DesignLights Consortium Test Report

Refference Standards

UL1598-2008
ANSI C82.77-10-2014
IES LM-79-2008

Prepared For

Espen Technology Inc

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Test Laboratory:
UL-CCIC Company Limited
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Catalog Number
VEKT2X2(20W/25W/30W)

Project Number
4790446284
Report Number
4790446284_1

Test Date
2020-05-07~2021-09-01
Issue Date
2022-06-23
Revision Date
N/A

Prepared By	**Approved By**
Zhao, Elaine	Wu, Elvis

Test Summary

DLC Technical Requirements V5.1- issued 2020-02-14

Requirement Category	Test Method	Requirements	Tolerance	Test Result
Minimum Light Output (lm)-Luminaires	**IES LM-79-2008**	≥2000	-10%	2719.88
Minimum Luminaire Efficacy (lm/W)-Luminaires	**IES LM-79-2008**	≥110	-3%	125.38
Spacing Criteria (0-180°)	**IES LM-79-2008**	1.0-2.0	±0.1	1.20
Spacing Criteria (90-270°)	**IES LM-79-2008**	1.0-2.0	±0.1	1.28
Zonal Lumen Requirement 1(0°-60°)	**IES LM-79-2008**	≥75%	-3%	75.20%
Allowable CCT (3500K)	**IES LM-79-2008/ANSI C78.377-2015**	3465±245	N/A	3394
Allowable CCT (3500K)	**IES LM-79-2008/ANSI C78.377-2015**	3465±245	N/A	3400
Allowable CCT (3500K)	**IES LM-79-2008/ANSI C78.377-2015**	3465±245	N/A	3409
Allowable CCT (4000K)	**IES LM-79-2008/ANSI C78.377-2015**	3985±275	N/A	4085
Allowable CCT (5000K)	**IES LM-79-2008/ANSI C78.377-2015**	5029±283	N/A	5055
Minimum CRI	**IES LM-79-2008/CIE 13.3-1995**	≥80	-1	83
Minimum R9	**IES LM-79-2008**	≥0	-1	9.0
Minimum Rg	**IES LM-79-2008**	≥89	-1	96
Minimum Rf	**IES LM-79-2008**	≥70	-1	82
Rcs,h1	**IES LM-79-2008**	-12%-23%	-1%	-12%
L70 Lumen maintenance (Hours)	**N/A**	≥50000	N/A	≥50000
L90 Lumen maintenance (Hours)	**N/A**	≥36000	N/A	≥36000
Power Factor	**ANSI C82.77-10-2014**	≥0.9	-0.03	0.9223
Total Harmonic Distortion (A%)	**ANSI C82.77-10-2014**	≤20%	5%	16.60%
In-Situ Temperature Measurement Test for LED 1 (°C)	**UL1598-2008**	≤105	N/A	49.3
In-Situ Temperature Measurement Test for Driver 1 (°C)	**UL1598-2008**	≤90	N/A	38.5
Max Chromaticity Shift (1000-6000h)	**N/A**	≤0.004	0.0004	0.0024
Minimum Luminaire Warranty (Years)	**N/A**	≥5	N/A	≥5

Test List

Sample Received Date: 2020-04-28

Test Item	Test Date	Model Number	Tests Conducted By
Integrating Sphere Test	2020-05-11	VEKT2X2(20W/25W/30W) 20W	Yang, Gavin X
Integrating Sphere Test	2020-05-11	VEKT2X2(20W/25W/30W)25W	Yang, Gavin X
Integrating Sphere Test	2020-05-11	VEKT2X2(20W/25W/30W) 30W	Yang, Gavin X
Integrating Sphere Test	2020-05-11	VEKT2X2(20W/25W/30W) 30W	Yang, Gavin X
Integrating Sphere Test	2020-05-11	VEKT2X2(20W/25W/30W)30W	Yang, Gavin X
Goniophotometer Test	2020-05-07	VEKT2X2(20W/25W/30W)30W	Yang, Gavin X
Goniophotometer Test	2020-05-07	VEKT2X2(20W/25W/30W)30W	Yang, Gavin X
THD and PF Test	2020-05-07	VEKT2X2(20W/25W/30W) 20W	Yang, Gavin X
THD and PF Test	2020-05-07	VEKT2X2(20W/25W/30W)25W	Yang, Gavin X
THD and PF Test	2020-05-07	VEKT2X2(20W/25W/30W)30W	Yang, Gavin X
THD and PF Test	2021-09-01	VEKT2X2(20W/25W/30W) 30W	Yang, Gavin X
THD and PF Test	2021-09-01	VEKT2X2(20W/25W/30W)30W	Yang, Gavin X
In-Situ Temperature Measurement Test	2020-05-11	VEKT2X2(20W/25W/30W)30W	Yang, Gavin X

Remark (if any)

1. UL test equipment information is recorded on Meter Use in UL's Aurora database.
2. The accuracy method decision rule is applied when the compliance or verdict is made to the results of this report.
3.This Report is a copy report of Test Report 4790087535_1R01 issued on 2021-09-03.

