Ningbo TengLi Testing Co., Ltd

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Energy Star Test Report

For

Espen Technology, Inc.

(Brand Name: Espen)

12257 FLORENCE AVE SANTA FE SPRINGS, CA 90670 USA

Model name(s): VEKR4D/9T/14W-10V

Report Type:	Testing and Report According to ENERGY STAR® Program Requirements Product Specification for Luminaires (Light Fixtures) - Version 2.1
Type of Luminaire:	Downlights
Report Date:	2019-06-03
Prepared By:	Ningbo TengLi Testing Co., Ltd 2nd floor, Block B, Ningbo Testing and Certification Base, No. 66 Qingyi Road, Ningbo National Hi-Tech Zone, Ningbo, Zhejiang

Test & Report By:

Xeon Ren

Engineer: Xeon Ren

Review By:

Johnson Sun

Manager: Johnson Sun

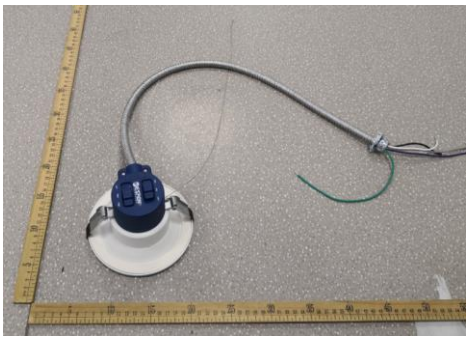
Note: 1.The results contained in this report pertain only to the tested samples.

2.This report does not imply product certification, approval, or endorsement by A2LA, or any agency of the Federal Government.

1.1 Product Information:		
Model Number	VEKR4D/9T/14W-10V	
Remark	N/A	
Representative (Tested) Model	VEKR4D/9T/14W-10V	
Model Difference	N/A	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	Downlights	
LED Manufacturer	Seoul Semiconductor Co.LTD	
LED Model	SAWxA32E-xx	
Dimming	Dimmable	
Sample Number	STD190468NB-A1	
Date of Receipt	May.28, 2019	
Luminaire Aperture (for downlights)	--	in.
Luminaire Length	--	mm
Luminaires Width	--	mm
Number of Units (modular products)	N/A	s

1.2 Rated Values:	
Rated Voltage / Frequency	120-277Vac,60 Hz
Nominal Power	14W
Rated Initial Lamp Lumen	--
Declared CCT	3000K,3500K,4000K

1.3 Product Photos



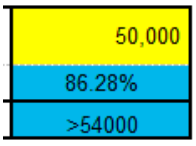
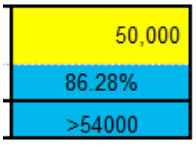
1.4 Test Specifications:

Test item	1. Total Luminous Flux 2. Luminous Distribution Intensity 3. Luminous Efficacy 4. Correlated Color Temperature 5. Color Rendering Index 6. Chromaticity Coordinate 7. Electrical Parameters
Reference Standard	1. IES LM-79-2008 Electrical and Photometric Measurements of Solid-State Lighting Products 2. ANSI C78.377-2008 Specifications for the Chromaticity of Solid State Lighting Products 3. CIE 13.3-1995 Method of Measuring and Specifying Colour Rendering Properties of Light Sources 4. CIE 15-2004 Technical Report Colorimetry 5. IESNA LM-16-93 Practical Guide to Colorimetry of Light Source 6. IESNA TM-16-05 Technical Memorandum on Light Emitting Diode (LED) Sources and Systems 7. UL1993 4th Edition, Self-Ballasted Lamps and Lamp Adapters 8. ENERGY STAR® Program Requirements Product Specification for Luminaires (Light Fixtures) – Version 2.1
Reference Work Instruction	QD25
Remark	Below test and data are not covered by A2LA accreditation: - Operating Frequency

1.5 Test Methods

1) Photometric and Light Distribution Measurement – Goniophotometer Method: Photometric parameters were measured using the goniophotometer and software. The ambient temperature shall be maintained at 25 °C ±1 °C, measured at a point not more than 1 m from the sample and at the same height as the sample. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 1 °vertical intervals and 22.5 °horizontal intervals.
2) Chromaticity Measurement – Sphere-Spectroradiometer Method: Chromaticity parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 ºC ±1 ºC. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral power distribution taken at 5 nm intervals over the range of 380 to 780 nm.
3) Electrical Measurements: Electrical parameters were measured using power meters incorporated in goniophotometer or sphere-spectroradiometer system. The ambient temperature surrounding the sample was maintained at 25 ºC ±1 ºC. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Voltage, frequency, current, power, power factor and total harmonic distortion were measured by and read from the power meter.

2.1 Summary of Test Result

Criteria Item	The Type of Luminaires	Requirement (ES for Luminaires V2.1)	Measured Value	Status
Input Wattage	All	≤ Rated Wattage	13.39W	Pass
Luminous Efficacy	Downlights	≥55 lm/W	72.34lm/W	Pass
Luminaire Minimum Light Output	Downlights	≤ 4.5" aperture: 345 lumens > 4.5" aperture: 575 lumens	968.87lm	Pass
Luminaire Zonal Lumen Density Requirement	Downlights	≥75% of total initiallumens within the 0-60 °zone	88.2	Pass
Correlated Color Temperature (CCT)	Solid State	Shall be capable of providing at least one of the following nominal correlated color temperatures (CCTs): • 2700 Kelvin • 3000 Kelvin • 3500 Kelvin • 4000 Kelvin • 5000 Kelvin	2971K Duv=0.0007	Pass
Color Rendering Index (CRI)	Solid State	Ra ≥ 80 R9 >0	Ra =93.3 R9 =67	Pass
Color Angular Uniform	Directional Solid State Indoor Luminaires	The variation of chromaticity shall be within 0.006 from the weighted average point on the CIE 1976(u',v') diagram	0.0057	Pass
Lumen Maintenance	Solid State Option 1:	L70 lumen maintenance: ≥ 25,000 hours for indoor ≥ 35,000 hours for outdoor ≥ 50,000 hours for inseparable luminaires		Pass
Light Source Life	Solid State	L70 lumen maintenance: ≥ 25,000 hours for indoor ≥ 35,000 hours for outdoor ≥ 50,000 hours for inseparable luminaires		Pass

