8" Ball				80Vac		80.1		Vac		409.4		Candela		0.982	0.922
Color:	Green				120Vac		120.1		Vac		416.8		Candela		1.000	
Lens Type:	Clear				135Vac		135.1		Vac		413.2		Candela		0.991	
Photometric Test Distance: 25 meters																
Max	645	25°C		25°C		25°C		74°C/49°C		74°C/49°C		74°C/49°C				
Vertical	Horizontal	Rated 80Vac		Measured 120Vac		Rated 135Vac		Rated 80Vac		Measured 120Vac		Rated 135Vac		Table 1		
Angle	Angle	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Minimum	
Up/Down	Left/Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Right	Candela	
12.5U	2.5	96	100	97	102	96	101	88	92	90	94	89	93		22	
12.5U	7.5	80	87	81	89	80	88	73	81	75	82	74	81		17	
7.5U	2.5	165	171	168	175	167	173	152	158	155	161	154	160		41	
7.5U	7.5	136	151	139	154	137	153	126	140	128	142	127	141		32	
7.5U	12.5	102	118	104	120	103	119	94	109	96	111	95	110		24	
2.5U	2.5	379	387	385	394	382	390	349	357	355	363	352	360		88	
2.5U	7.5	304	336	310	342	307	339	281	310	286	316	283	313		73	
2.5U	12.5	219	259	223	264	221	262	202	239	205	243	203	241		49	
2.5U	17.5	140	175	143	179	141	177	129	162	131	165	130	163		28	
2.5U	22.5	68	93	69	95	69	94	63	86	64	88	63	87		15	
2.5D	2.5	454	466	462	475	458	471	418	430	426	438	422	434		211	
2.5D	7.5	385	432	392	440	388	436	355	398	361	405	358	402		172	
2.5D	12.5	281	351	286	357	284	354	259	324	264	329	262	327		118	
2.5D	17.5	173	239	176	243	174	241	159	220	162	224	161	222		69	
2.5D	22.5	102	157	104	160	103	158	94	145	96	147	95	146		37	
2.5D	27.5	48	81	49	82	49	82	44	75	45	76	45	75		19	
7.5D	2.5	420	422	428	430	424	426	387	390	394	397	391	393		166	
7.5D	7.5	383	390	390	397	387	394	354	360	360	366	357	363		138	
7.5D	12.5	297	321	302	326	300	324	274	296	279	301	276	298		92	
7.5D	17.5	207	223	211	227	209	225	191	206	195	210	193	208		54	
7.5D	22.5	137	149	140	152	139	151	127	138	129	140	128	139		28	
7.5D	27.5	68	80	70	81	69	80	63	73	64	75	64	74		15	
12.5D	2.5	208	204	212	208	210	206	192	188	195	192	193	190		65	
12.5D	7.5	192	186	195	189	193	187	177	171	180	174	178	173		52	
12.5D	12.5	156	149	159	152	158	150	144	137	147	140	145	139		37	
12.5D	17.5	112	105	114	107	113	106	103	97	105	98	104	98		22	
12.5D	22.5	73	69	74	70	74	69	67	63	68	64	68	64		11	
12.5D	27.5	41	41	41	42	41	41	38	38	38	38	38	38		6	
17.5D	2.5	99	98	101	100	100	99	91	90	93	92	92	91		30	
17.5D	7.5	87	91	89	93	88	92	80	84	82	86	81	85		24	
17.5D	12.5	70	76	71	78	70	77	64	70	65	72	65	71		17	
17.5D	17.5	53	58	54	59	53	59	49	54	50	55	49	54		9	
17.5D	22.5	37	43	38	43	38	43	34	39	35	40	35	40		4	
22.5D	2.5	72	73	73	74	72	73	66	67	67	68	67	68		22	
22.5D	7.5	66	69	67	71	66	70	60	64	62	65	61	65		17	
22.5D	12.5	55	60	56	61	55	60	51	55	52	56	51	56		13	
22.5D	17.5	41	45	41	46	41	46	37	42	38	43	38	42		6	
27.5D	2.5	40	41	41	41	41	41	37	37	38	38	38	38		15	
27.5D	7.5	37	39	38	39	38	39	34	36	35	36	35	36		11	

