

LEOTEK Electronics USA LLC

TEST REPORT

SCOPE OF WORK

Intertek Traffic Signal ITE Program Certification Testing
of 5yr 8" Clear and Tinted Green Balls.

REPORT NUMBER

106110477CRT-001G

ISSUE DATE

28-Mar-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	Address	3933 US Rt 11
	San Jose, CA 95131		Cortland, NY 13045
			USA
Client Contact	Frank Saltani	Quote Number	Qu-01514889-1
Phone	408-380-1788 Ext. 202	Test Start Date	February 21, 2025
Email	frank@leotek.com	Completion Date	March 27, 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 106110477CRT-001Y.

***Covered under Dialight test report 105587577CRT-001G.

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

John C. Robins

John C. Robins
Engineer
Lighting

Christopher W. Metcalf

Christopher W. Metcalf
Engineering Supervisor
Lighting

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Sample Information				
Date Rec.	Intertek ID	Description	Condition	Model No.
2/17/25	CRT2502170837-012	5yr 8" Green Tinted/Clear Ball	Engineering	See Below

Note: Clear lenses provided.

Further Sample Description

Intertek Sample Number	Description	Model Number	Serial Number
CRT2502170837-012-1	8" Green Ball Tinted	433-2120-001XL	A2412011803
CRT2502170837-012-2	8" Green Ball Tinted	433-2120-001XL	A2412011804
CRT2502170837-012-3	8" Green Ball Tinted	433-2120-001XL	A2412011805
CRT2502170837-012-4	8" Green Ball Clear	433-2170-001XL	A2412011806
CRT2502170837-012-5	8" Green Ball Clear	433-2170-001XL	A2412011807
CRT2502170837-012-6	8" Green Ball Clear	433-2170-001XL	A2412011808

General Requirements

Intertek Sample Number	ETL Cert. Number	Label Identification	Lens Orientation	Color Coded Wires
CRT2502170837-012-1	NA	Pass	Pass	Brown/White
CRT2502170837-012-2	NA	Pass	Pass	Brown/White
CRT2502170837-012-3	NA	Pass	Pass	Brown/White
CRT2502170837-012-4	NA	Pass	Pass	Brown/White
CRT2502170837-012-5	NA	Pass	Pass	Brown/White
CRT2502170837-012-6	NA	Pass	Pass	Brown/White

General Requirements

Intertek Sample Number	600V / 20 AWG Min.	Wire Length $\geq$ 39"	Service Rating +105°C
CRT2502170837-012-1	600V / 18 AWG	Pass	Pass
CRT2502170837-012-2	600V / 18 AWG	Pass	Pass
CRT2502170837-012-3	600V / 18 AWG	Pass	Pass
CRT2502170837-012-4	600V / 18 AWG	Pass	Pass
CRT2502170837-012-5	600V / 18 AWG	Pass	Pass
CRT2502170837-012-6	600V / 18 AWG	Pass	Pass

Sample Modification Log	
Date	Modification description
2/21/25	AC Cable: Browe/White_C-G000000018
	Waterproof Cable Gland : NYLCGL-H203BM
	Back Cover: C-A000000098
	Heat Sink: C-A000000093
	Metal PCB: C-E000000017
	Connector: CNRP4-A2001WRBS04P
	LED: C21C08EG0001
	Thermistor: C-F000000025
	2nd Lens: PPCTSL-LENS008B
	SPS: _5y SPS_C-D000000002
	Power Clip_C-A000000092
	Connect Cable: C-G000000020
	Fresnel Lens: PPCTSL-FL08A2
	O-ring: _8" _PRBTSL-LG0806
	Gasket: _8" Gasket_AF1040100001
	Front Cover Tinted: PPCTSL-FC08GN1Z
	Front Cover Clear: PPCTSL-FC08WN1Z

Picture(s)



