

LEOTEK Electronics USA LLC

TEST REPORT

SCOPE OF WORK

Intertek Traffic Signal ITE Program Certification Testing
of 15yr 12" Clear and Tinted Green Balls.

REPORT NUMBER

106115934CRT-001G

ISSUE DATE

3-Apr-2025

PAGES

19

DOCUMENT CONTROL NUMBER

NA
© 2025 INTERTEK



**WARNING: This document may contain information subject to EARR99.
Diversion contrary to US law is prohibited.**

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-01514892-2
Phone	408-380-1788 Ext. 202	Test Start Date	February 27, 2025
Email	frank@leotek.com	Completion Date	April 2, 2025

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

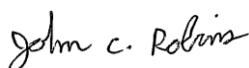
Spec.	Test name	Clause	Tinted	Clear
			Result	
ITE	Conditioning	6.4.2	Pass	Pass
ITE	Mechanical Vibration	6.4.3.1	Pass**	
ITE	Temperature Cycling	6.4.3.2	Pass	Pass
ITE	Moisture Resistance	6.4.3.3	Pass**	
ITE	Luminous Intensity	6.4.4.1, 2,3,4	Pass	Pass
ITE	Luminance Uniformity	6.4.4.5	Pass	Pass
ITE	Chromaticity	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 106115934CRT-001R.

***Covered under Dialight test report 105772891CRT-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

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program. Statement of Conformity – "Simple Acceptance" rule of ISO/IEC GUIDE 98-4:2012(E), also called "Shared Risk approach" of ILAC-G8:09/2019 guide.

Sample Information				
Date Rec.	Intertek ID	Description	Condition	Model No.
2/17/25	CRT2502170837-007	15yr 12" Green Tinted/Clear Ball	Engineering	See Below

Note: Clear lenses provided.

Further Sample Description

Intertek Sample Number	Description	Model Number	Serial Number
CRT2502170837-007-1	12" Green Ball Tinted	433-2220-001XL15	A2412011779
CRT2502170837-007-2	12" Green Ball Tinted	433-2220-001XL15	A2412011780
CRT2502170837-007-3	12" Green Ball Tinted	433-2220-001XL15	A2412011781
CRT2502170837-007-4	12" Green Ball Clear	433-2270-001XL15	A2412011782
CRT2502170837-007-5	12" Green Ball Clear	433-2270-001XL15	A2412011783
CRT2502170837-007-6	12" Green Ball Clear	433-2270-001XL15	A2412011784

General Requirements

Intertek Sample Number	ETL Cert. Number	Label Identification	Lens Orientation	Color Coded Wires
CRT2502170837-007-1	NA	Pass	Pass	Brown/White
CRT2502170837-007-2	NA	Pass	Pass	Brown/White
CRT2502170837-007-3	NA	Pass	Pass	Brown/White
CRT2502170837-007-4	NA	Pass	Pass	Brown/White
CRT2502170837-007-5	NA	Pass	Pass	Brown/White
CRT2502170837-007-6	NA	Pass	Pass	Brown/White

General Requirements

Intertek Sample Number	600V / 20 AWG Min.	Wire Length ≥ 39"	Service Rating +105°C
CRT2502170837-007-1	600V / 18 AWG	Pass	Pass
CRT2502170837-007-2	600V / 18 AWG	Pass	Pass
CRT2502170837-007-3	600V / 18 AWG	Pass	Pass
CRT2502170837-007-4	600V / 18 AWG	Pass	Pass
CRT2502170837-007-5	600V / 18 AWG	Pass	Pass
CRT2502170837-007-6	600V / 18 AWG	Pass	Pass

Sample Modification Log	
Date	Modification description
2/21/25	AC Cable: Brown/White_C-G000000018
	Wire Cover : C-A000000097
	Waterproof Plug
	Back Cover: C-A000000096
	Heat Sink: C-A000000095
	Metal PCB: C-E000000013
	Connector: CNRP4-A2001WRBS04P
	LED: LEDLXG-NCSE219BT
	Thermistor: C-F000000023
	2nd Lens: PPCTSL-LENS009B1
	SPS: 15y SPS_C-D000000001
	Power Clip_C-A000000092
	Fresnel Lens: PPCTSL-FL08A
	O-ring: 12" PRBTSL-LG1206
	Gasket: 12" Gasket PRBTSL-FG12T1
	Front Cover Tinted: PPCTSL-FC12GV1Z
	Front Cover Clear: PPCTSL-FC12WV1Z

Picture(s)