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-013-6	Target Input voltage	Measured Input Voltage	H, V Lum. Intensity	Vac Variation Factor	MMLI Factor
Module:	8" Ball	80Vac	80.0 Vac	409.0 Candela	0.984	0.937
Color:	Green	120Vac	120.1 Vac	415.7 Candela	1.000	
Lens Type:	Clear	135Vac	135.1 Vac	414.7 Candela	0.998	

Photometric Test Distance: 25 meters

Max	645	25°C		25°C		25°C		74°C/49°C		74°C/49°C		74°C/49°C		
Vertical	Horizontal	Rated 80Vac		Measured 120Vac		Rated 135Vac		Rated 80Vac		Measured 120Vac		Rated 135Vac		Table 1
Angle	Angle	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Candela	Minimum
Up/Down	Left/Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Candela
12.5U	2.5	96	101	98	102	98	102	90	94	92	96	92	96	22
12.5U	7.5	80	88	82	90	82	89	75	83	77	84	76	84	17
7.5U	2.5	165	170	167	173	167	173	154	160	157	162	156	162	41
7.5U	7.5	137	151	139	153	139	153	128	141	130	144	130	143	32
7.5U	12.5	103	117	104	119	104	119	96	110	98	112	97	112	24
2.5U	2.5	374	382	380	388	379	387	350	358	356	364	355	363	88
2.5U	7.5	302	332	307	338	306	337	283	311	288	317	287	316	73
2.5U	12.5	218	257	221	261	221	261	204	241	207	245	207	244	49
2.5U	17.5	140	174	142	177	141	177	131	163	133	166	133	166	28
2.5U	22.5	69	93	70	95	70	94	65	87	66	89	66	88	15
2.5D	2.5	460	471	468	479	467	478	431	442	438	449	437	448	211
2.5D	7.5	393	438	399	445	398	444	368	410	374	417	373	416	172
2.5D	12.5	287	357	292	363	291	362	269	334	274	340	273	339	118
2.5D	17.5	179	240	182	244	181	244	167	225	170	229	170	228	69
2.5D	22.5	105	159	107	161	107	161	99	149	100	151	100	151	37
2.5D	27.5	50	83	50	84	50	84	47	77	47	79	47	79	19
7.5D	2.5	435	432	442	439	441	438	408	405	414	412	413	411	166
7.5D	7.5	398	397	405	403	404	402	373	372	379	378	378	377	138
7.5D	12.5	310	326	315	332	314	331	291	306	295	311	295	310	92
7.5D	17.5	217	225	221	228	220	228	203	210	207	214	206	213	54
7.5D	22.5	143	149	146	152	145	152	134	140	137	142	136	142	28
7.5D	27.5	70	80	71	81	71	81	66	75	67	76	67	76	15
12.5D	2.5	215	207	219	211	218	210	202	194	205	198	205	197	65
12.5D	7.5	198	188	202	191	201	190	186	176	189	179	189	178	52
12.5D	12.5	163	150	166	152	165	152	153	140	155	143	155	142	37
12.5D	17.5	118	105	120	107	119	106	110	98	112	100	112	100	22
12.5D	22.5	76	69	78	70	77	70	71	64	73	65	72	65	11
12.5D	27.5	42	41	43	41	43	41	39	38	40	39	40	39	6
17.5D	2.5	101	99	103	101	102	101	95	93	96	95	96	95	30
17.5D	7.5	89	92	91	94	90	94	84	87	85	88	85	88	24
17.5D	12.5	72	77	73	78	73	78	67	72	69	73	68	73	17
17.5D	17.5	55	58	56	59	56	59	52	55	52	56	52	55	9
17.5D	22.5	39	42	39	43	39	43	36	40	37	40	37	40	4
22.5D	2.5	74	74	75	75	75	75	69	69	70	70	70	70	22
22.5D	7.5	68	70	69	71	69	71	63	66	64	67	64	67	17
22.5D	12.5	57	60	58	61	58	61	53	56	54	57	54	57	13
22.5D	17.5	42	45	43	46	43	46	40	43	40	43	40	43	6
27.5D	2.5	41	41	42	42	42	42	39	39	39	39	39	39	15
27.5D	7.5	38	39	39	40	39	39	36	36	37	37	37	37	11