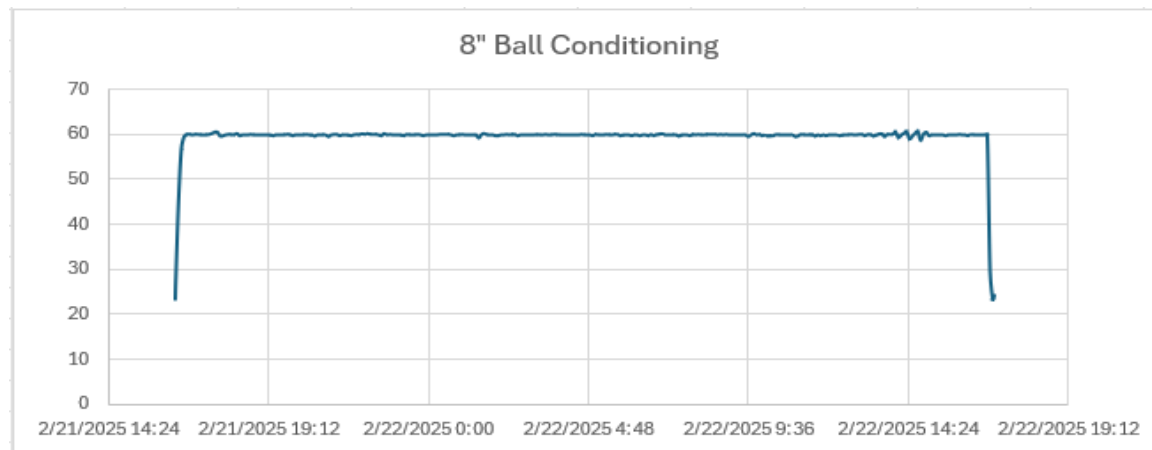
Note: The client supplied clear lenses for the modules, The clear lens model number is 433-2170-001XL.

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
CRT2502170837-012-1	8" Green Ball Tinted	Pass	Pass	Pass	Pass
CRT2502170837-012-2	8" Green Ball Tinted	Pass	Pass	Pass	Pass
CRT2502170837-012-3	8" Green Ball Tinted	Pass	Pass	Pass	Pass
CRT2502170837-012-4	8" Green Ball Clear	Pass	Pass	Pass	Pass
CRT2502170837-012-5	8" Green Ball Clear	Pass	Pass	Pass	Pass
CRT2502170837-012-6	8" Green Ball Clear	Pass	Pass	Pass	Pass



Measured Voltage: 120.1 Vac

Complies: ☒ YES ☐ NO

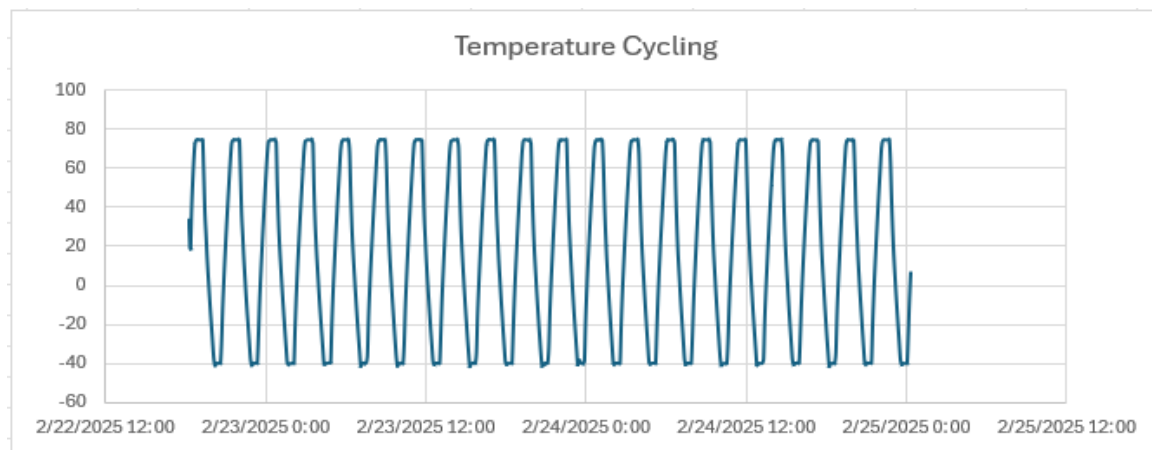
Tested By:	John Robins	Signature or initials:	
Engineer:	John Robins	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	
Equipment Used:	8,9	Completion Date:	22-Feb-2025
Amb (°C):	NA	RH%	NA