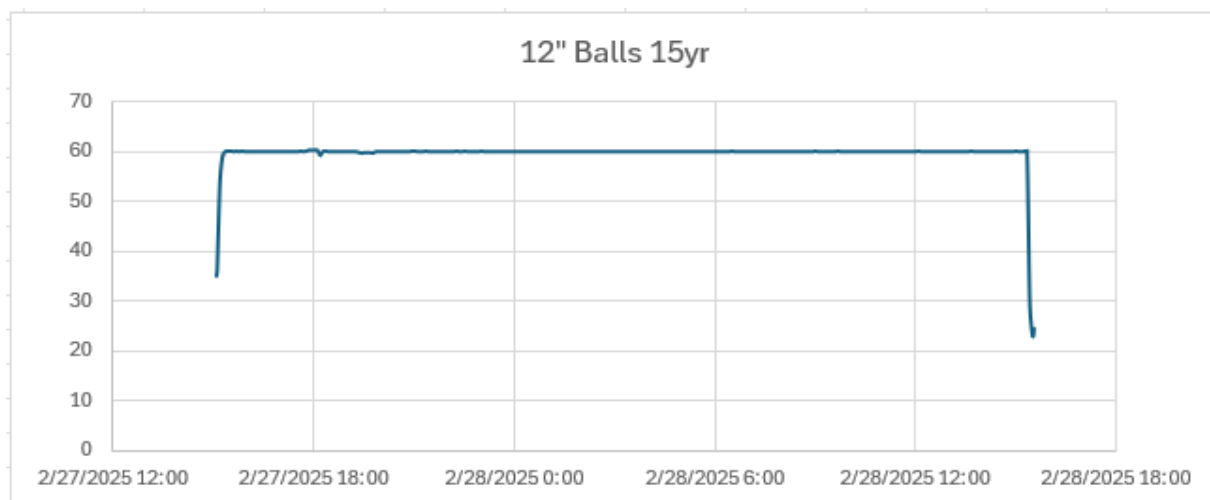
Note: The client supplied clear lenses for the modules, The clear lens model number is 433-2270-001XL15.

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
CRT2502170837-007-1	12" Green Ball Tinted	Pass	Pass	Pass	Pass
CRT2502170837-007-2	12" Green Ball Tinted	Pass	Pass	Pass	Pass
CRT2502170837-007-3	12" Green Ball Tinted	Pass	Pass	Pass	Pass
CRT2502170837-007-4	12" Green Ball Clear	Pass	Pass	Pass	Pass
CRT2502170837-007-5	12" Green Ball Clear	Pass	Pass	Pass	Pass
CRT2502170837-007-6	12" Green Ball Clear	Pass	Pass	Pass	Pass



Measured Voltage: 120 - 122 Vac

Complies: ☒ YES ☐ NO

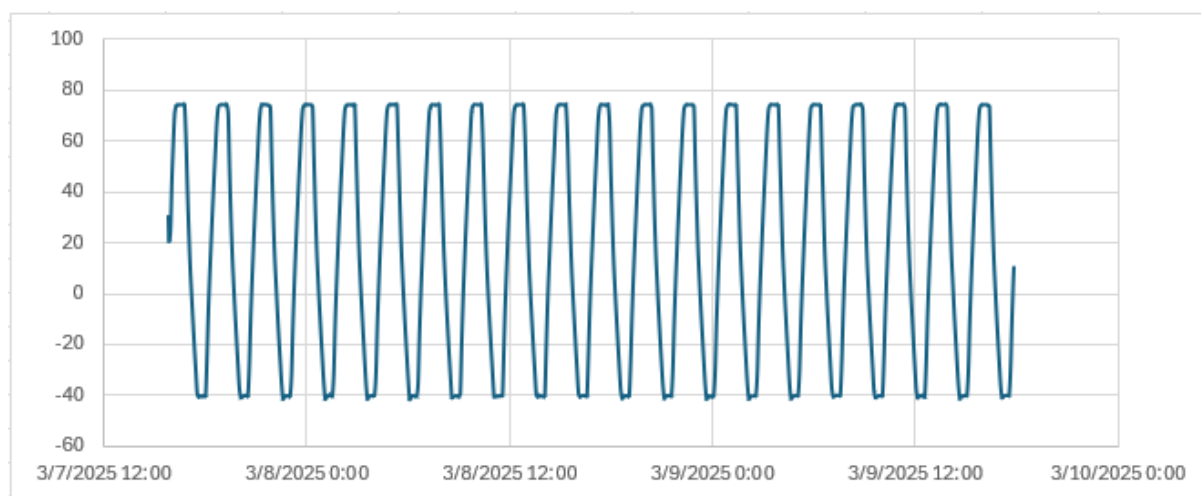
Tested By:	John Robins	Signature or initials:	
Engineer:	John Robins	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	
Equipment Used:	1,2	Completion Date:	28-Feb-2025
Amb (°C):	NA	RH%	NA

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
CRT2502170837-007-1	12" Green Ball Tinted	Pass	Pass
CRT2502170837-007-2	12" Green Ball Tinted	Pass	Pass
CRT2502170837-007-3	12" Green Ball Tinted	Pass	Pass
CRT2502170837-007-4	12" Green Ball Clear	Pass	Pass
CRT2502170837-007-5	12" Green Ball Clear	Pass	Pass
CRT2502170837-007-6	12" Green Ball Clear	Pass	Pass