Color Maintenance	Solid State Indoor Luminaires	Δu'v' ≤ 0.007	Max.0.0035 in LM-80 report	Pass
Source Start Time	Solid State	<750 ms	124ms	Pass
Power Factor	Solid State	Total luminaire input power ≤ 5 watts: PF ≥ 0.5 Total luminaire input power > 5 watts: PF ≥ 0.7	0.9944	Pass
Transient Protection	Solid State	The line transient shall consist of seven strikes of a 100 kHz ring wave, 2.5 kV level, for both common mode and differential mode.	Survival	Pass
Standby Power Consumption	All Luminaires	Luminaires shall not draw power in the off state.	0W	Pass
Operating Frequency	Solid State	Frequency ≥ 120 Hz	120.37Hz	Pass
Light Source Replaceability	Solid State	LED light engines or retrofit kits shall make use of electrical interconnects that allow for consumer replacement of the engine or kit without the cutting of wires or the use of solder.	Pin connector	Pass
Driver Replaceability	Solid State: Directional	Drivers shall be accessible and removable by an electrician without the cutting of wires and without damage to the luminaire housing, trim, decorative elements or the carpentry (e.g., ceilingdrywall) to which theluminaire is attached.	N/A	N/A
Maximum Measured Driver Case	Solid State	shall not exceed the driver manufacturer's maximum recommended temperature	35.7℃	Pass

Temperature		during in situ operation. ≤ 105 ℃		
Maximum In-Situ Source Temperature	Solid State	Maximum permitted Ts temperature for L70≥50,000 hrs ≤ 105 ℃	57.8 ℃	Pass
Electronic Driver Safety	Solid State: Directional	Demonstrate compliance with ANSI/UL 1310-2010, ANSI/UL 2108-2004, ANSI/UL 8750-2009, as applicable.	Driver safety report has been verified	Pass
Dimming	Solid State	The luminaire and its components shall provide continuous dimming from 100% to 20% of total light output. Luminaire shall not emit noise above 24dBA at 1 meter or less at the minimum output.	Validated	Pass
Warranty Requirements	Solid State	incorporating replaceable drivers: ≥ 3 years incorporating non-replaceable drivers: ≥ 5 years	5 years	Pass
Lighting Toxics Reduction Requirements	Solid State	Luminaires and lamps shall not exceed: 1000 ppm: Mercury, Lead, Hexavalent Chromium, PBB and PBDE 100 ppm: Cadmium	RoHS report has been verified	Pass
CCT	Solid State	Packaging shall clearly describe the nominal color designation in units of Kelvin (e.g. 2700K, 3000K).	3000K,3500K, 4000K	Pass

2.2.1 Data comparison for different CCT setting

Test Date:	2019-05-28	Test Ambient:	25 deg C
Sample No. STD190468NB-A1	**3000K 6W setting**	**3000K 9W setting**	**3000K 14W setting**
Test Voltage (V)	120.19	120.16	120.0
Frequency (Hz)	60	60	60
CCT (K)	2964	2966	2971
Duv	0.0010	0.0010	0.0007
Chromaticity (x, y)	x=0.4411 y=0.4081	x=0.4408 y=0.4078	x=0.4401 y=0.4069
Chromaticity (u', v')	u'=0.2515 v'=0.5236	u'=0.2515 v'=0.5234	u'=0.2514 v'=0.5230
Color Rendering Index (CRI)	93.7	93.5	93.3
R9	69	68	67
Total Luminous (lm)	430.5	666.2	968.87
Power(W)	5.454	8.683	13.39
Luminous Efficacy (lm/W)	78.93	76.73	72.34

2.2.2 Electrical, Photometric and Chromaticity Measurements *(Refer to Work Instruction QD25)*	**IES LM-79 2008**

Test date	2019-05-28	**Test Ambient:**	25.0 ºC
Test Orientation	As intended	**Stabilization Time (min)**	90
Model Number	VEKR4D/9T/14W-10V	3000K 14W setting	

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
STD190468NB-A1	120.0	60.01	0.1126	13.39	0.9944
	277.0	60.01	0.0522	13.56	0.9381

Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Color Rendering Index (CRI)	93.3
R9	67
CCT (K)	2971
Duv	0.0007