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
CRT2502170837-012-1	8" Green Ball Tinted	Pass	Pass
CRT2502170837-012-2	8" Green Ball Tinted	Pass	Pass
CRT2502170837-012-3	8" Green Ball Tinted	Pass	Pass
CRT2502170837-012-4	8" Green Ball Clear	Pass	Pass
CRT2502170837-012-5	8" Green Ball Clear	Pass	Pass
CRT2502170837-012-6	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	CRT2502170837-012-1				Target Input voltage		Measured Input Voltage			H, V Lum. Intensity		Vac Variation Factor		MMLI Factor	
Module	8" Ball				80Vac		80.0		Vac		311.9		Candela	0.988	0.992
Color:	Green				120Vac		120.1		Vac		315.6		Candela	1.000	
Lens Type:	Tinted				135Vac		135.1		Vac		318.4		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	82	84	83	85	84	86	82	83	83	84	83	85	22	
12.5U	7.5	74	78	75	79	76	80	74	77	75	78	75	79	17	
7.5U	2.5	121	123	122	125	123	126	120	122	121	124	122	125	41	
7.5U	7.5	103	110	105	111	105	112	102	109	104	110	105	111	32	
7.5U	12.5	80	87	81	88	82	89	80	87	81	88	81	88	24	
2.5U	2.5	217	225	220	228	222	230	215	223	218	226	220	228	88	
2.5U	7.5	180	200	182	202	184	204	178	198	180	200	182	202	73	
2.5U	12.5	132	155	133	157	134	158	131	154	132	156	133	157	49	
2.5U	17.5	87	107	88	109	89	109	87	106	88	108	88	109	28	
2.5U	22.5	51	62	51	62	52	63	50	61	51	62	51	62	15	
2.5D	2.5	439	455	445	461	448	465	436	452	441	457	445	461	211	
2.5D	7.5	353	402	358	407	361	410	351	399	355	403	358	407	172	
2.5D	12.5	245	297	248	301	250	304	243	295	246	299	248	301	118	
2.5D	17.5	151	198	153	200	154	202	150	196	152	199	153	200	69	
2.5D	22.5	75	98	76	99	76	100	74	97	75	98	76	99	37	
2.5D	27.5	39	50	39	51	40	51	39	50	39	50	39	51	19	
7.5D	2.5	416	420	421	425	425	428	413	416	418	421	422	425	166	
7.5D	7.5	349	365	353	369	356	373	346	362	350	366	353	370	138	
7.5D	12.5	252	261	255	265	257	267	250	259	253	262	255	265	92	
7.5D	17.5	158	167	160	169	161	171	156	166	158	168	160	169	54	
7.5D	22.5	82	88	83	89	83	90	81	87	82	88	83	89	28	
7.5D	27.5	43	46	44	46	44	47	43	46	43	46	44	47	15	
12.5D	2.5	213	210	215	212	217	214	211	208	213	210	215	212	65	
12.5D	7.5	183	180	185	182	187	184	182	178	184	181	186	182	52	
12.5D	12.5	139	134	141	136	142	137	138	133	140	135	141	136	37	
12.5D	17.5	94	92	96	93	96	94	94	91	95	92	96	93	22	
12.5D	22.5	57	57	58	58	58	58	57	56	57	57	58	58	11	
12.5D	27.5	34	34	35	34	35	35	34	34	34	34	35	34	6	
17.5D	2.5	119	120	121	121	122	122	118	119	120	120	121	122	30	
17.5D	7.5	103	107	105	108	106	109	103	106	104	108	105	109	24	
17.5D	12.5	81	85	82	86	83	86	81	84	82	85	82	86	17	
17.5D	17.5	59	61	59	62	60	63	58	61	59	62	59	62	9	
17.5D	22.5	39	41	40	42	40	42	39	41	39	41	40	42	4	
22.5D	2.5	81	82	82	83	83	83	80	81	81	82	82	83	22	
22.5D	7.5	69	73	70	74	71	74	69	72	70	73	70	74	17	
22.5D	12.5	54	57	55	57	56	58	54	56	55	57	55	57	13	
22.5D	17.5	41	42	41	42	42	43	41	42	41	42	42	42	6	
27.5D	2.5	48	48	49	49	49	49	48	48	48	49	49	49	15	
27.5D	7.5	42	44	43	44	43	45	42	43	42	44	43	44	11	