Complies: ☒ YES ☐ NO

Tested By:	John Robins	Signature or initials:	<i>JR</i>
Engineer:	John Robins	Signature or initials:	<i>JR</i>
Reviewed By:	cwm	Signature or initials:	<i>cwm</i>
Equipment Used:	1	Completion Date:	9-Mar-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	CRT2502170837-007-1				Target Input voltage		Measured Input Voltage			H, V Lum. Intensity		Vac Variation Factor		MMLI Factor	
Module	12" Ball				80Vac		80.0		Vac		791.2		Candela	0.984	0.838
Color:	Green				120Vac		120.1		Vac		804.4		Candela	1.000	
Lens Type:	Tinted				135Vac		135.1		Vac		816.9		Candela	1.016	
Photometric Test Distance: 25 meters															
Max	1425	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	141	143	143	145	145	147	118	120	120	122	122	124	48	
12.5U	7.5	123	129	125	131	127	133	103	108	105	110	107	112	38	
7.5U	2.5	210	215	214	218	217	222	176	180	179	183	182	186	90	
7.5U	7.5	174	184	177	188	180	190	146	154	148	157	151	160	71	
7.5U	12.5	126	138	128	140	130	142	105	115	107	117	109	119	52	
2.5U	2.5	463	477	471	485	478	492	388	399	395	406	401	412	195	
2.5U	7.5	373	410	380	417	385	423	313	343	318	349	323	355	162	
2.5U	12.5	263	307	267	312	271	317	220	257	224	261	227	265	109	
2.5U	17.5	164	197	167	200	170	203	138	165	140	168	142	170	62	
2.5U	22.5	93	116	95	118	96	120	78	97	79	99	80	100	33	
2.5D	2.5	1076	1094	1094	1112	1111	1129	901	916	916	931	931	946	466	
2.5D	7.5	880	928	894	944	908	958	737	778	749	791	761	803	380	
2.5D	12.5	624	681	634	692	644	703	523	570	531	580	540	589	261	
2.5D	17.5	386	428	392	435	398	442	323	358	328	364	334	370	152	
2.5D	22.5	216	244	220	248	223	252	181	204	184	208	187	211	81	
2.5D	27.5	95	116	96	118	98	120	79	97	81	99	82	100	43	
7.5D	2.5	858	854	873	868	886	881	719	715	731	727	742	738	366	
7.5D	7.5	725	708	737	720	748	731	607	593	617	603	627	613	304	
7.5D	12.5	523	506	532	514	540	522	438	424	445	431	452	437	204	
7.5D	17.5	328	311	333	317	338	321	274	261	279	265	283	269	119	
7.5D	22.5	191	178	194	181	197	184	160	149	163	152	165	154	62	
7.5D	27.5	91	86	93	88	94	89	76	72	78	74	79	75	33	
12.5D	2.5	310	302	315	307	320	312	260	253	264	257	268	261	143	
12.5D	7.5	266	250	271	254	275	258	223	209	227	213	230	216	114	
12.5D	12.5	195	180	199	183	202	186	164	151	166	153	169	156	81	
12.5D	17.5	128	117	131	119	133	120	108	98	109	99	111	101	48	
12.5D	22.5	79	71	80	72	81	74	66	60	67	61	68	62	24	
12.5D	27.5	45	42	46	42	47	43	38	35	39	36	39	36	14	
17.5D	2.5	161	163	164	166	166	168	135	136	137	139	139	141	67	
17.5D	7.5	139	142	141	145	143	147	116	119	118	121	120	123	52	
17.5D	12.5	104	107	105	109	107	111	87	90	88	91	90	93	38	
17.5D	17.5	73	74	74	76	75	77	61	62	62	63	63	64	19	
17.5D	22.5	49	51	50	52	51	53	41	43	42	43	43	44	10	
22.5D	2.5	125	127	127	129	129	131	105	106	106	108	108	110	48	
22.5D	7.5	104	104	106	106	107	108	87	87	88	89	90	90	38	
22.5D	12.5	73	76	75	77	76	78	61	64	63	65	63	66	29	
22.5D	17.5	51	51	51	52	52	53	42	43	43	44	44	44	14	
27.5D	2.5	68	68	69	69	71	70	57	57	58	58	59	58	33	
27.5D	7.5	58	58	59	59	60	60	49	49	50	50	50	50	24	