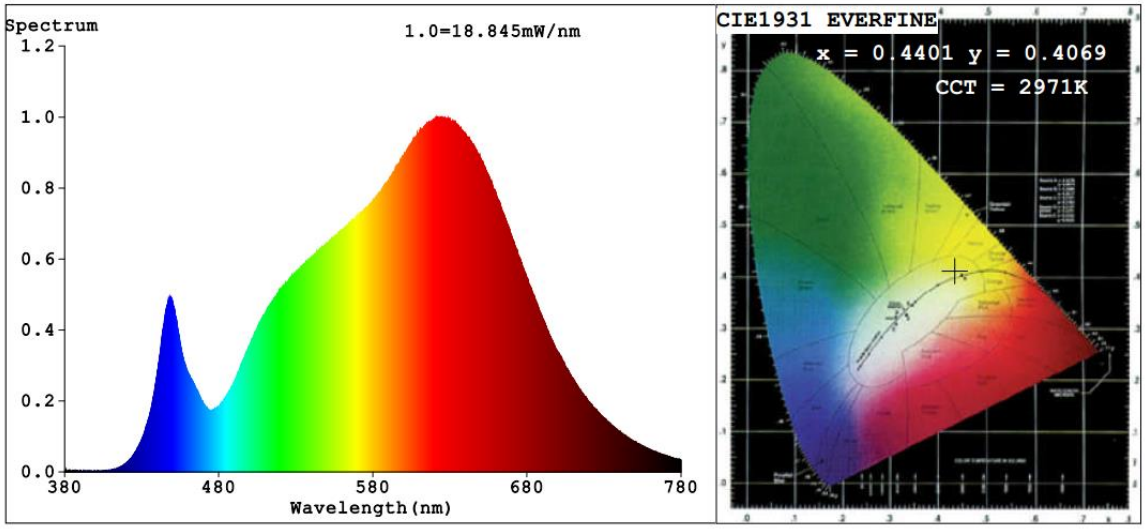
Goniophotometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Total Luminous (lm)	968.87
Luminous Efficacy (lm/W)	72.34
Beam Angle °	98.9
Center Beam Candle Power (cd)	426

Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	277.0
Frequency (Hz)	60
Total Luminous (lm)	953
Luminous Efficacy (lm/W)	70.28

Spectral Power Distribution and Chromaticity Diagram



Colorimetric Parameters

Chromaticity Coordinate:x=0.4401 y=0.4069/u'=0.2514 v'=0.5230
CCT=2971K(Duv=0.0007) Dominant WL:Ld =582.7nm Purity=54.2%
Ratio:R=24.5% G=72.9% B=2.5% Peak WL:Lp=621.6nm FWHM=166.6nm
Render Index:Ra=93.3 CRI=90.6 AvgR=90.6 TM30:Rf=0 Rg=0

R1 =94	R2 =95	R3 =95	R4 =95	R5 =93	R6 =94	R7 =95	
R8 =87	R9 =67	R10=87	R11=95	R12=81	R13=94	R14=96	R15=91

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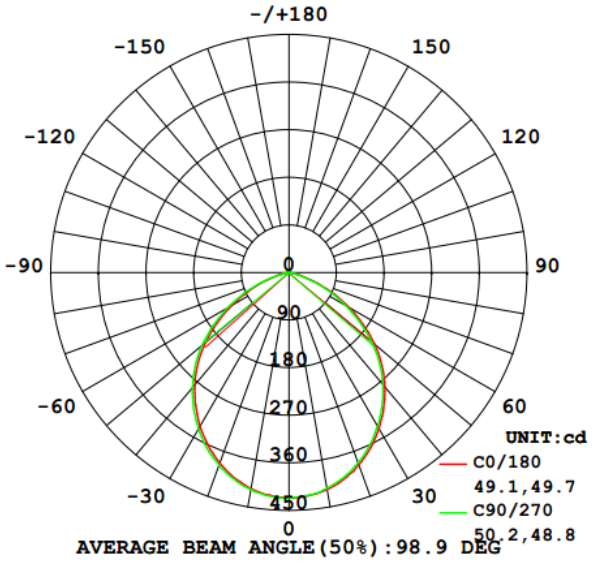
Zonal Lumen Tabulation



Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	320.9	33.1%
0-40	514.7	53.1%
0-60	854.5	88.2%
60-90	114.2	11.8%
70-100	27.1	2.8%
90-120	0.0	0%
0-90	968.7	100%
90-180	0.0	0%
0-180	968.7	100%

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	40.2	4.1%	90-100	0.0	0%
10-20	113.4	11.7%	100-110	0	0%
20-30	167.3	17.3%	110-120	0	0%
30-40	193.8	20.0%	120-130	0	0%
40-50	189.3	19.5%	130-140	0	0%
50-60	150.5	15.5%	140-150	0	0%
60-70	87.1	9.0%	150-160	0	0%
70-80	24.5	2.5%	160-170	0	0%
80-90	2.6	0.3%	170-180	0	0%

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ACCREDITED
Certificate#4703.02

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5		
0	426	426	426	426	426	426	426	426	426	426	426	426	426	426	426	426		
5	424	424	423	423	423	423	423	422	423	423	423	424	424	425	424	424		
10	417	416	415	414	414	414	413	413	415	415	415	416	417	418	418	417		
15	404	403	402	401	401	400	400	399	401	402	402	403	404	405	406	405		
20	387	386	385	384	383	382	382	382	383	384	385	387	388	389	389	388		
25	365	365	362	362	360	360	359	359	361	363	364	365	367	367	368	367		
30	340	339	338	337	335	335	334	333	336	337	338	341	342	343	343	343		
35	313	311	309	308	307	306	305	305	308	309	311	313	314	315	315	314		
40	281	280	279	277	276	275	274	274	277	278	280	282	283	285	285	284		
45	248	247	245	244	242	241	240	240	244	245	247	250	251	252	252	251		
50	211	210	207	205	204	203	202	202	206	208	211	214	215	216	216	214		
55	171	169	167	165	163	162	161	162	166	168	171	174	175	176	176	175		
60	130	128	126	124	122	121	121	121	125	128	130	133	135	135	135	134		
65	89.1	87.4	85.6	83.9	82.6	81.6	81.2	81.7	85.4	87.6	90.0	92.5	94.2	94.7	94.3	92.7		
70	50.8	49.4	48.0	46.9	45.9	45.3	45.2	45.8	49.2	51.1	53.2	54.8	55.9	56.3	55.5	54.3		
75	20.2	19.2	18.4	17.8	17.3	17.4	17.6	18.3	20.6	21.7	22.8	23.8	24.3	24.3	23.7	22.8		
80	5.53	5.33	5.17	5.11	5.09	5.17	5.30	5.50	6.06	6.33	6.55	6.72	6.76	6.64	6.41	6.13		
85	2.03	1.92	1.84	1.81	1.81	1.86	1.94	2.06	2.37	2.48	2.57	2.62	2.61	2.56	2.46	2.33		
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.01	0.00	0.00		
95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
110	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
130	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
140	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
150	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
160	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
170	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
180	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