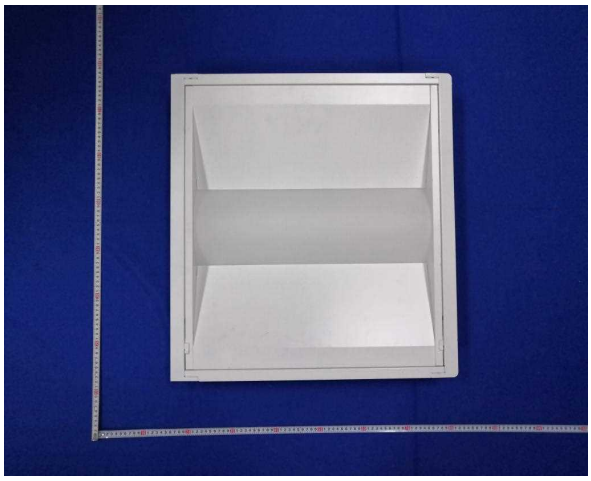
Product Description

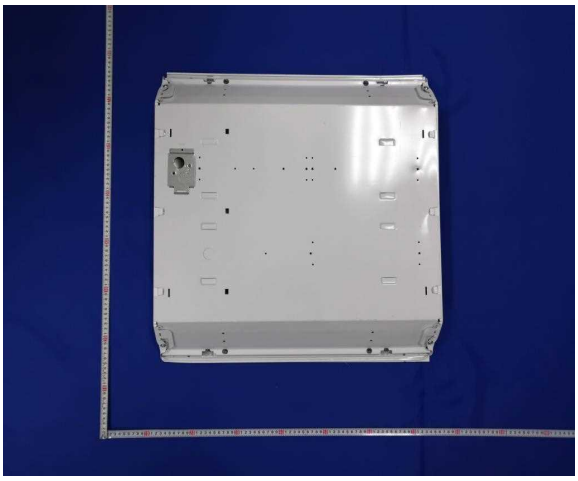
Lamp/Luminaire Description: Integrated Retrofit Kits for 2x2 Luminaires
Model Number: VEKT2X2(20W/25W/30W)
Electrical Parameter: 120-277V, 50/60Hz
LED Package: STW8A2PD-XX
Dimming Information: Continuous dimming capability
Remark: Housing Model: Lithonia 2GT8 2 17 A12 MVOLT GEB10IS

Products Scaled Value

Model Number	CCT	Luminous Flux	Power	Luminous Efficacy
VEKT2X2(20W/25W/30W)	3500k	3750	30	125
VEKT2X2(20W/25W/30W)	4000k	3780	30	126
VEKT2X2(20W/25W/30W)	5000k	3810	30	127

Photos of Products Characteristics





Integrating Sphere Test

Model No.	VEKT2X2(20W/25W/30W) 20W		Sample ID.	3033620
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

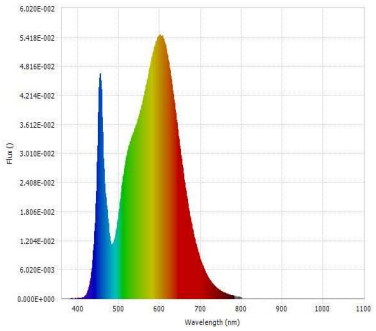
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

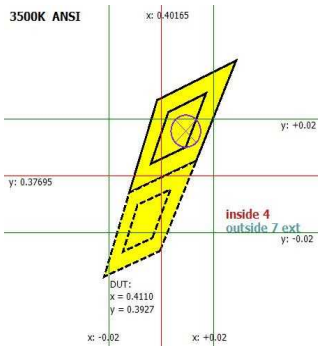
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	120.04	60	0.1685	20.02	0.9899	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3394	83	9.0	-0.0004	2719.88	135.86	N/A