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-007-2				Target Input voltage		Measured Input Voltage			H, V Lum. Intensity		Vac Variation Factor		MMLI Factor
Module	12" Ball				80Vac		80.0	Vac		825.2	Candela	0.986		0.834
Color:	Green				120Vac		120.1	Vac		836.9	Candela	1.000		
Lens Type:	Tinted				135Vac		135.1	Vac		847.2	Candela	1.012		
Photometric Test Distance: 25 meters														
Max	1425	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	143	145	145	147	146	149	119	121	121	122	122	124	48
12.5U	7.5	125	128	127	130	128	131	104	107	105	108	107	110	38
7.5U	2.5	216	218	219	222	221	224	180	182	182	185	185	187	90
7.5U	7.5	180	185	182	188	185	190	150	154	152	157	154	159	71
7.5U	12.5	131	138	132	140	134	142	109	115	110	117	112	118	52
2.5U	2.5	482	487	489	494	495	500	402	406	408	412	413	417	195
2.5U	7.5	394	415	400	420	405	426	329	346	333	351	338	355	162
2.5U	12.5	282	306	286	311	289	314	235	255	238	259	241	262	109
2.5U	17.5	178	194	180	197	182	200	148	162	150	164	152	166	62
2.5U	22.5	101	113	103	114	104	116	85	94	86	95	87	96	33
2.5D	2.5	1077	1082	1092	1097	1105	1111	898	902	910	915	922	926	466
2.5D	7.5	887	910	900	923	911	934	740	759	750	770	760	779	380
2.5D	12.5	630	662	639	672	647	680	525	552	533	560	539	567	261
2.5D	17.5	392	412	397	418	402	423	327	343	331	348	335	352	152
2.5D	22.5	221	233	224	236	227	239	184	194	187	197	189	199	81
2.5D	27.5	97	109	99	111	100	112	81	91	82	92	83	93	43
7.5D	2.5	814	808	825	819	835	829	678	674	688	683	696	692	366
7.5D	7.5	685	671	695	680	703	688	571	559	579	567	586	574	304
7.5D	12.5	493	484	500	491	506	497	411	404	417	410	422	415	204
7.5D	17.5	308	300	313	305	317	308	257	250	261	254	264	257	119
7.5D	22.5	179	171	182	174	184	176	149	143	151	145	153	147	62
7.5D	27.5	87	84	89	85	90	86	73	70	74	71	75	72	33
12.5D	2.5	287	282	291	286	295	290	239	235	243	239	246	242	143
12.5D	7.5	246	236	249	240	252	242	205	197	208	200	210	202	114
12.5D	12.5	179	172	182	175	184	177	149	144	151	146	153	147	81
12.5D	17.5	118	112	120	114	121	115	98	94	100	95	101	96	48
12.5D	22.5	72	69	73	70	74	71	60	58	61	59	62	59	24
12.5D	27.5	42	41	43	41	43	42	35	34	36	34	36	35	14
17.5D	2.5	156	156	158	159	160	160	130	130	132	132	133	134	67
17.5D	7.5	135	136	137	138	139	140	113	113	114	115	116	116	52
17.5D	12.5	101	102	103	104	104	105	85	85	86	86	87	88	38
17.5D	17.5	71	71	72	72	73	73	59	59	60	60	61	61	19
17.5D	22.5	49	49	49	49	50	50	40	41	41	41	42	42	10
22.5D	2.5	122	122	124	123	125	125	102	101	103	103	104	104	48
22.5D	7.5	102	99	103	100	105	101	85	82	86	83	87	84	38
22.5D	12.5	72	71	73	72	74	73	60	60	61	60	62	61	29
22.5D	17.5	49	49	50	50	50	50	41	41	41	41	42	42	14
27.5D	2.5	64	63	65	64	66	65	53	53	54	53	55	54	33
27.5D	7.5	55	54	56	55	56	56	46	45	46	46	47	46	24

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-007-3				Target Input voltage		Measured Input Voltage				H, V Lum. Intensity		Vac Variation Factor		MMLI Factor	
Module	12" Ball				80Vac		80.1		Vac		830.2		Candela		0.983	0.834
Color:	Green				120Vac		120.1		Vac		844.3		Candela		1.000	
Lens Type:	Tinted				135Vac		135.1		Vac		853.4		Candela		1.011	
Photometric Test Distance: 25 meters																
Max	1425	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	
12.5U	2.5	145	146	147	149	149	150	121	122	123	124	124	125	124	48	
12.5U	7.5	127	130	129	132	130	133	106	108	108	110	109	111	109	38	
7.5U	2.5	217	219	221	223	223	226	181	183	184	186	186	188	186	90	
7.5U	7.5	181	186	184	189	186	191	151	155	154	158	156	160	156	71	
7.5U	12.5	132	139	134	141	135	143	110	116	112	118	113	119	113	52	
2.5U	2.5	483	489	491	497	496	502	403	408	410	415	414	419	414	195	
2.5U	7.5	394	417	401	424	406	428	329	348	335	353	338	357	338	162	
2.5U	12.5	282	309	286	314	289	317	235	258	239	262	242	265	242	109	
2.5U	17.5	178	197	181	200	183	202	148	164	151	167	153	169	153	62	
2.5U	22.5	102	115	104	117	105	118	85	96	87	97	88	98	88	33	
2.5D	2.5	1093	1096	1112	1115	1124	1127	912	915	928	930	938	940	938	466	
2.5D	7.5	903	921	919	937	929	947	754	769	766	782	775	790	775	380	
2.5D	12.5	643	671	654	682	661	689	537	559	546	569	552	575	552	261	
2.5D	17.5	401	417	408	424	413	429	335	348	341	354	344	358	344	152	
2.5D	22.5	228	236	232	240	234	242	190	197	193	200	196	202	196	81	
2.5D	27.5	100	112	102	114	103	115	84	93	85	95	86	96	86	43	
7.5D	2.5	831	824	846	838	855	847	694	687	705	699	713	707	705	366	
7.5D	7.5	705	680	717	691	725	699	589	567	599	577	605	583	605	304	
7.5D	12.5	512	489	520	497	526	502	427	408	434	415	439	419	439	204	
7.5D	17.5	322	301	327	307	331	310	268	251	273	256	276	258	276	119	
7.5D	22.5	188	172	191	175	193	177	157	143	160	146	161	147	161	62	
7.5D	27.5	92	84	94	86	95	86	77	70	78	71	79	72	79	33	
12.5D	2.5	293	287	298	292	302	295	245	240	249	244	252	246	252	143	
12.5D	7.5	253	239	257	243	260	246	211	199	215	203	217	205	217	114	
12.5D	12.5	185	174	189	177	191	179	155	145	157	147	159	149	159	81	
12.5D	17.5	123	113	125	115	127	116	103	95	104	96	106	97	106	48	
12.5D	22.5	76	70	77	71	78	72	63	59	65	60	65	60	65	24	
12.5D	27.5	44	41	45	42	46	42	37	34	38	35	38	35	38	14	
17.5D	2.5	159	159	161	161	163	163	132	132	134	135	136	136	136	67	
17.5D	7.5	138	138	141	141	142	142	115	115	117	117	119	119	119	52	
17.5D	12.5	104	104	106	106	107	107	87	87	88	88	89	89	89	38	
17.5D	17.5	73	73	74	74	75	75	61	61	62	62	63	62	63	19	
17.5D	22.5	50	50	51	51	51	51	42	42	42	42	43	43	43	10	
22.5D	2.5	124	124	126	126	128	128	104	104	105	105	107	106	107	48	
22.5D	7.5	104	101	106	103	107	104	87	84	89	86	89	87	89	38	
22.5D	12.5	74	73	75	74	76	75	62	61	63	62	64	63	64	29	
22.5D	17.5	51	50	52	51	52	52	42	42	43	43	43	43	43	14	
27.5D	2.5	66	65	67	66	68	67	55	54	56	55	56	56	56	33	
27.5D	7.5	56	56	57	57	58	58	47	47	48	47	48	48	48	24	