2.2.3 Electrical, Photometric and Chromaticity Measurements *(Refer to Work Instruction QD25)*	**IES LM-79 2008**

Test date	2019-05-28	**Test Ambient:**	25.0 ºC
Test Orientation	As intended	**Stabilization Time (min)**	90
Model Number	VEKR4D/9T/14W-10V	3500K 14W setting	

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
STD190468NB-A1	120.10	60	0.1090	12.95	0.9893
	277.11	60	0.0507	13.11	0.9332

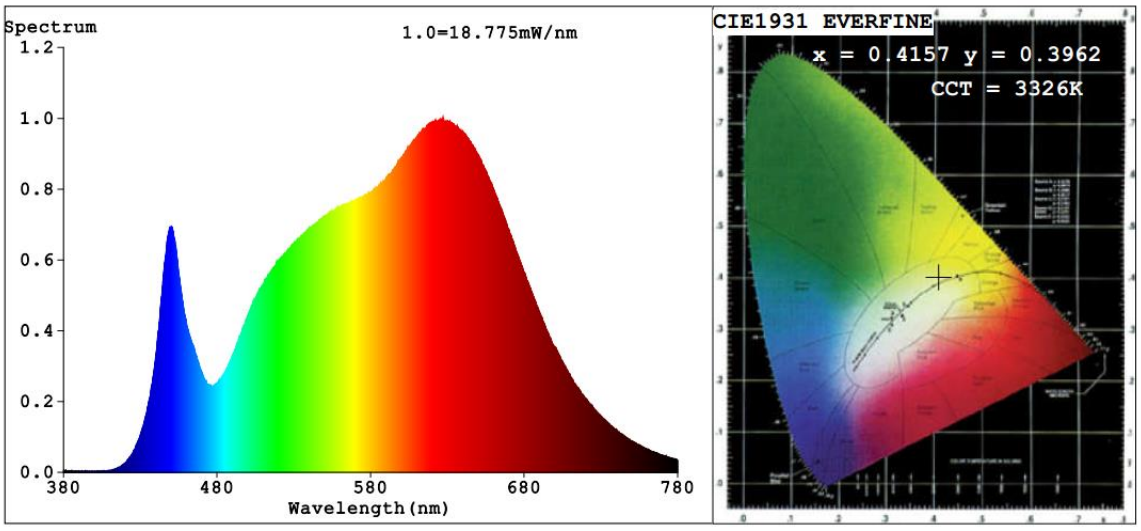
Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Color Rendering Index (CRI)	94.9
R9	78
CCT (K)	3326
Duv	0.0002
Total Luminous (lm)	1038
Luminous Efficacy (lm/W)	80.15

Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	277.0
Frequency (Hz)	60
Total Luminous (lm)	1021
Luminous Efficacy (lm/W)	77.88

Spectral Power Distribution and Chromaticity Diagram



Colorimetric Parameters

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Chromaticity Coordinate:x=0.4157  y=0.3962/u'=0.2402 v'=0.5151
CCT=3326K(Duv=0.0002) Dominant WL:Ld =581.4nm Purity=43.7%
Ratio:R=22.7% G=74.1% B=3.2%  Peak WL:Lp=627.1nm  FWHM=180.4nm
Render Index:Ra=94.9  CRI=92.4  AvgR=92.5  TM30:Rf=0 Rg=0
R1 =96    R2 =96    R3 =94    R4 =96    R5 =95    R6 =94    R7 =96
R8 =92    R9 =78    R10=89    R11=96    R12=79    R13=96    R14=96    R15=94
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2.2.4 Electrical, Photometric and Chromaticity Measurements *(Refer to Work Instruction QD25)*	**IES LM-79 2008**

Test date	2019-05-28	**Test Ambient:**	25.0 ºC
Test Orientation	As intended	**Stabilization Time (min)**	90
Model Number	VEKR4D/9T/14W-10V	4000K 14W setting	

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
STD190468NB-A1	120.10	60	0.1131	13.45	0.9906
	277.04	60	0.0526	13.62	0.9345

Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Color Rendering Index (CRI)	95.1
R9	86
CCT (K)	3901
Duv	0.0011
Total Luminous (lm)	985.1
Luminous Efficacy (lm/W)	73.24

Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	277.0
Frequency (Hz)	60
Total Luminous (lm)	968.1
Luminous Efficacy (lm/W)	71.61