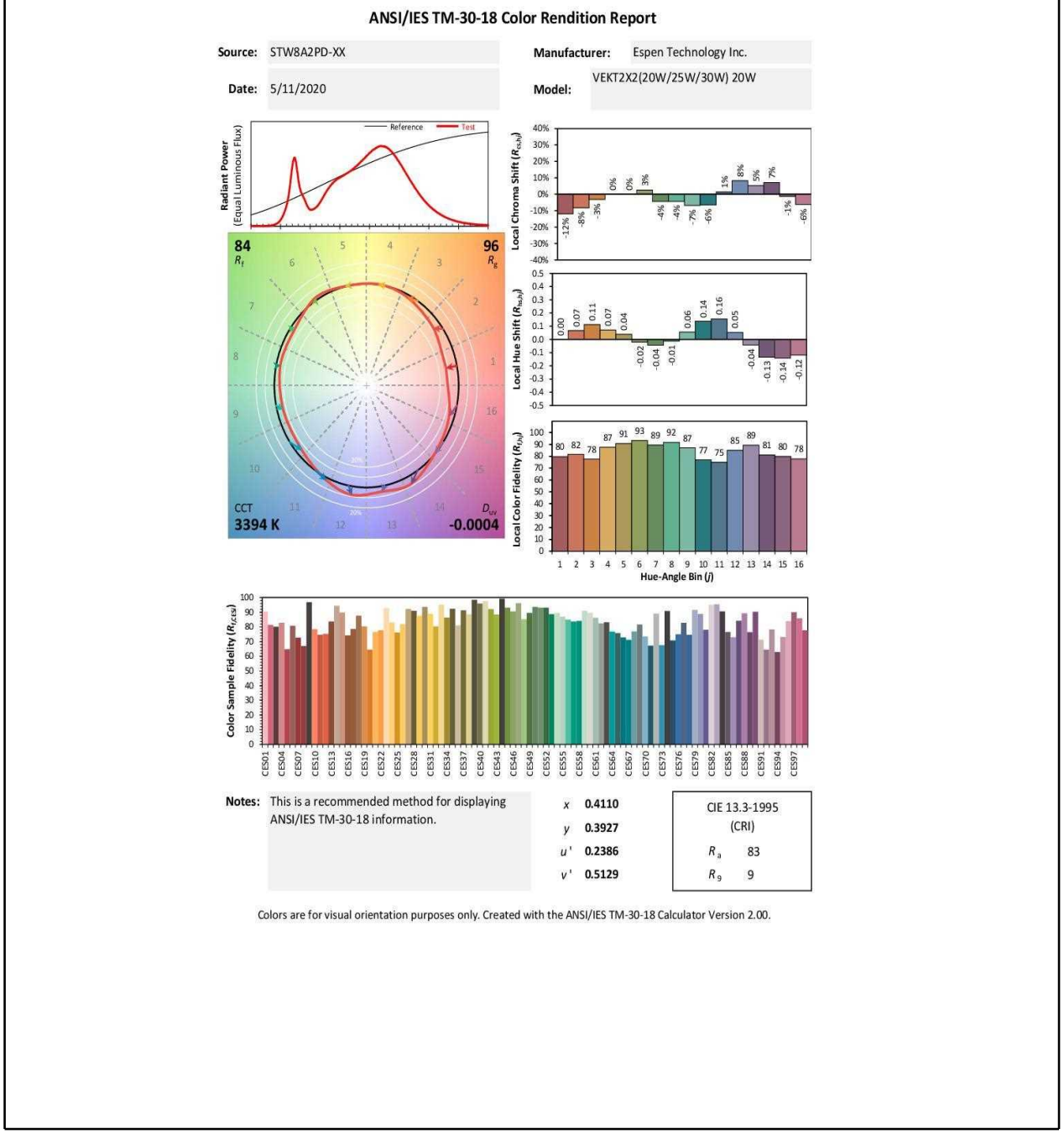




Luminous Flux (lm)	2719.88	Chrom x	0.4110
Chrom y	0.3927	Chrom u	0.2386
Chrom v	0.3419	Duv	-0.0004
Chrom u’	0.2386	Chrom v’	0.5129
CCT (K)	3394	Luminous Efficacy (lm/W)	135.86
Ra	83	R1	81.3
R2	89.9	R3	95.8
R4	80.7	R5	80.8
R6	86.2	R7	84.5
R8	61.9	R9	9.0
R10	75.7	R11	79.4
R12	62.3	R13	83.4
R14	97.9	R15	74.9
Rf	84	Rg	96
Rcs,h1	-12%		

Integrating Sphere Test (Cont'd)

TM-30 Report



Integrating Sphere Test

Model No.	VEKT2X2(20W/25W/30W)25W		Sample ID.	3033620
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

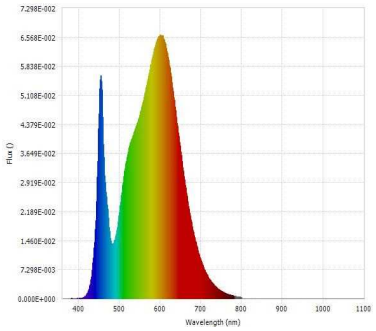
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

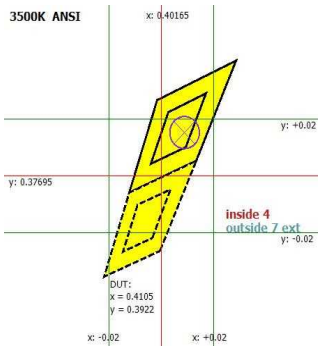
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	120	60	0.2103	25.051	0.9925	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3400	83	9.0	-0.0005	3300.51	131.75	N/A