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-007-4				Target Input voltage		Measured Input Voltage			H, V Lum. Intensity		Vac Variation Factor		MMLI Factor		
Module	12" Ball				80Vac		80.0		Vac		888.2		Candela		0.988	0.843
Color:	Green				120Vac		120.0		Vac		899.2		Candela		1.000	
Lens Type:	Clear				135Vac		135.2		Vac		909.1		Candela		1.011	
Photometric Test Distance: 25 meters																
Max	1425	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	155	158	157	160	159	161	131	133	133	135	134	136	48		
12.5U	7.5	136	141	138	143	140	144	115	119	116	120	118	122	38		
7.5U	2.5	234	239	237	242	240	245	198	202	200	204	202	206	90		
7.5U	7.5	194	205	197	207	199	210	164	173	166	175	168	177	71		
7.5U	12.5	140	153	142	155	144	156	118	129	120	130	121	132	52		
2.5U	2.5	522	535	529	542	535	548	441	452	446	457	451	462	195		
2.5U	7.5	423	460	428	465	433	470	357	388	361	392	365	397	162		
2.5U	12.5	297	342	301	347	304	350	251	289	254	292	257	296	109		
2.5U	17.5	186	218	188	221	190	224	157	184	159	186	161	189	62		
2.5U	22.5	106	128	107	130	108	131	89	108	90	109	91	111	33		
2.5D	2.5	1172	1191	1187	1206	1200	1219	989	1005	1001	1017	1012	1028	466		
2.5D	7.5	963	1010	975	1023	986	1034	812	852	823	863	832	872	380		
2.5D	12.5	685	746	693	755	701	764	578	629	585	637	591	644	261		
2.5D	17.5	424	467	429	473	434	478	357	394	362	399	366	403	152		
2.5D	22.5	240	268	243	271	246	274	202	226	205	228	207	231	81		
2.5D	27.5	106	128	107	129	108	131	89	108	90	109	91	110	43		
7.5D	2.5	910	902	921	914	931	924	767	761	777	770	785	779	366		
7.5D	7.5	767	749	777	758	785	767	647	632	655	640	662	647	304		
7.5D	12.5	555	540	562	547	568	553	468	455	474	461	479	466	204		
7.5D	17.5	349	333	354	338	357	341	295	281	298	285	302	288	119		
7.5D	22.5	204	193	207	195	209	197	172	162	174	164	176	166	62		
7.5D	27.5	99	94	100	95	101	96	83	79	84	80	85	81	33		
12.5D	2.5	326	319	330	323	334	327	275	269	278	273	281	276	143		
12.5D	7.5	279	265	282	268	285	271	235	223	238	226	240	228	114		
12.5D	12.5	203	192	206	194	208	196	171	162	174	164	175	165	81		
12.5D	17.5	134	124	136	126	137	127	113	105	114	106	116	107	48		
12.5D	22.5	82	77	83	78	84	79	69	65	70	66	71	66	24		
12.5D	27.5	47	45	48	46	49	46	40	38	41	39	41	39	14		
17.5D	2.5	175	177	177	179	179	181	148	149	149	151	151	153	67		
17.5D	7.5	151	154	153	156	154	157	127	130	129	131	130	133	52		
17.5D	12.5	113	116	114	117	115	118	95	98	96	99	97	100	38		
17.5D	17.5	79	81	80	82	81	83	66	68	67	69	68	70	19		
17.5D	22.5	54	55	54	56	55	56	45	47	46	47	46	48	10		
22.5D	2.5	136	139	138	140	140	142	115	117	116	118	118	120	48		
22.5D	7.5	113	113	115	115	116	116	95	95	97	97	98	98	38		
22.5D	12.5	80	82	81	83	81	84	67	69	68	70	69	71	29		
22.5D	17.5	55	55	55	56	56	57	46	47	47	47	47	48	14		
27.5D	2.5	73	72	74	73	75	74	62	61	63	62	63	63	33		
27.5D	7.5	63	63	63	63	64	64	53	53	53	53	54	54	24		