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-012-2				Target Input voltage		Measured Input Voltage			H, V Lum. Intensity		Vac Variation Factor		MMLI Factor
Module	8" Ball				80Vac		79.9 Vac			334.2 Candela		0.988		0.990
Color:	Green				120Vac		120.1 Vac			338.1 Candela		1.000		
Lens Type:	Tinted				135Vac		135.1 Vac			339.9 Candela		1.005		
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	89	90	90	90	91	88	88	89	89	89	90	22
12.5U	7.5	80	83	81	84	81	84	79	82	80	83	81	84	17
7.5U	2.5	129	132	131	134	132	134	128	131	130	132	130	133	41
7.5U	7.5	111	117	112	119	113	119	110	116	111	118	112	118	32
7.5U	12.5	86	93	87	94	88	95	85	92	86	93	87	94	24
2.5U	2.5	234	240	237	243	238	244	231	237	234	240	235	242	88
2.5U	7.5	195	212	198	214	199	216	193	210	196	212	197	213	73
2.5U	12.5	144	163	146	165	146	166	143	161	144	163	145	164	49
2.5U	17.5	96	112	97	114	97	114	95	111	96	112	96	113	28
2.5U	22.5	55	65	56	66	56	67	55	65	55	66	56	66	15
2.5D	2.5	470	483	476	489	478	492	466	479	471	484	474	487	211
2.5D	7.5	382	422	387	427	389	429	378	418	383	423	385	425	172
2.5D	12.5	269	311	272	314	274	316	266	308	270	311	271	313	118
2.5D	17.5	168	207	170	209	171	210	166	205	168	207	169	208	69
2.5D	22.5	83	104	84	105	84	106	82	103	83	104	83	105	37
2.5D	27.5	43	53	43	54	43	54	42	53	43	54	43	54	19
7.5D	2.5	445	449	451	455	453	457	441	445	446	450	448	452	166
7.5D	7.5	372	390	377	395	379	397	369	386	373	391	375	393	138
7.5D	12.5	267	282	270	285	271	287	264	279	267	282	269	284	92
7.5D	17.5	168	181	170	183	171	184	167	179	169	181	169	182	54
7.5D	22.5	87	95	88	96	88	97	86	94	87	95	88	96	28
7.5D	27.5	46	50	47	51	47	51	46	50	46	50	46	51	15
12.5D	2.5	227	226	230	229	231	230	225	224	228	226	229	227	65
12.5D	7.5	194	195	196	197	197	198	192	193	194	195	195	196	52
12.5D	12.5	146	147	147	149	148	149	144	145	146	147	147	148	37
12.5D	17.5	99	100	101	101	101	102	98	99	99	100	100	101	22
12.5D	22.5	60	62	61	63	61	63	59	61	60	62	60	62	11
12.5D	27.5	36	37	36	37	37	38	36	37	36	37	36	37	6
17.5D	2.5	128	129	130	130	130	131	127	127	128	129	129	130	30
17.5D	7.5	111	114	112	115	113	116	110	113	111	114	112	115	24
17.5D	12.5	87	90	88	91	88	92	86	89	87	90	87	91	17
17.5D	17.5	63	66	63	66	64	67	62	65	63	66	63	66	9
17.5D	22.5	42	44	42	45	42	45	41	44	42	44	42	44	4
22.5D	2.5	87	87	88	89	88	89	86	87	87	88	88	88	22
22.5D	7.5	74	77	75	78	76	78	74	76	74	77	75	78	17
22.5D	12.5	58	60	59	61	59	61	57	60	58	60	58	61	13
22.5D	17.5	44	45	44	45	44	46	43	44	44	45	44	45	6
27.5D	2.5	51	52	52	52	52	53	51	51	51	52	52	52	15
27.5D	7.5	45	46	46	47	46	47	45	46	45	46	45	47	11

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-012-3				Target Input voltage		Measured Input Voltage			H, V Lum. Intensity		Vac Variation Factor		MMLI Factor
Module	8" Ball				80Vac		80.0		Vac		341.9	Candela	1.006	0.969
Color:	Green				120Vac		120.1		Vac		339.8	Candela	1.000	
Lens Type:	Tinted				135Vac		135.2		Vac		340.5	Candela	1.002	
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	90	91	90	90	90	90	87	88	87	87	87	88	22
12.5U	7.5	81	85	81	84	81	84	79	82	78	82	78	82	17
7.5U	2.5	132	135	131	134	132	134	128	131	127	130	127	130	41
7.5U	7.5	113	121	112	120	112	120	109	117	108	116	109	116	32
7.5U	12.5	87	96	87	95	87	95	85	93	84	92	84	92	24
2.5U	2.5	238	246	237	244	237	245	231	238	229	237	230	237	88
2.5U	7.5	197	219	196	217	197	218	191	212	190	210	190	211	73
2.5U	12.5	145	168	144	167	144	168	140	163	140	162	140	163	49
2.5U	17.5	96	117	96	116	96	116	93	113	93	113	93	113	28
2.5U	22.5	55	68	55	67	55	67	54	66	53	65	54	65	15
2.5D	2.5	475	491	472	488	473	489	460	476	458	473	459	474	211
2.5D	7.5	382	434	380	431	381	432	370	420	368	418	369	418	172
2.5D	12.5	268	319	266	318	267	318	260	309	258	308	259	308	118
2.5D	17.5	166	216	165	214	165	215	161	209	160	208	160	208	69
2.5D	22.5	82	108	82	108	82	108	80	105	79	104	79	104	37
2.5D	27.5	43	55	43	55	43	55	41	53	41	53	41	53	19
7.5D	2.5	448	454	445	451	446	452	434	440	431	437	432	438	166
7.5D	7.5	372	397	370	395	370	396	360	385	358	382	359	383	138
7.5D	12.5	266	286	264	285	265	285	258	278	256	276	257	276	92
7.5D	17.5	167	185	166	184	166	185	162	180	161	178	161	179	54
7.5D	22.5	87	98	86	97	86	97	84	95	83	94	84	94	28
7.5D	27.5	46	51	46	51	46	51	44	49	44	49	44	49	15
12.5D	2.5	228	227	226	226	227	226	221	220	219	219	220	219	65
12.5D	7.5	194	197	193	196	193	196	188	191	187	189	187	190	52
12.5D	12.5	146	148	145	147	145	147	141	143	140	142	141	143	37
12.5D	17.5	99	102	99	101	99	101	96	98	96	98	96	98	22
12.5D	22.5	60	63	59	62	60	63	58	61	58	60	58	61	11
12.5D	27.5	36	37	36	37	36	37	35	36	35	36	35	36	6
17.5D	2.5	128	129	128	129	128	129	124	125	124	125	124	125	30
17.5D	7.5	111	116	110	115	110	115	107	112	107	111	107	111	24
17.5D	12.5	86	92	86	91	86	91	84	89	83	88	83	88	17
17.5D	17.5	62	67	62	66	62	66	60	64	60	64	60	64	9
17.5D	22.5	41	45	41	44	41	44	40	43	40	43	40	43	4
22.5D	2.5	87	88	86	88	87	88	84	85	84	85	84	85	22
22.5D	7.5	74	78	73	78	74	78	72	76	71	75	71	76	17
22.5D	12.5	58	61	57	60	57	61	56	59	56	59	56	59	13
22.5D	17.5	43	45	43	45	43	45	42	44	42	43	42	44	6
27.5D	2.5	51	52	51	52	51	52	50	50	49	50	49	50	15
27.5D	7.5	45	47	45	46	45	47	43	45	43	45	43	45	11