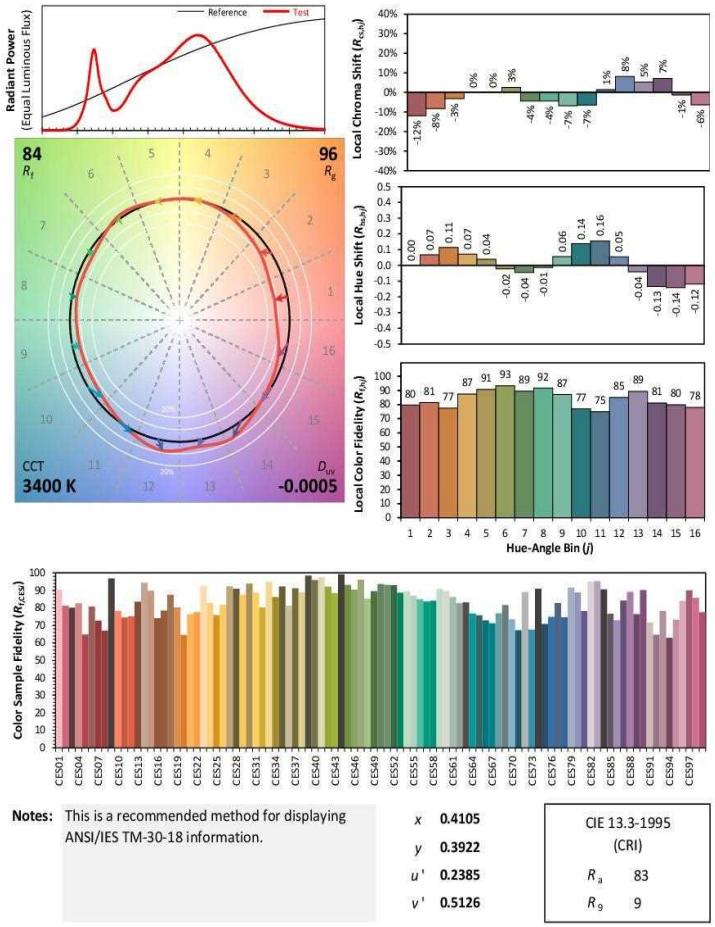
Luminous Flux (lm)	3300.51	Chrom x	0.4105
Chrom y	0.3922	Chrom u	0.2385
Chrom v	0.3418	Duv	-0.0005
Chrom u’	0.2385	Chrom v’	0.5126
CCT (K)	3400	Luminous Efficacy (lm/W)	131.75
Ra	83	R1	81.2
R2	89.9	R3	95.8
R4	80.6	R5	80.8
R6	86.2	R7	84.4
R8	61.9	R9	9.0
R10	75.7	R11	79.2
R12	62.5	R13	83.4
R14	97.8	R15	74.8
Rf	84	Rg	96
Rcs,h1	-12%		

Integrating Sphere Test (Cont'd)

TM-30 Report

ANSI/IES TM-30-18 Color Rendition Report

Source:	STW8A2PD-XX	**Manufacturer:**	Espen Technology Inc.
Date:	5/11/2020	**Model:**	VEKT2X2(20W/25W/30W) 25W



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.4105
y	0.3922
u'	0.2385
v'	0.5126

CIE 13.3-1995 (CRI)

R_a	83
R_9	9

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

Integrating Sphere Test

Model No.	VEKT2X2(20W/25W/30W) 30W		Sample ID.	3033620
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

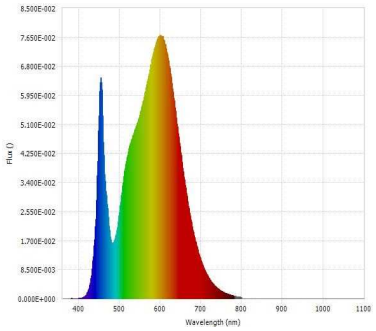
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

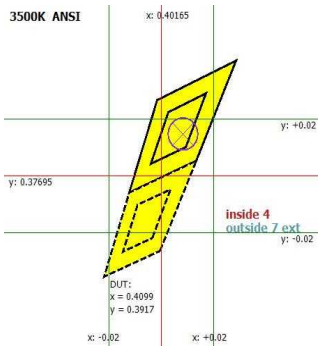
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	119.98	60	0.2526	30.103	0.9935	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3409	83	9.0	-0.0006	3842.96	127.66	N/A