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-007-5				Target Input voltage		Measured Input Voltage			H, V Lum. Intensity		Vac Variation Factor		MMLI Factor
Module	12" Ball				80Vac		80.0		Vac		875.3	Candela	0.985	0.848
Color:	Green				120Vac		120.1		Vac		888.7	Candela	1.000	
Lens Type:	Clear				135Vac		135.0		Vac		900.3	Candela	1.013	
Photometric Test Distance: 25 meters														
Max	1425	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	154	156	156	158	158	160	131	132	133	134	134	136	48
12.5U	7.5	135	140	137	142	139	144	114	118	116	120	118	122	38
7.5U	2.5	231	236	235	240	238	243	196	200	199	203	202	206	90
7.5U	7.5	192	202	195	205	197	208	163	171	165	174	167	176	71
7.5U	12.5	139	151	142	153	143	155	118	128	120	130	122	131	52
2.5U	2.5	516	525	524	533	531	540	438	445	444	452	450	458	195
2.5U	7.5	419	448	426	455	431	461	355	380	361	386	366	391	162
2.5U	12.5	299	333	303	338	307	342	253	282	257	287	260	290	109
2.5U	17.5	188	212	191	216	193	219	159	180	162	183	164	185	62
2.5U	22.5	107	124	109	126	110	128	91	105	92	107	93	108	33
2.5D	2.5	1149	1165	1167	1183	1182	1198	975	988	990	1003	1003	1016	466
2.5D	7.5	946	986	960	1001	973	1014	802	836	814	849	825	860	380
2.5D	12.5	672	723	682	734	691	743	570	613	579	622	586	630	261
2.5D	17.5	418	455	425	462	430	468	355	386	360	392	365	397	152
2.5D	22.5	236	259	240	263	243	266	200	220	203	223	206	226	81
2.5D	27.5	104	123	105	125	107	127	88	105	89	106	91	108	43
7.5D	2.5	882	884	896	898	907	909	748	750	760	761	770	771	366
7.5D	7.5	741	740	752	752	762	762	628	628	638	638	646	646	304
7.5D	12.5	532	536	541	545	548	552	452	455	459	462	464	468	204
7.5D	17.5	335	335	340	340	344	345	284	284	288	288	292	292	119
7.5D	22.5	194	194	197	197	199	200	164	165	167	167	169	169	62
7.5D	27.5	94	95	96	97	97	98	80	81	81	82	82	83	33
12.5D	2.5	316	312	321	317	325	321	268	265	272	269	276	272	143
12.5D	7.5	268	262	272	267	276	270	227	223	231	226	234	229	114
12.5D	12.5	194	192	197	195	200	198	165	163	167	165	170	168	81
12.5D	17.5	128	126	130	128	132	130	109	107	110	109	112	110	48
12.5D	22.5	79	78	80	79	81	80	67	66	68	67	68	68	24
12.5D	27.5	46	46	46	47	47	47	39	39	39	40	40	40	14
17.5D	2.5	170	172	173	175	175	177	145	146	147	148	149	150	67
17.5D	7.5	147	150	150	153	152	155	125	128	127	130	129	131	52
17.5D	12.5	110	113	112	115	113	117	94	96	95	98	96	99	38
17.5D	17.5	77	79	78	81	79	82	65	67	66	68	67	69	19
17.5D	22.5	52	55	53	55	54	56	44	46	45	47	46	48	10
22.5D	2.5	133	135	135	137	137	138	113	114	115	116	116	117	48
22.5D	7.5	111	110	112	112	114	113	94	93	95	95	96	96	38
22.5D	12.5	78	80	79	81	80	82	66	68	67	69	68	69	29
22.5D	17.5	53	55	54	56	55	56	45	46	46	47	46	48	14
27.5D	2.5	71	70	72	71	73	72	60	60	61	60	62	61	33
27.5D	7.5	60	61	61	62	62	63	51	52	52	53	53	53	24