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-012-4					Target Input voltage		Measured Input Voltage		H, V Lum. Intensity		Vac Variation Factor		MMLI Factor
Module	8" Ball					80Vac		80.0	Vac		324.4	Candela	1.003	0.972
Color:	Green					120Vac		120.1	Vac		323.4	Candela	1.000	
Lens Type:	Clear					135Vac		135.1	Vac		324.1	Candela	1.002	
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	87	87	87	87	87	87	85	85	84	84	85	84	22
12.5U	7.5	79	81	79	80	79	81	77	78	77	78	77	78	17
7.5U	2.5	128	129	127	129	127	129	124	126	124	125	124	125	41
7.5U	7.5	110	114	110	114	110	114	107	111	106	111	107	111	32
7.5U	12.5	86	90	86	90	86	90	84	88	83	88	84	88	24
2.5U	2.5	229	233	228	232	228	233	222	226	222	226	222	226	88
2.5U	7.5	193	203	193	203	193	203	188	198	187	197	188	197	73
2.5U	12.5	144	156	143	155	144	156	140	151	139	151	140	151	49
2.5U	17.5	97	107	97	107	97	107	94	104	94	104	94	104	28
2.5U	22.5	56	62	56	62	56	62	54	60	54	60	54	60	15
2.5D	2.5	460	467	459	466	460	467	447	454	446	453	447	454	211
2.5D	7.5	380	405	378	403	379	404	369	393	368	392	369	393	172
2.5D	12.5	270	297	269	296	270	297	263	289	262	288	262	288	118
2.5D	17.5	173	198	172	198	173	198	168	193	167	192	168	192	69
2.5D	22.5	85	98	85	98	85	98	83	96	83	95	83	96	37
2.5D	27.5	44	50	44	50	44	50	43	49	43	49	43	49	19
7.5D	2.5	448	453	446	452	447	453	435	440	434	439	435	440	166
7.5D	7.5	374	394	373	393	374	393	364	383	363	382	363	382	138
7.5D	12.5	269	286	269	285	269	285	262	278	261	277	262	277	92
7.5D	17.5	172	186	171	186	172	186	167	181	167	180	167	181	54
7.5D	22.5	88	97	88	96	88	97	86	94	86	94	86	94	28
7.5D	27.5	46	50	46	50	46	50	45	49	45	49	45	49	15
12.5D	2.5	232	232	231	231	232	232	225	225	225	225	225	225	65
12.5D	7.5	197	201	197	200	197	200	192	195	191	194	191	195	52
12.5D	12.5	147	151	147	151	147	151	143	147	143	146	143	147	37
12.5D	17.5	101	104	100	103	101	103	98	101	98	100	98	101	22
12.5D	22.5	60	63	60	63	60	63	59	61	58	61	59	61	11
12.5D	27.5	36	37	36	37	36	37	35	36	35	36	35	36	6
17.5D	2.5	129	130	129	129	129	130	126	126	125	126	126	126	30
17.5D	7.5	112	115	112	115	112	115	109	112	109	111	109	112	24
17.5D	12.5	88	91	88	91	88	91	86	88	86	88	86	88	17
17.5D	17.5	64	66	64	66	64	66	62	64	62	64	62	64	9
17.5D	22.5	42	44	42	44	42	44	41	43	41	43	41	43	4
22.5D	2.5	89	90	89	89	89	90	87	87	86	87	87	87	22
22.5D	7.5	76	79	76	79	76	79	74	77	74	76	74	77	17
22.5D	12.5	59	62	59	61	59	61	58	60	58	60	58	60	13
22.5D	17.5	45	46	45	46	45	46	44	44	43	44	44	44	6
27.5D	2.5	53	53	53	53	53	53	51	52	51	52	51	52	15
27.5D	7.5	47	47	46	47	47	47	45	46	45	46	45	46	11