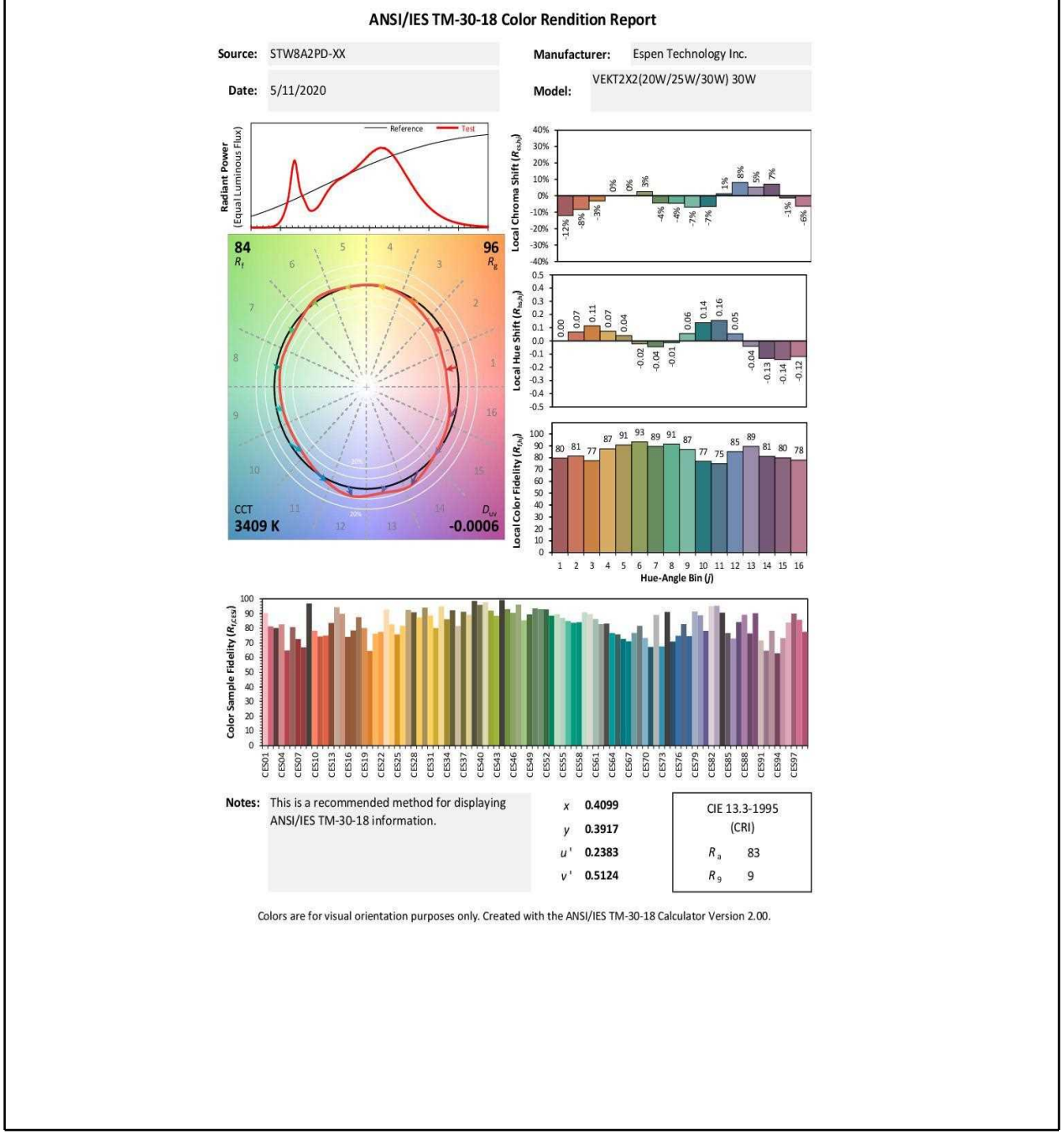




Luminous Flux (lm)	3842.96	Chrom x	0.4099
Chrom y	0.3917	Chrom u	0.2383
Chrom v	0.3416	Duv	-0.0006
Chrom u’	0.2383	Chrom v’	0.5124
CCT (K)	3409	Luminous Efficacy (lm/W)	127.66
Ra	83	R1	81.1
R2	89.9	R3	95.7
R4	80.5	R5	80.7
R6	86.1	R7	84.4
R8	61.8	R9	9.0
R10	75.7	R11	79.1
R12	62.6	R13	83.3
R14	97.8	R15	74.8
Rf	84	Rg	96
Rcs,h1	-12%		

Integrating Sphere Test (Cont'd)

TM-30 Report



Integrating Sphere Test

Model No.	VEKT2X2(20W/25W/30W) 30W		Sample ID.	3033620
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

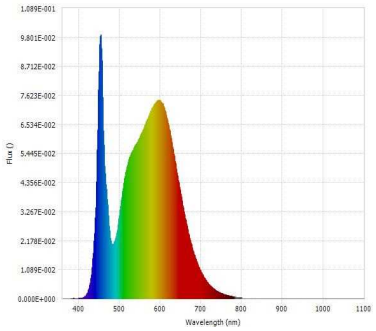
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

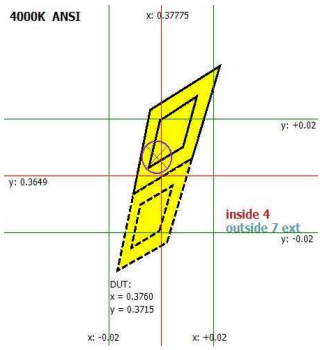
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	119.99	60	0.2449	29.19	0.9934	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
4085	84	14.0	-0.0012	4036.47	138.28	N/A