Luminous Intensity 6.4.4.1 through 6.4.4.4

Sample:	CRT2502170837-007-6				Target Input voltage		Measured Input Voltage			H, V Lum. Intensity		Vac Variation Factor		MMLI Factor
Module	12" Ball				80Vac		80.0		Vac		884.3	Candela	0.985	0.841
Color:	Green				120Vac		120.1		Vac		898.1	Candela	1.000	
Lens Type:	Clear				135Vac		135.1		Vac		893.2	Candela	0.995	
Photometric Test Distance: 25 meters														
Max	1425	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	153	155	155	158	154	157	129	131	131	133	130	132	48
12.5U	7.5	133	138	135	140	134	139	112	116	113	118	113	117	38
7.5U	2.5	228	233	232	236	231	235	192	196	195	199	194	198	90
7.5U	7.5	189	199	192	203	191	201	159	168	161	170	161	169	71
7.5U	12.5	137	150	139	153	138	152	115	127	117	128	116	128	52
2.5U	2.5	507	522	515	530	512	527	427	439	434	446	431	443	195
2.5U	7.5	411	449	417	456	415	453	346	378	351	384	349	382	162
2.5U	12.5	290	337	295	343	293	341	244	284	248	288	247	287	109
2.5U	17.5	182	218	185	221	184	220	154	183	156	186	155	185	62
2.5U	22.5	104	129	106	131	106	130	88	108	89	110	89	109	33
2.5D	2.5	1125	1141	1143	1159	1137	1153	947	960	962	975	957	970	466
2.5D	7.5	922	969	937	984	931	978	776	815	788	828	784	823	380
2.5D	12.5	652	714	662	725	659	721	549	601	557	610	554	607	261
2.5D	17.5	403	447	410	454	407	451	339	376	345	382	343	380	152
2.5D	22.5	228	257	232	261	230	260	192	216	195	220	194	219	81
2.5D	27.5	101	123	102	125	102	125	85	104	86	105	86	105	43
7.5D	2.5	833	828	846	841	841	836	701	697	712	708	708	704	366
7.5D	7.5	703	690	714	700	710	696	591	580	600	589	597	586	304
7.5D	12.5	510	499	518	507	515	504	429	420	436	427	433	424	204
7.5D	17.5	322	308	327	313	325	311	271	259	275	263	273	262	119
7.5D	22.5	188	177	191	179	190	178	158	149	161	151	160	150	62
7.5D	27.5	92	88	93	89	93	89	77	74	79	75	78	75	33
12.5D	2.5	291	287	296	291	294	290	245	241	249	245	247	244	143
12.5D	7.5	251	239	255	243	253	242	211	202	214	205	213	204	114
12.5D	12.5	185	176	188	178	187	177	156	148	158	150	157	149	81
12.5D	17.5	124	116	126	118	125	117	104	98	106	99	105	99	48
12.5D	22.5	77	73	79	74	78	73	65	61	66	62	66	62	24
12.5D	27.5	46	43	46	44	46	44	38	37	39	37	39	37	14
17.5D	2.5	163	166	166	168	165	167	137	140	139	142	139	141	67
17.5D	7.5	141	145	143	147	143	146	119	122	121	124	120	123	52
17.5D	12.5	106	110	108	112	107	111	89	92	91	94	90	93	38
17.5D	17.5	75	77	76	78	76	78	63	65	64	66	64	65	19
17.5D	22.5	52	53	52	54	52	54	43	45	44	46	44	45	10
22.5D	2.5	128	131	130	133	129	132	108	110	109	112	109	111	48
22.5D	7.5	106	107	108	108	107	108	89	90	90	91	90	91	38
22.5D	12.5	75	78	77	79	76	79	63	65	64	66	64	66	29
22.5D	17.5	52	53	53	54	52	54	44	45	44	45	44	45	14
27.5D	2.5	67	67	68	68	67	67	56	56	57	57	57	57	33
27.5D	7.5	57	58	58	59	58	59	48	49	49	50	49	49	24

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:	10,11,12,13,14,15,16			Completion Date:	1-Apr-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.

12" Green Ball Tinted			
Sample	CRT2502170837-007-1	CRT2502170837-007-2	CRT2502170837-007-3
Location	Luminance	Luminance	Luminance
1	18400	19799	20556
2	25841	24680	25743
3	22259	22992	23849
4	21057	25711	23496
5	13967	15748	15376
6	20867	20051	20630
7	23654	22441	22476
8	15750	16221	15848
9	11630	12944	13624
Average	19269	20065	20178
Intensity Ratio	2.2	2.0	1.9

12" Green Ball Clear			
Sample	CRT2502170837-007-4	CRT2502170837-007-5	CRT2502170837-007-6
Location	Luminance	Luminance	Luminance
1	11303	20756	20755
2	15435	28046	25782
3	17138	26581	26309
4	13767	23322	24172
5	9258	17337	16927
6	21361	22622	21242
7	24090	24777	22631
8	13205	17038	17032
9	9249	13747	13790
Average	14978	21581	20960
Intensity Ratio	2.6	2.0	1.9

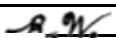
Luminance measurements are in cd/m2

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
-------------------	---------------	-----

Complies: ☒ YES ☐ NO

Tested By:	Rex Williams	Signature or initials:	
Engineer:	John Robins	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	
Equipment Used:	3-6	Completion Date:	12-Mar-2025
Amb (°C):	25.1	RH%	13.1

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)	CRT2502170837-007-1	0.070	0.538
	CRT2502170837-007-2	0.073	0.570
	CRT2502170837-007-3	0.071	0.548

		Chromaticity Coordinates	
Color	Sample	x	y
Green (Clear)	CRT2502170837-007-4	0.076	0.543
	CRT2502170837-007-5	0.076	0.546
	CRT2502170837-007-6	0.075	0.536

The chromaticity measurements meet the requirements of the referenced specification.