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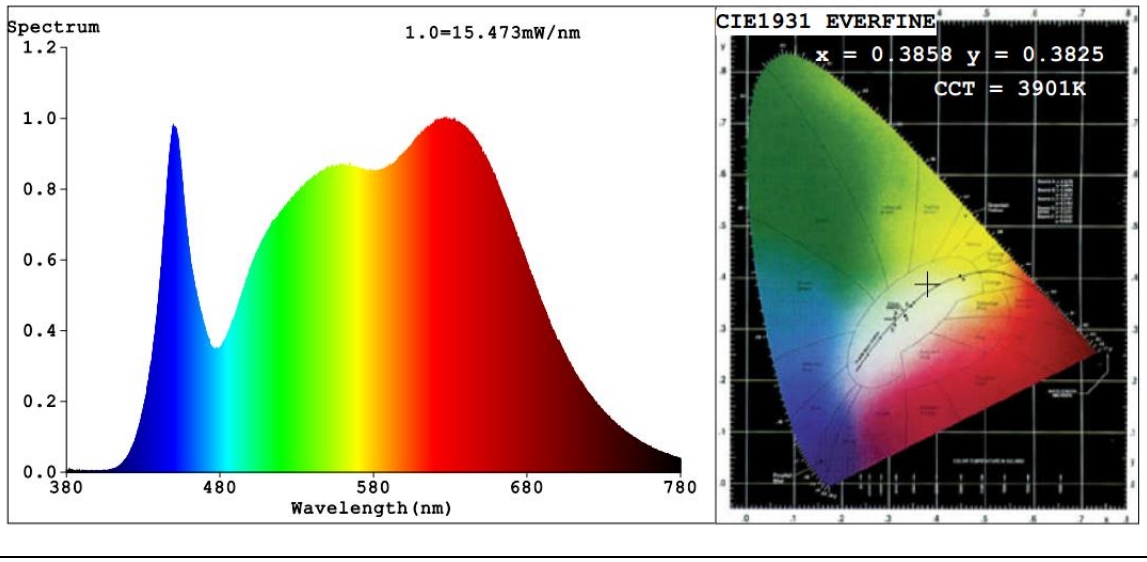
Spectral Power Distribution and Chromaticity Diagram