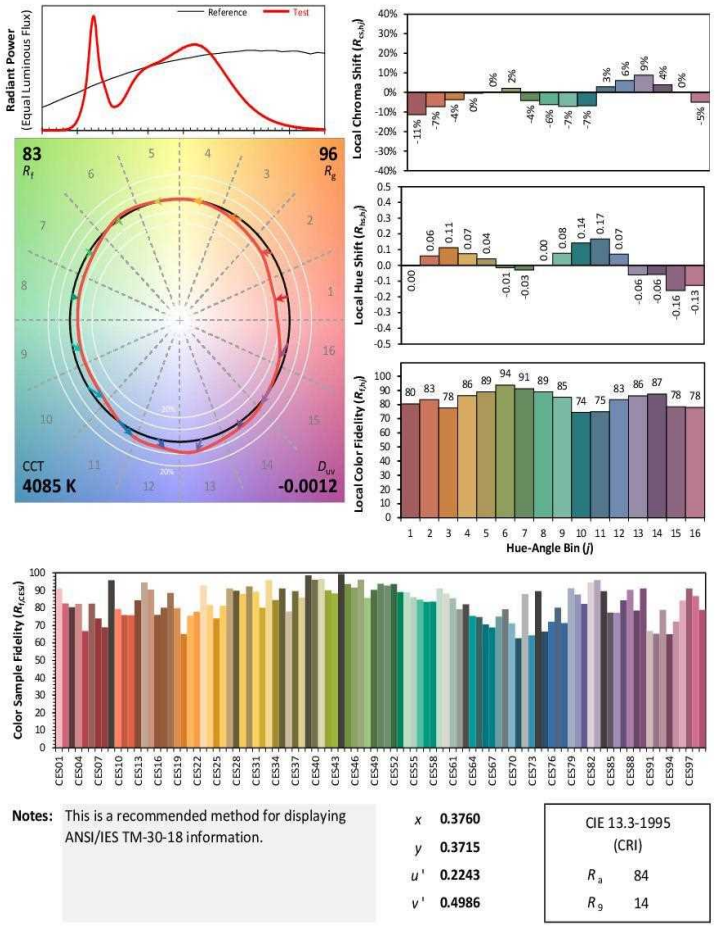
Luminous Flux (lm)	4036.47	Chrom x	0.3760
Chrom y	0.3715	Chrom u	0.2243
Chrom v	0.3324	Duv	-0.0012
Chrom u’	0.2243	Chrom v’	0.4986
CCT (K)	4085	Luminous Efficacy (lm/W)	138.28
Ra	84	R1	82.6
R2	89.7	R3	93.8
R4	82.3	R5	82.0
R6	84.6	R7	86.6
R8	66.8	R9	14.0
R10	74.4	R11	80.9
R12	58.0	R13	84.6
R14	96.6	R15	77.6
Rf	83	Rg	96
Rcs,h1	-11%		

Integrating Sphere Test (Cont'd)

TM-30 Report

ANSI/IES TM-30-18 Color Rendition Report

Source:	STW8A2PD-XX	**Manufacturer:**	Espen Technology Inc.
Date:	5/11/2020	**Model:**	VEKT2X2(20W/25W/30W) 30W



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.3760
y	0.3715
u'	0.2243
v'	0.4986

CIE 13.3-1995 (CRI)

R_a	84
R_9	14

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

Integrating Sphere Test

Model No.	VEKT2X2(20W/25W/30W)30W	Sample ID.	3033620
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

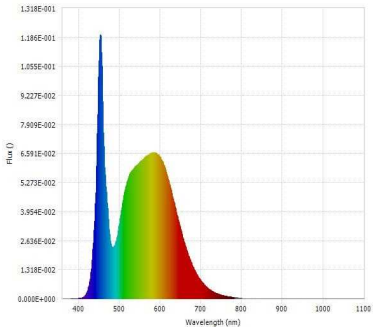
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

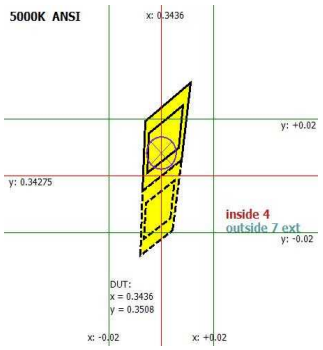
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	119.99	60	0.2528	30.134	0.9935	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
5055	83	11.0	0.0002	3945.07	130.92	N/A