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-012-5				Target Input voltage		Measured Input Voltage			H, V Lum. Intensity		Vac Variation Factor		MMLI Factor
Module	8" Ball				80Vac		80.0		Vac		350.5	Candela	1.006	0.974
Color:	Green				120Vac		120.0		Vac		348.4	Candela	1.000	
Lens Type:	Clear				135Vac		135.1		Vac		349.2	Candela	1.002	
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	94	93	93	93	93	93	91	91	91	90	91	90	22
12.5U	7.5	86	86	85	86	85	86	83	84	83	83	83	84	17
7.5U	2.5	137	138	136	137	136	137	133	134	132	133	132	134	41
7.5U	7.5	118	122	117	121	117	121	115	119	114	118	114	118	32
7.5U	12.5	93	96	92	96	92	96	90	94	90	93	90	93	24
2.5U	2.5	247	249	246	248	246	248	240	243	239	241	240	242	88
2.5U	7.5	211	216	209	215	210	215	205	211	204	209	204	210	73
2.5U	12.5	158	165	157	164	157	164	154	160	153	159	153	160	49
2.5U	17.5	107	113	107	113	107	113	104	110	104	110	104	110	28
2.5U	22.5	62	66	61	66	61	66	60	64	60	64	60	64	15
2.5D	2.5	499	502	496	499	497	500	486	489	483	486	484	487	211
2.5D	7.5	415	429	412	427	413	428	404	418	401	416	402	417	172
2.5D	12.5	299	313	297	311	298	311	291	304	289	302	290	303	118
2.5D	17.5	193	207	192	206	193	207	188	202	187	201	188	201	69
2.5D	22.5	95	104	94	103	95	103	92	101	92	100	92	101	37
2.5D	27.5	49	53	48	53	49	53	47	52	47	51	47	52	19
7.5D	2.5	468	475	465	472	466	473	455	462	453	459	454	460	166
7.5D	7.5	391	412	389	410	390	411	381	401	379	399	380	400	138
7.5D	12.5	283	301	282	299	282	300	276	293	274	291	275	292	92
7.5D	17.5	181	197	180	196	180	196	176	192	175	191	176	191	54
7.5D	22.5	93	103	93	102	93	102	91	100	90	99	91	100	28
7.5D	27.5	50	54	49	53	49	54	48	52	48	52	48	52	15
12.5D	2.5	239	241	238	240	238	240	233	235	231	233	232	234	65
12.5D	7.5	203	210	201	209	202	209	197	205	196	203	196	204	52
12.5D	12.5	152	160	151	159	151	160	148	156	147	155	147	155	37
12.5D	17.5	104	111	103	110	104	110	101	108	101	107	101	108	22
12.5D	22.5	63	68	63	67	63	68	62	66	61	66	61	66	11
12.5D	27.5	38	40	38	40	38	40	37	39	37	39	37	39	6
17.5D	2.5	137	137	136	136	136	137	133	133	132	133	133	133	30
17.5D	7.5	119	121	118	120	119	121	116	118	115	117	116	117	24
17.5D	12.5	94	97	93	96	93	96	91	94	91	93	91	94	17
17.5D	17.5	68	71	67	70	68	70	66	69	66	68	66	69	9
17.5D	22.5	45	47	45	47	45	47	44	46	44	46	44	46	4
22.5D	2.5	94	94	93	94	93	94	91	92	91	91	91	92	22
22.5D	7.5	81	83	80	82	81	82	79	81	78	80	78	80	17
22.5D	12.5	63	65	63	65	63	65	61	63	61	63	61	63	13
22.5D	17.5	47	49	47	48	47	49	46	47	46	47	46	47	6
27.5D	2.5	56	56	55	55	55	56	54	54	54	54	54	54	15
27.5D	7.5	50	50	49	49	49	50	48	48	48	48	48	48	11