Complies: ☒ YES ☐ NO

Tested By:	Matthew Benninger	Signature or initials:	
Engineer:	John Robins	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	
Test Equipment Used:	10,11,12,13,15,16,17	Completion Date:	4/3/2025
Amb (°C):	21	RH%	46

Luminance Uniformity

Luminance measurements were taken at nine locations across the signal face. A spot size of one inch was used. The luminance meter was translated from side to side and up and down remaining normal to the sample surface. The measurements were used to determine luminance uniformity. The measurements were taken after operating on the same duty cycle used during the photometric test.

Results

The ratio between the maximum and the minimum luminance was less than 10 to 1. Data follows.

8" Green Ball Tinted			
Sample	CRT2502170837-013-1	CRT2502170837-013-2	CRT2502170837-013-3
Location	Luminance	Luminance	Luminance
1	20478	20488	18889
2	11612	12142	10872
3	14931	14017	14048
4	9502	17135	10181
5	15224	13415	15761
6	20093	18980	17044
7	10449	13762	11358
8	17222	17764	16307
9	16239	13329	14224
Average	15083	15670	14298
Intensity Ratio	2.2	1.7	1.9

8" Green Ball Clear			
Sample	CRT2502170837-013-4	CRT2502170837-013-5	CRT2502170837-013-6
Location	Luminance	Luminance	Luminance
1	22725	22939	20808
2	13906	13993	12487
3	15334	17331	16484
4	10931	11481	11403
5	18846	17722	16404
6	19240	18470	18541
7	13171	13013	14165
8	17248	16614	18090
9	14609	16072	14115
Average	16223	16404	15833
Intensity Ratio	2.1	2.0	1.8

Luminance measurements are in cd/m²

Same 60 minute warm-up used for luminous intensity

Test distance is 19 feet with ¼ degree aperture using the PR 740

Measured Voltage:	120.0 - 120.3	Vac
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Complies: ☒ YES ☐ NO

Tested By:	Rex Williams	Signature or initials:	<i>A.W.</i>
Engineer:	John Robins	Signature or initials:	<i>JR</i>
Reviewed By:	cwm	Signature or initials:	<i>cwm</i>
Equipment Used:	1-4	Completion Date:	28-Feb-2025
Amb (°C):	25.2	RH%	17.6

Chromaticity 6.4.4.6

The chromaticity measurements were performed on the submitted LED Traffic Signal Modules with the spectroradiometer. The samples were operated at nominal input voltage and ambient temperature during the measurements. The measurements were taken from 380-780nm in 2nm increments.

The chromaticity measurements were taken at nine locations across the signal face. A spot size of one inch was used with the samples operating on the same duty cycle used during the photometric test. The spectro-radiometer was translated from side to side and up and down remaining normal to the sample surface. The average of the measurements are recorded.

Results

		Chromaticity Coordinates	
Color	Sample	x	y
Green (Tinted)	CRT2502170837-013-1	0.073	0.552
	CRT2502170837-013-2	0.074	0.552
	CRT2502170837-013-3	0.073	0.541

		Chromaticity Coordinates	
Color	Sample	x	y
Green (Clear)	CRT2502170837-013-4	0.075	0.522
	CRT2502170837-013-5	0.078	0.547
	CRT2502170837-013-6	0.076	0.539

The chromaticity measurements meet the requirements of the referenced specification.

Measured Voltage:	120.0 - 120.3	Vac
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Complies: ☒ YES ☐ NO

Tested By:	Rex Williams	Signature or initials:	<i>R.W.</i>
Engineer:	John Robins	Signature or initials:	<i>JR</i>
Reviewed By:	cwm	Signature or initials:	<i>cwm</i>
Equipment Used:	1-4	Completion Date:	28-Feb-2025
Amb (°C):	25.2	RH%	17.6

Color Uniformity 6.4.4.7

Three samples of each model were tested. Nine color measurements were taken at different locations on the traffic signal face. The measurements were taken after operating on the same duty cycle used during the photometric test.