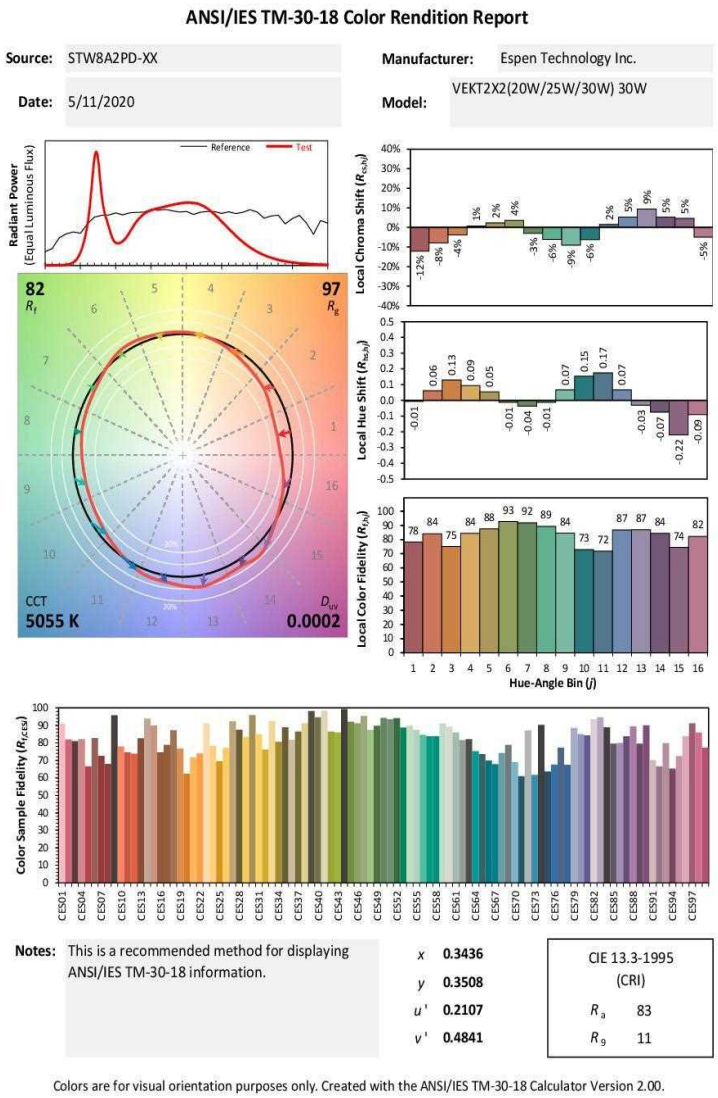




Luminous Flux (lm)	3945.07	Chrom x	0.3436
Chrom y	0.3508	Chrom u	0.2107
Chrom v	0.3227	Duv	0.0002
Chrom u’	0.2107	Chrom v’	0.4841
CCT (K)	5055	Luminous Efficacy (lm/W)	130.92
Ra	83	R1	81.8
R2	87.9	R3	90.8
R4	82.7	R5	81.9
R6	82.0	R7	86.9
R8	68.3	R9	11.0
R10	70.0	R11	81.5
R12	58.1	R13	83.5
R14	95.0	R15	77.6
Rf	82	Rg	97
Rcs,h1	-12%		

Integrating Sphere Test (Cont'd)

TM-30 Report



Goniophotometer Test

Model No.	VEKT2X2(20W/25W/30W)30W	Sample ID.	3033620
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using a type C goniophotometer and software.
3.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 reference standard lamp is rated current 3.8581A, 3.8558A, 3.8466A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
4.The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonallumen were calculated from the software taken at 1° vertical intervals and 22.5° horizontal intervals. Photometric distance was more than five times of the largest dimension of the test SSL product.

Goniophotometer Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.1	120.06	60	0.2526	30.142	0.9938	9.84%	Horizontal

Test Results

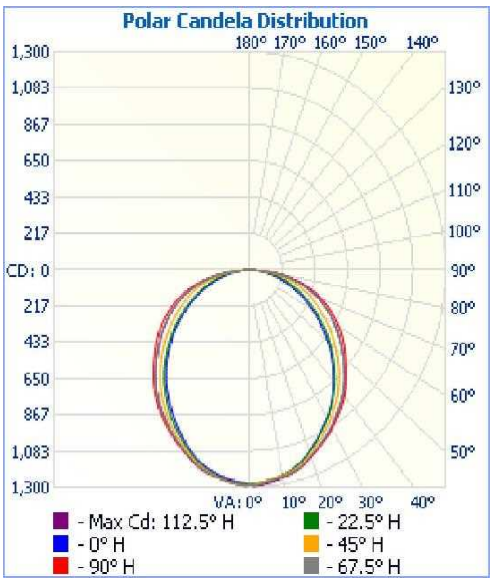
Luminous Flux (lm)	Zonal Lumen Requirement 1	Zonal Lumen Requirement 2	Beam Angle (50%)		Luminous Efficacy (lm/W)
	0°-60°	N/A	Horizontal Spread	Vertical Spread	
3779.3	75.30%	N/A	124.9	104.6	125.38