Colorimetric Parameters

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Chromaticity Coordinate:x=0.3858  y=0.3825/u'=0.2263 v'=0.5049
CCT=3901K(Duv=0.0011) Dominant WL:Ld =578.9nm Purity=30.6%
Ratio:R=20.4% G=75.8% B=3.9%  Peak WL:Lp=627.5nm  FWHM=194.0nm
Render Index:Ra=95.1  CRI=92.5  AvgR=92.8  TM30:Rf=0 Rg=0
R1 =96    R2 =95    R3 =92    R4 =96    R5 =95    R6 =92    R7 =97
R8 =95    R9 =86    R10=88    R11=95    R12=75    R13=96    R14=95    R15=96
```

2.3 Color Spatial Uniformity	IES LM-79 2008 ENERGY STAR® Program Requirements Product Specification for Luminaires (Light Fixtures) - Version 2.1

Test Data:

Test date	2019-05-28	Test Ambient	25.1 ℃
Sample No.		Maximum Δu'v'	
STD190468NB-A1		0.0057	

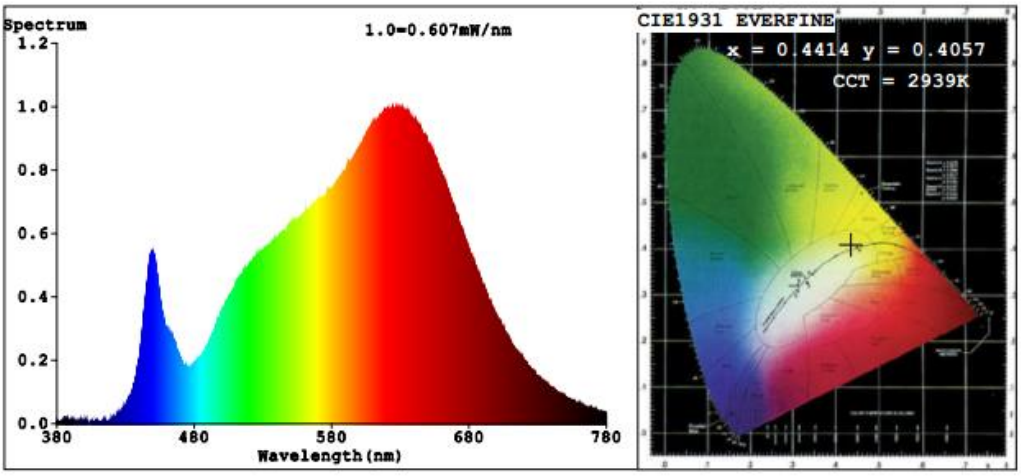
Gamma\C	CIE u'	CIE v'	du'v'	CIE u'	CIE v'	du'v'
-50	0.2484	0.521	0.0057	0.2485	0.5211	0.0056
-49	0.2484	0.5211	0.0057	0.2484	0.5212	0.0056
-48	0.2484	0.5212	0.0056	0.2485	0.5212	0.0055
-47	0.2487	0.5213	0.0053	0.2487	0.5213	0.0053
-46	0.2489	0.5214	0.0051	0.249	0.5215	0.005
-45	0.2493	0.5216	0.0047	0.2491	0.5216	0.0048
-44	0.2494	0.5217	0.0045	0.2493	0.5217	0.0046
-43	0.2496	0.5218	0.0043	0.2496	0.5218	0.0043
-42	0.2497	0.5219	0.0042	0.2498	0.5219	0.0041
-41	0.2499	0.522	0.0039	0.2499	0.5219	0.004
-40	0.25	0.5221	0.0038	0.25	0.522	0.0038
-39	0.2505	0.5222	0.0033	0.2503	0.5221	0.0035
-38	0.2506	0.5223	0.0032	0.2504	0.5222	0.0034
-37	0.2507	0.5224	0.003	0.2506	0.5223	0.0032
-36	0.2509	0.5225	0.0028	0.2507	0.5224	0.003
-35	0.251	0.5225	0.0027	0.2508	0.5224	0.003
-34	0.2511	0.5226	0.0026	0.2509	0.5225	0.0028
-33	0.2511	0.5226	0.0026	0.2511	0.5226	0.0026
-32	0.2512	0.5227	0.0025	0.2513	0.5226	0.0024
-31	0.2515	0.5227	0.0022	0.2514	0.5226	0.0023
-30	0.2515	0.5228	0.0022	0.2514	0.5227	0.0023
-29	0.2516	0.5228	0.0021	0.2515	0.5227	0.0022
-28	0.2516	0.5229	0.002	0.2516	0.5228	0.0021
-27	0.2518	0.5229	0.0018	0.2517	0.5228	0.002
-26	0.2519	0.523	0.0017	0.2519	0.5229	0.0017
-25	0.2519	0.523	0.0017	0.252	0.5229	0.0017
-24	0.252	0.523	0.0016	0.252	0.523	0.0016
-23	0.2521	0.523	0.0015	0.2521	0.523	0.0015
-22	0.2522	0.5231	0.0014	0.2522	0.523	0.0014

-21	0.2523	0.5231	0.0013	0.2522	0.523	0.0014
-20	0.2524	0.5232	0.0012	0.2523	0.5231	0.0013
-19	0.2524	0.5232	0.0012	0.2524	0.5231	0.0012
-18	0.2525	0.5232	0.0011	0.2524	0.5231	0.0012
-17	0.2525	0.5232	0.0011	0.2527	0.5232	0.0009
-16	0.2527	0.5233	0.0009	0.2527	0.5232	0.0009
-15	0.2527	0.5233	0.0009	0.2528	0.5232	0.0008
-14	0.2528	0.5233	0.0008	0.2528	0.5233	0.0008
-13	0.2528	0.5233	0.0008	0.2529	0.5233	0.0007
-12	0.2528	0.5233	0.0008	0.2529	0.5233	0.0007
-11	0.2529	0.5234	0.0006	0.253	0.5233	0.0006
-10	0.2529	0.5234	0.0006	0.253	0.5233	0.0006
-9	0.253	0.5234	0.0005	0.253	0.5234	0.0005
-8	0.253	0.5234	0.0005	0.2531	0.5233	0.0005
-7	0.2531	0.5234	0.0004	0.2531	0.5234	0.0004
-6	0.2532	0.5234	0.0004	0.2531	0.5234	0.0004
-5	0.2532	0.5235	0.0003	0.2532	0.5234	0.0004
-4	0.2532	0.5235	0.0003	0.2532	0.5234	0.0004
-3	0.2532	0.5235	0.0003	0.2532	0.5234	0.0004
-2	0.2533	0.5235	0.0002	0.2533	0.5234	0.0003
-1	0.2533	0.5235	0.0002	0.2533	0.5234	0.0003
0	0.2535	0.5236	0	0.2535	0.5236	0
1	0.2533	0.5235	0.0002	0.2533	0.5235	0.0002
2	0.2533	0.5235	0.0002	0.2533	0.5235	0.0002
3	0.2533	0.5235	0.0002	0.2533	0.5235	0.0002
4	0.2534	0.5235	0.0001	0.2534	0.5235	0.0001