Results

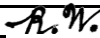
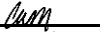
8" Green Ball Tinted									
Sample	CRT2502170837-013-1			CRT2502170837-013-2			CRT2502170837-013-3		
Location	x	y	Dominant	x	y	Dominant	x	y	Dominant
1	0.075	0.560	502	0.075	0.556	502	0.074	0.549	501
2	0.077	0.560	502	0.078	0.565	502	0.077	0.554	502
3	0.073	0.550	502	0.074	0.550	502	0.073	0.541	501
4	0.074	0.546	501	0.075	0.560	502	0.073	0.536	501
5	0.073	0.556	502	0.072	0.540	501	0.074	0.547	501
6	0.072	0.549	501	0.073	0.548	501	0.071	0.539	501
7	0.072	0.549	501	0.073	0.551	502	0.072	0.537	501
8	0.074	0.557	502	0.074	0.557	502	0.073	0.542	501
9	0.071	0.542	501	0.072	0.539	501	0.070	0.523	500
Average	0.073	0.552	502	0.074	0.552	502	0.073	0.541	501

8" Green Ball Clear									
Sample	CRT2502170837-013-4			CRT2502170837-013-5			CRT2502170837-013-6		
Location	x	y	Dominant	x	y	Dominant	x	y	Dominant
1	0.075	0.527	500	0.078	0.555	502	0.078	0.546	501
2	0.079	0.537	501	0.082	0.561	502	0.080	0.541	501
3	0.075	0.520	500	0.078	0.548	502	0.076	0.538	501
4	0.075	0.513	500	0.077	0.541	501	0.079	0.543	501
5	0.075	0.525	500	0.078	0.550	502	0.074	0.534	501
6	0.073	0.526	500	0.076	0.543	501	0.074	0.544	501
7	0.075	0.522	500	0.078	0.546	501	0.076	0.542	501
8	0.074	0.524	500	0.078	0.550	502	0.076	0.541	501
9	0.072	0.504	499	0.074	0.532	501	0.072	0.519	500
Average	0.075	0.522	500	0.078	0.547	501	0.076	0.539	501

The color uniformity measurements meet the requirements of the referenced specification.

Measured Voltage:	120.0 - 120.3	Vac
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Complies: ☒ YES ☐ NO

Tested By:	Rex Williams	Signature or initials:	
Engineer:	John Robins	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	
Equipment Used:	1-4	Completion Date:	28-Feb-2025
Amb (°C):	25.2	RH%	17.6

Lens Abrasion Resistance 6.4.5.2

A lens was mounted in the abrasion test fixture with the lens facing upwards. An abrading pad was cycled back and forth (1 cycle) for twelve cycles at $10\text{cm} \pm 2\text{cm}$ per second over the test surface of the lens. The abrading pad shall not be less than $2.5\text{cm} \pm 0.1\text{cm}$ square, constructed of 0000 steel wool rubber cemented to a rigid base shaped to the contour of the lens. The "grain" of the pad was perpendicular to the direction of motion. The abrading pad support was equal in size to the pad and the center of the support surface was within $\pm 2\text{mm}$ of parallel to the lens surface. The density of the abrading pad was such that when the pad was mounted to its support and is resting unweight on the lens, the base of the pad was no closer than 3.2mm to the lens at its closest point. When mounted on its support and resting on the lens, the abrading pad was weighted such that a pad pressure of $14\text{kPa} \pm 1\text{kPa}$ exists at the center and perpendicular to the face of the lens. A pivot was used to follow the contour of the lens.

Results

A single intensity point was measured before and after the abrasion. In all samples tested the abraded lens intensity measurement was at least 90% of the un-abraded lens intensity measurement.