Measured Voltage:	120.0 - 120.3	Vac
-------------------	---------------	-----

Complies: ☒ YES ☐ NO

Tested By:	Rex Williams	Signature or initials:	
Engineer:	John Robins	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	
Equipment Used:	3-6	Completion Date:	12-Mar-2025
Amb (°C):	25.1	RH%	13.1

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

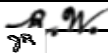
12" Green Ball Tinted									
Sample	CRT2502170837-007-1			CRT2502170837-007-2			CRT2502170837-007-3		
Location	x	y	Dominant	x	y	Dominant	x	y	Dominant
1	0.070	0.538	501	0.074	0.573	503	0.071	0.548	501
2	0.069	0.539	501	0.074	0.575	503	0.071	0.550	502
3	0.070	0.541	501	0.074	0.574	503	0.071	0.551	502
4	0.069	0.538	501	0.074	0.575	503	0.071	0.550	502
5	0.070	0.538	501	0.074	0.571	503	0.071	0.548	501
6	0.071	0.547	501	0.074	0.572	503	0.072	0.554	502
7	0.071	0.545	501	0.075	0.575	503	0.072	0.555	502
8	0.069	0.535	501	0.072	0.566	502	0.070	0.545	501
9	0.068	0.524	500	0.071	0.554	502	0.069	0.533	501
Average	0.070	0.538	501	0.073	0.570	503	0.071	0.548	501

12" Green Ball Clear									
Sample	CRT2502170837-007-4			CRT2502170837-007-5			CRT2502170837-007-6		
Location	x	y	Dominant	x	y	Dominant	x	y	Dominant
1	0.076	0.546	501	0.077	0.548	502	0.075	0.537	501
2	0.075	0.542	501	0.076	0.546	501	0.075	0.538	501
3	0.076	0.543	501	0.077	0.548	501	0.075	0.537	501
4	0.076	0.542	501	0.077	0.545	501	0.075	0.537	501
5	0.075	0.545	501	0.077	0.547	501	0.074	0.536	501
6	0.077	0.548	502	0.077	0.554	502	0.076	0.543	501
7	0.076	0.546	501	0.078	0.553	502	0.076	0.543	501
8	0.075	0.537	501	0.075	0.540	501	0.074	0.532	501
9	0.074	0.533	501	0.074	0.534	501	0.073	0.520	500
Average	0.076	0.543	501	0.076	0.546	501	0.075	0.536	501

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

Measured Voltage:	120.0 - 120.3	Vac
-------------------	---------------	-----

Complies:	☒ YES	☐ NO
-----------	---	-----------------------------

Tested By:	Rex Williams	Signature or initials:	
Engineer:	John Robins	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	
Equipment Used:	3-6	Completion Date:	12-Mar-2025
Amb (°C):	25.1	RH%	13.1

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.

12" Green Ball Tinted			
Sample	Pre Abrasion	Post Abrasion	Percentage
CRT2502170837-007-1	804.4	791.2	0.98
CRT2502170837-007-2	836.9	823.8	0.98
CRT2502170837-007-3	844.3	818.4	0.97

measurements in cd

12" Green Ball Clear			
Sample	Pre Abrasion	Post Abrasion	Percentage
CRT2502170837-007-4	899.2	859.1	0.96
CRT2502170837-007-5	888.7	832.7	0.94
CRT2502170837-007-6	898.1	877.4	0.98

measurements in cd

Measured Voltage:	120.05	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:	
Engineer:	John Robins	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	
Equipment Used:	13,14,15,16,17	Completion Date:	2-Apr-2025
Amb (°C):	19	RH%	42

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)

12" Green Ball			
Sample	-40°C	25°C	74°C
CRT2502170837-007-1	59.8	58.1	58.6
CRT2502170837-007-2	58.5	56.6	54.9
CRT2502170837-007-3	58.6	56.9	57.5

Label lists 7.4VA

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:	<i>JR</i>
Engineer:	John Robins	Signature or initials:	<i>JR</i>
Reviewed By:	cwm	Signature or initials:	<i>cwm</i>
Equipment Used:	1,7,9	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

12" Green Ball						
Sample	Voltage	Current (mA)	Power (W)	Power Factor	THD V%	THD I%
CRT2502170837-007-1	120.0	59.2	7.0	0.98	0.99	7.1
CRT2502170837-007-2	120.0	57.6	6.8	0.98	0.97	7.0
CRT2502170837-007-3	120.0	57.9	6.8	0.98	0.96	7.1
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:	7,8,9	Completion Date:	24-Mar-2025
Amb (°C):	24.7	RH%	22.7

Equipment list				
#	Intertek ID No.	Description	Manufacturer	Calibration Due
1	H204	Thermal Chamber	Thermotron	12-Jun-2025
2	M207	Multimeter	Fluke	14-Oct-2025
3	O757	Spectra Scan PR740	Photo Research	30-Apr-2025
4	D589	Digital Multimeter	Fluke	22-Apr-2025
5	L282	Hygro-Thermometer	Testo	5-Apr-2025
6	L268	Tape Measure	Crescent	9-Dec-2027
7	A206	CT	Pearson	01-Jun-2025
8	L176	Thermometer	Testo	19-Jul-2025
9	M297	Power Analyzer	Yokogawa	29-May-2025
10	H138	Thermal Chamber	Despatch	Used with cal'd Equip.
11	T1546	Digital Thermometer	Dickson	09-May-2025
12	O756	Flex Optometer	UDT	29-Mar-2025
13	O109	Goniometer	Optroniks	04-Mar-2026
14	L235	25M Photocell	Instrument Systems	17-Apr-2025
15	L254	Hygrometer	Testo	03-Jun-2025
16	O091	Power Analyzer	Yokogawa	11-Jun-2025
17	F363A	Push Pull Meter	Imada	08-May-2025

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