5	0.2534	0.5235	0.0001	0.2534	0.5235	0.0001
6	0.2534	0.5235	0.0001	0.2534	0.5235	0.0001
7	0.2534	0.5235	0.0001	0.2534	0.5235	0.0001
8	0.2534	0.5235	0.0001	0.2534	0.5235	0.0001
9	0.2534	0.5235	0.0001	0.2534	0.5235	0.0001
10	0.2534	0.5236	0.0001	0.2534	0.5235	0.0001
11	0.2534	0.5235	0.0001	0.2534	0.5235	0.0001
12	0.2534	0.5236	0.0001	0.2534	0.5235	0.0001
13	0.2534	0.5236	0.0001	0.2534	0.5235	0.0001
14	0.2534	0.5236	0.0001	0.2534	0.5235	0.0001
15	0.2534	0.5236	0.0001	0.2534	0.5235	0.0001
16	0.2534	0.5236	0.0001	0.2534	0.5235	0.0001
17	0.2534	0.5236	0.0001	0.2534	0.5235	0.0001
18	0.2534	0.5235	0.0001	0.2534	0.5235	0.0001
19	0.2534	0.5235	0.0001	0.2534	0.5235	0.0001

20	0.2534	0.5235	0.0001	0.2534	0.5235	0.0001
21	0.2533	0.5235	0.0002	0.2534	0.5235	0.0001
22	0.2533	0.5235	0.0002	0.2533	0.5235	0.0002
23	0.2533	0.5235	0.0002	0.2533	0.5235	0.0002
24	0.2533	0.5235	0.0002	0.2533	0.5235	0.0002
25	0.2533	0.5235	0.0002	0.2533	0.5235	0.0002
26	0.2532	0.5235	0.0003	0.2533	0.5235	0.0002
27	0.2532	0.5235	0.0003	0.2533	0.5235	0.0002
28	0.2532	0.5234	0.0004	0.2532	0.5234	0.0004
29	0.2532	0.5234	0.0004	0.2532	0.5234	0.0004
30	0.2531	0.5234	0.0004	0.253	0.5234	0.0005
31	0.2531	0.5234	0.0004	0.253	0.5234	0.0005
32	0.2531	0.5234	0.0004	0.253	0.5234	0.0005
33	0.2531	0.5234	0.0004	0.2529	0.5233	0.0007
34	0.253	0.5233	0.0006	0.2529	0.5233	0.0007
35	0.2529	0.5233	0.0007	0.2529	0.5233	0.0007
36	0.2529	0.5233	0.0007	0.2528	0.5233	0.0008
37	0.2529	0.5233	0.0007	0.2528	0.5233	0.0008
38	0.2529	0.5233	0.0007	0.2527	0.5233	0.0009
39	0.2528	0.5232	0.0008	0.2525	0.5232	0.0011
40	0.2527	0.5232	0.0009	0.2525	0.5232	0.0011
41	0.2527	0.5232	0.0009	0.2525	0.5232	0.0011
42	0.2526	0.5231	0.001	0.2524	0.5232	0.0012
43	0.2525	0.5231	0.0011	0.2523	0.5231	0.0013
44	0.2523	0.523	0.0013	0.2523	0.5231	0.0013
45	0.2522	0.523	0.0014	0.2522	0.5231	0.0014
46	0.2522	0.523	0.0014	0.2522	0.523	0.0014
47	0.2521	0.523	0.0015	0.2521	0.523	0.0015
48	0.252	0.5229	0.0017	0.252	0.523	0.0016
49	0.252	0.5229	0.0017	0.252	0.5229	0.0017
50	0.2519	0.5229	0.0017	0.2519	0.5229	0.0017

2.4 Electrical and Photometric Measurements, with dimming	IES LM-79 2008 ENERGY STAR® Program Requirements Product Specification for Luminaires (Light Fixtures) - Version 2.1

Test date	2019-05-28		Test Ambient:	25.1℃
Dimmer Technology			Forward phase-cut	
Sample No.			Maximum Level	Minimum Level
STD190468NB-A1	Input: 120.0 V / 60 Hz	Light outout(Lumen)	879.7	29.12
		Percentage	90.80%	3.31%



Color Parameters:

Chromaticity Coordinate:x=0.4414 y=0.4057/u'=0.2528 v'=0.5227
CCT=2939K(Duv=0.0000) Dominant WL:Ld =583.1nm Purity=54.3%
Ratio:R=24.9% G=72.5% B=2.6% Peak WL:Lp=624.5nm FWHM=164.0nm
Render Index:Ra=94.6 CRI=92.1 AvgR=92.1 TM30:Rf=0 Rg=0

R1 =96	R2 =96	R3 =95	R4 =96	R5 =95	R6 =95	R7 =95	
R8 =88	R9 =72	R10=90	R11=96	R12=82	R13=96	R14=97	R15=93

Photo Parameters:

Flux = 29.12 lm Eff. : 32.91 lm/W Fe = 103.2 mW Scotopic:40.357 S/P:1.3858

The luminaires [can] ~~[can not]~~ provide less than 20% of total light output with continuous dimmer.

Dimmer	Peak Noise Reading (dBA)	Test Condition	Distance between the microphone and the UUT
LEVITON MFG CO INC (E31373), Cat. No. 6681	20.4	Dimmer adjusted to lowest light output	< 1 m

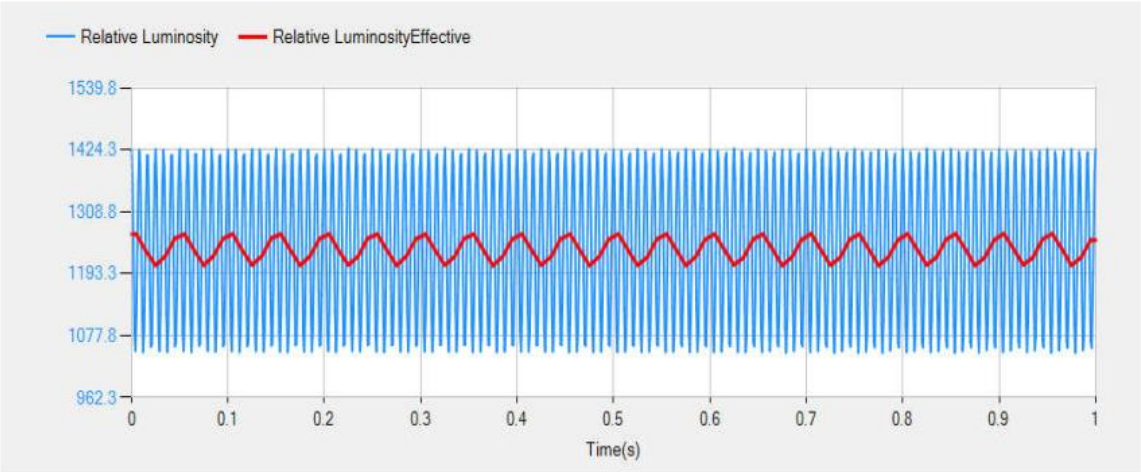