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-012-6				Target Input voltage		Measured Input Voltage			H, V Lum. Intensity		Vac Variation Factor		MMLI Factor
Module	8" Ball				80Vac		80.0		Vac		366.4	Candela	0.996	0.968
Color:	Green				120Vac		120.0		Vac		367.8	Candela	1.000	
Lens Type:	Clear				135Vac		135.2		Vac		367.9	Candela	1.000	
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	97	98	98	98	98	98	94	95	95	95	95	95	22
12.5U	7.5	88	91	88	92	89	92	85	88	86	89	86	89	17
7.5U	2.5	141	144	142	145	142	145	137	139	137	140	137	140	41
7.5U	7.5	121	128	122	129	122	129	117	124	118	124	118	124	32
7.5U	12.5	94	102	95	102	95	102	91	98	92	99	92	99	24
2.5U	2.5	256	262	257	263	257	263	248	254	249	255	249	255	88
2.5U	7.5	214	231	215	232	215	232	207	224	208	225	208	225	73
2.5U	12.5	159	178	160	178	160	178	154	172	154	173	154	173	49
2.5U	17.5	107	123	107	124	107	124	103	119	104	120	104	120	28
2.5U	22.5	61	72	62	72	62	72	59	70	60	70	60	70	15
2.5D	2.5	518	530	520	533	521	533	502	513	504	515	504	515	211
2.5D	7.5	422	462	424	464	424	464	409	447	410	449	410	449	172
2.5D	12.5	300	340	301	342	301	342	290	329	291	330	292	331	118
2.5D	17.5	190	229	191	230	191	230	184	222	184	223	184	223	69
2.5D	22.5	93	115	93	116	93	116	90	112	90	112	90	112	37
2.5D	27.5	48	59	48	59	48	59	46	57	46	57	46	57	19
7.5D	2.5	483	489	485	491	485	491	467	473	469	475	469	475	166
7.5D	7.5	402	428	403	429	403	429	389	414	390	415	390	416	138
7.5D	12.5	288	311	289	312	289	312	279	301	280	302	280	302	92
7.5D	17.5	183	205	184	206	184	206	177	198	178	199	178	199	54
7.5D	22.5	94	108	95	109	95	109	91	105	92	105	92	105	28
7.5D	27.5	50	57	50	57	50	57	48	55	48	55	48	55	15
12.5D	2.5	243	243	244	244	244	244	235	235	236	236	236	236	65
12.5D	7.5	206	212	207	213	207	213	199	205	200	206	200	206	52
12.5D	12.5	155	161	156	162	156	162	150	156	150	157	151	157	37
12.5D	17.5	106	112	107	113	107	113	103	109	103	109	103	109	22
12.5D	22.5	64	70	64	70	64	70	62	68	62	68	62	68	11
12.5D	27.5	39	42	39	42	39	42	37	40	38	41	38	41	6
17.5D	2.5	139	140	140	141	140	141	134	135	135	136	135	136	30
17.5D	7.5	120	125	120	125	120	125	116	121	117	121	117	121	24
17.5D	12.5	94	100	94	100	94	100	91	96	91	97	91	97	17
17.5D	17.5	68	73	68	74	68	74	66	71	66	71	66	71	9
17.5D	22.5	45	50	45	50	45	50	44	48	44	48	44	48	4
22.5D	2.5	95	96	96	97	96	97	92	93	93	93	93	93	22
22.5D	7.5	81	85	81	86	81	86	78	82	79	83	79	83	17
22.5D	12.5	63	67	63	67	63	67	61	65	61	65	61	65	13
22.5D	17.5	47	50	48	50	48	50	46	49	46	49	46	49	6
27.5D	2.5	56	57	56	57	56	57	54	55	54	55	54	55	15
27.5D	7.5	49	51	50	51	50	51	48	50	48	50	48	50	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:	14-Mar-2025
Amb (°C):	20	RH%	38		

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	CRT2502170837-012-1	CRT2502170837-012-2	CRT2502170837-012-3
Location	Luminance	Luminance	Luminance
1	7395	8229	5876
2	12932	14325	14917
3	14351	17324	19476
4	11522	12749	13645
5	8821	8929	9332
6	17588	20569	21672
7	19742	25670	29176
8	9601	9526	11221
9	6089	6649	5880
Average	12005	13774	14577
Intensity Ratio	3.2	3.9	5.0

8" Green Ball Clear			
Sample	CRT2502170837-012-4	CRT2502170837-012-5	CRT2502170837-012-6
Location	Luminance	Luminance	Luminance
1	9786	4700	9594
2	12527	14791	15510
3	15186	13228	13766
4	12129	13407	11917
5	8972	8810	9499
6	19135	20042	18983
7	23700	23857	24836
8	9636	9636	9227
9	7308	6859	6371
Average	13153	12814	13300
Intensity Ratio	3.2	5.1	3.9