8" Green Ball Tinted			
Sample	Pre Abrasion	Post Abrasion	Percentage
CRT2502170837-013-1	398.6	372.4	0.93
CRT2502170837-013-2	396.5	375.9	0.95
CRT2502170837-013-3	386	368.4	0.95

measurements in cd

8" Green Ball Clear			
Sample	Pre Abrasion	Post Abrasion	Percentage
CRT2502170837-013-4	409.3	392.4	0.96
CRT2502170837-013-5	416.8	406.7	0.98
CRT2502170837-013-6	415.7	391.4	0.94

measurements in cd

Measured Voltage:	120.03	Vac		
Measured Weight:	8	lbs		
Abrasion Pad	4	Sq. In		
Pad Pressure	2.1	psi	14.5	Kpa

Complies: ☒ YES ☐ NO

Tested By:	Matthew Benninger	Signature or initials:	<i>MB</i>
Engineer:	John Robins	Signature or initials:	<i>JR</i>
Reviewed By:	cwm	Signature or initials:	<i>cwm</i>
Equipment Used:	10,11,12,13,14	Completion Date:	4-Apr-2025
Amb (°C):	21	RH%	44

Current Consumption 6.4.6.1

Three samples were measured for current flow in amperes. The measured current values are supplied for comparison of Product Quality Assurance current measurements on production modules. Current measurements were taken at start up.

Results

Measurements are in (mA)

8" Green Ball			
Sample	-40°C	25°C	74°C
CRT2502170837-013-1	53.8	51.9	51.0
CRT2502170837-013-2	53.9	52.4	53.1
CRT2502170837-013-3	53.7	51.8	50.9

Label lists 6.5VA

The current consumption was not in excess of 120% of the design qualification current values for an ambient temperature of 25°C.

Measured Voltage:	120.0 - 120.3	Vac
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Complies: ☒ YES ☐ NO			
Tested By:	John Robins	Signature or initials:	
Engineer:	John Robins	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	
Equipment Used:	5,7,8	Completion Date:	27-Mar-2025
Amb (°C):	NA	RH%	NA

Power Factor & Total Harmonic Distortion 6.4.6.6 & 6.4.6.7

Three tinted samples were measured for power factor and total harmonic distortion. A commercially available power analyzer was used to perform these measurements.

Results

8" Green Ball						
Sample	Voltage	Current (mA)	Power (W)	Power Factor	THD V%	THD I%
CRT2502170837-013-1	120.1	52.9	6.2	0.97	1.13	8.7
CRT2502170837-013-2	120.0	53.4	6.3	0.98	1.20	8.6
CRT2502170837-013-3	120.0	52.9	6.2	0.98	1.20	8.3
Requirement	NA	NA	NA	≥ 0.90	≤ 20%	≤ 20%

Measurements taken after a minimum 60 minute warmup.

Complies: ☒ YES ☐ NO

Tested By:	John Robins	Signature or initials:	
Engineer:	John Robins	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	
Equipment Used:	5,6,7	Completion Date:	5-Mar-2025
Amb (°C):	24.1	RH%	25.8

Equipment list				
#	Intertek ID No.	Description	Manufacturer	Calibration Due
1	O757	Spectra Scan PR740	Photo Research	30-Apr-2025
2	D589	Digital Multimeter	Fluke	22-Apr-2025
3	L282	Hygro-Thermometer	Testo	5-Apr-2025
4	L268	Tape Measure	Crescent	9-Dec-2027
5	A185	Current Transformer	Pearson	21-Aug-2027
6	L176	Thermometer	Testo	19-Jul-2025
7	M297	Power Analyzer	Yokogawa	29-May-2025
8	H204	Thermal Chamber	Thermotron	12-Jun-2025
9	M207	Multimeter	Fluke	14-Oct-2025
10	O109	Goniometer	Optroniks	04-Mar-2026
11	L235	25M Photometer	Instrument Systems	17-Apr-2025
12	L254	Hygrometer	Testo	03-Jun-2025
13	O091	Power Analyzer	Yokogawa	11-Jun-2025
14	F363A	Push-Pull Meter	Imada	08-May-2025
15	H138	Thermal Chamber	Despatch	Used with cal'd Equip.
16	T1546	Digital Thermometer	Dickson	09-May-2025
17	O756	Flex Optometer	UDT	29-Mar-2025

Note: For measurement uncertainty, refer to the calibration certificates for all the test equipment located in the equipment files.