2.5 Flicker	NEMA 77-2017 ENERGY STAR® Program Requirements Product Specification for Luminaires (Light Fixtures) - Version 2.1

Dimming Technology	phase-cut
Dimmer	LEVITON MFG CO INC (E31373), Cat. No. 6681

Item	Short Term Flicker Indicator (Pst)	Stroboscopic Visibility Measure (SVM)
Full light output	0.056	0.554
Maximum Level (100%)	0.060	0.556
Minimun Level (20%)	0.076	0.151

2.6 Operating Frequency	ENERGY STAR® Program Requirements Product Specification for Luminaires (Light Fixtures) - Version 2.1
Noted: This test and data are not covered by A2LA accreditation	

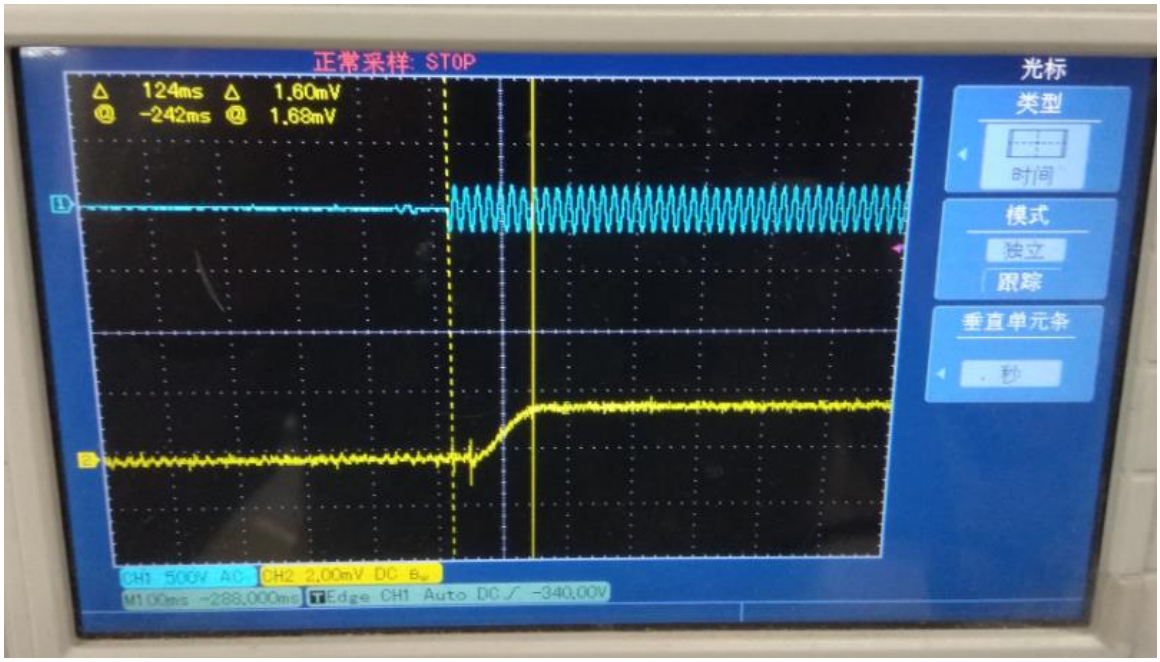
Test date	2019-05-28	Test Ambient:	25.1 ℃
Sample No.	Operating Frequency (Hz)		
STD190468NB-A1	120.37		



2.7 Starting Time *(Refer to Work Instruction QD28)*	**ENERGY STAR® Program Requirements Product Specification for Luminaires (Light Fixtures) - Version 2.1**

Test date	2019-05-28	**Test Ambient:**	25.1 ℃
Sample No.		**Start Time (ms)**	
STD190468NB-A1		124	

Graph (Start Time):



2.8 Transient Protection Test *(Refer to Work Instruction QD34)*	**ANSI/IEEE C62.41** **ENERGY STAR® Program Requirements for Luminaires – Version 2.1**

Test voltage: 120V,60Hz

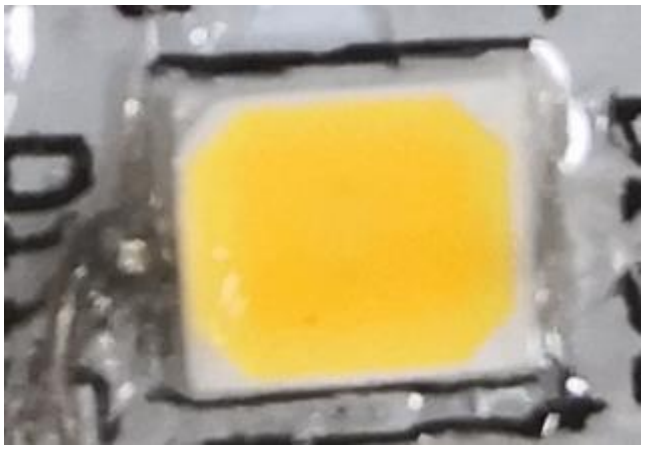
Test date	2019-05-28	**Test Ambient**	25.1 ℃
Sample No.		**Transient Protection Test - Seven Strikes**	
STD190468NB-A1		Survival	

2.9 In-Situ Temperature Measurement Test (ISTMT)	UL1598-2008, 3rd Edition

Test date	2019-05-28	Test Ambient	25.1 ℃
Input Vol./Frequency	120 V / 60 Hz	Output Current of Single LED(mA)	70.0

Sample No.	LED Package Model	Maximum Measured LED Ts Point Temperature (℃)	Maximum permitted Ts temperature for L70≥ 50,000 hrs (℃)
STD190468NB-A1	SAWxA32E-xx	57.8	105

In-Situ Picture - Ts:



2.10 Maximum Measured Ballast or Driver Case Temperature	UL1598-2008, 3rd Edition

Test date	2019-05-28	Test Ambient	25.1 ℃
Sample No.	Maximum Measured Driver Case Temperature (℃)	Maximum Driver Case Temperature Limited (℃)	
STD190468NB-A1	35.7	105	

In-Situ Picture - Ts:

2.11 Off-State Power Consumption:	ENERGY STAR® Program Requirements Product Specification for Luminaires (Light Fixtures) - Version 2.1

Test date	2019-05-28	Test Ambient:	25.0 ℃
Model Number	VEKR4D/9T/14W-10V	Stabilization Time (min)	90

Electrical Measurement – when the luminaires turned off:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)
STD190468NB-A1	120.0	60	0	0

3. Test Equipment

Equipment ID	Equipment Name	Last Calibration Date	Next Calibration Date
ST-R-702	2 meter Integrating Sphere	Verified by D204 standard lamp	
ST-R-701	Spectral analysis system HAAS-2000	Verified by D204 standard lamp	
ST-R-705	D204 Standard Lamp	2019-02-07	2020-02-06
ST-R-704	Power Meter for Integrating Sphere	2019-01-06	2020-01-05
ST-R-714	Goniophotometer system	Verified by D908S standard lamp	
ST-R-710	D908S Standard Lamp	2019-02-12	2020-02-11
ST-R-711	Power Meter for Goniophotometer	2019-01-06	2020-01-05
ST-R-720	Digital Luxmeter	2019-01-06	2020-01-05
ST-R-622	Oscillograph	2019-01-06	2020-01-05
ST-R-721	EMS61000-12C	2019-01-06	2020-01-05
ST-R-725	LFA-3000	2019-01-06	2020-01-05

Uncertainty
Photometric Measurement (Sphere):1.74%
Chromaticity Measurement(Sphere):14.3K
Photometric Measurement(Goniophotometer):1.62%

******** END OF DATASHEET PACKAGE ********