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:	
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%	17.8

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)	CRT2502170837-012-1	0.065	0.488
	CRT2502170837-012-2	0.066	0.496
	CRT2502170837-012-3	0.069	0.544

		Chromaticity Coordinates	
Color	Sample	x	y
Green (Clear)	CRT2502170837-012-4	0.069	0.474
	CRT2502170837-012-5	0.069	0.481
	CRT2502170837-012-6	0.070	0.478

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>Rex Williams</i>
Engineer:	John Robins	Signature or initials:	<i>John Robins</i>
Reviewed By:	cwm	Signature or initials:	<i>cwm</i>
Equipment Used:	1-4	Completion Date:	28-Feb-2025
Amb (°C):	25.2	RH%	17.8

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	CRT2502170837-012-1			CRT2502170837-012-2			CRT2502170837-012-3		
Location	x	y	Dominant	x	y	Dominant	x	y	Dominant
1	0.066	0.488	498	0.067	0.501	499	0.069	0.544	501
2	0.065	0.487	498	0.066	0.498	499	0.068	0.543	501
3	0.065	0.490	499	0.066	0.500	499	0.069	0.545	501
4	0.065	0.488	498	0.066	0.497	499	0.068	0.543	501
5	0.065	0.486	498	0.066	0.493	499	0.069	0.543	501
6	0.066	0.497	499	0.067	0.503	499	0.070	0.547	501
7	0.066	0.495	499	0.067	0.499	499	0.070	0.550	501
8	0.064	0.482	498	0.065	0.492	499	0.068	0.542	501
9	0.064	0.481	498	0.065	0.483	498	0.068	0.540	501
Average	0.065	0.488	498	0.066	0.496	499	0.069	0.544	501

8" Green Ball Clear									
Sample	CRT2502170837-012-4			CRT2502170837-012-5			CRT2502170837-012-6		
Location	x	y	Dominant	x	y	Dominant	x	y	Dominant
1	0.069	0.475	498	0.069	0.482	498	0.070	0.479	498
2	0.069	0.476	498	0.069	0.480	498	0.070	0.478	498
3	0.069	0.473	498	0.069	0.481	498	0.070	0.477	498
4	0.069	0.475	498	0.069	0.481	498	0.070	0.473	498
5	0.069	0.473	498	0.069	0.485	498	0.070	0.478	498
6	0.070	0.482	498	0.070	0.489	499	0.071	0.486	498
7	0.070	0.480	498	0.070	0.489	499	0.071	0.485	498
8	0.068	0.466	497	0.068	0.474	498	0.069	0.474	498
9	0.069	0.468	498	0.068	0.472	498	0.069	0.473	498
Average	0.069	0.474	498	0.069	0.481	498	0.070	0.478	498

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
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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%	17.8

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
CRT2502170837-012-1	315.6	314.1	1.00
CRT2502170837-012-2	338.1	336.9	1.00
CRT2502170837-012-3	339.8	322.4	0.95

measurements in cd

8" Green Ball Clear			
Sample	Pre Abrasion	Post Abrasion	Percentage
CRT2502170837-012-4	323.4	310.3	0.96
CRT2502170837-012-5	348.4	341.3	0.98
CRT2502170837-012-6	367.8	341.7	0.93

measurements in cd

Measured Voltage:	120.15	Vac		
Measured Weight:	9	lbs		
Abrasion Pad	4	Sq. In		
Pad Pressure	2.1	psi	14.7	Kpa

Complies: ☒ YES ☐ NO

Tested By:	Matthew Benninger	Signature or initials:	
Engineer:	John Robins	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	
Equipment Used:	15,16,17,18,19	Completion Date:	17-Mar-2025
Amb (°C):	20	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
CRT2502170837-012-1	55.5	49.9	46.8
CRT2502170837-012-2	58.1	52.3	48.9
CRT2502170837-012-3	57.8	52.1	48.8

Label lists 6.4VA

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

Complies: ☒ YES ☐ NO

Tested By:	John Robins	Signature or initials:	
Engineer:	John Robins	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	<i>cwm</i>
Equipment Used:	5,7,8	Completion Date:	26-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%
CRT2502170837-012-1	120.1	48.8	5.7	0.97	1.24	11.4
CRT2502170837-012-2	120.0	50.9	6.0	0.97	1.27	11.4
CRT2502170837-012-3	120.1	50.9	6.0	0.97	1.26	11.2
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	A206	Current Transformer	Pearson	01-Jun-2025
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 Photocell	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				