Backlight	Uplight	Glare
N/A	N/A	N/A

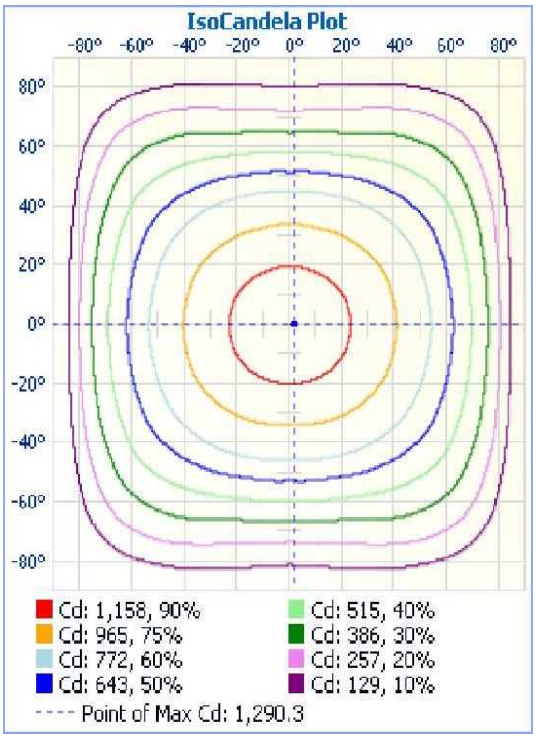
UGR		Spacing Criteria (0-180°)	Spacing Criteria (90°-270°)
Crosswise	Endwise		
N/A	N/A	1.20	1.28

Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot



Goniophotometer Test (Cont'd)

Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	979.6	25.90%
0-40	1599.8	42.30%
0-60	2847.3	75.30%
60-90	920.5	24.40%
70-100	432.9	11.50%
90-120	4.0	0.10%
0-90	3767.8	99.70%
90-180	11.5	0.30%
0-180	3779.3	100.00%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	%Total	Zone	Lumens	%Total
0-5	30.6	0.80%	90-95	1.0	0.00%
5-10	90.3	2.40%	95-100	0.8	0.00%
10-15	146.8	3.90%	100-105	0.6	0.00%
15-20	197.4	5.20%	105-110	0.5	0.00%
20-25	239.8	6.30%	110-115	0.5	0.00%
25-30	274.7	7.30%	115-120	0.5	0.00%
30-35	301.3	8.00%	120-125	0.6	0.00%
35-40	318.9	8.40%	125-130	0.7	0.00%
40-45	326.2	8.60%	130-135	0.7	0.00%
45-50	322.3	8.50%	135-140	0.8	0.00%
50-55	309.6	8.20%	140-145	0.8	0.00%
55-60	289.4	7.70%	145-150	0.8	0.00%
60-65	261.5	6.90%	150-155	0.8	0.00%
65-70	227.8	6.00%	155-160	0.7	0.00%
70-75	188.3	5.00%	160-165	0.6	0.00%
75-80	141.0	3.70%	165-170	0.5	0.00%
80-85	82.8	2.20%	170-175	0.3	0.00%
85-90	19.1	0.50%	175-180	0.1	0.00%

Goniophotometer Test (Cont'd)

Intensity Data(cd)

Candela Table - Type C																	
	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	1285	1285	1285	1285	1285	1285	1285	1285	1285	1285	1285	1285	1285	1285	1285	1285	1285
1	1278	1278	1283	1288	1290	1290	1286	1281	1276	1281	1286	1290	1290	1288	1283	1278	1278
2	1279	1276	1280	1285	1288	1290	1286	1281	1274	1281	1286	1290	1288	1285	1280	1276	1279
3	1278	1273	1276	1281	1285	1287	1285	1282	1271	1282	1285	1287	1285	1281	1276	1273	1278
4	1277	1270	1272	1275	1280	1285	1283	1278	1268	1278	1283	1285	1280	1275	1272	1270	1277
5	1274	1266	1266	1272	1275	1280	1280	1276	1265	1276	1280	1280	1275	1272	1266	1266	1274
6	1270	1262	1263	1267	1271	1277	1276	1273	1261	1273	1276	1277	1271	1267	1263	1262	1270
7	1266	1259	1258	1263	1268	1273	1272	1268	1256	1268	1272	1273	1268	1263	1258	1259	1266
8	1262	1254	1255	1260	1264	1267	1267	1262	1250	1262	1267	1267	1264	1260	1255	1254	1262
9	1256	1250	1252	1257	1261	1264	1263	1257	1248	1257	1263	1264	1261	1257	1252	1250	1256
10	1250	1244	1247	1255	1257	1258	1257	1252	1240	1252	1257	1258	1257	1255	1247	1244	1250
11	1245	1240	1244	1252	1254	1255	1250	1244	1234	1244	1250	1255	1254	1252	1244	1240	1245
12	1236	1234	1241	1248	1250	1250	1244	1238	1229	1238	1244	1250	1250	1248	1241	1234	1236
13	1229	1227	1235	1243	1247	1245	1238	1232	1222	1232	1238	1245	1247	1243	1235	1227	1229
14	1221	1220	1229	1238	1241	1240	1231	1223	1213	1223	1231	1240	1241	1238	1229	1220	1221
15	1211	1211	1222	1232	1236	1232	1223	1214	1206	1214	1223	1232	1236	1232	1222	1211	1211
16	1202	1204	1212	1224	1228	1226	1215	1205	1196	1205	1215	1226	1228	1224	1212	1204	1202
17	1192	1192	1203	1214	1220	1216	1206	1194	1188	1194	1206	1216	1220	1214	1203	1192	1192
18	1179	1181	1192	1207	1212	1208	1196	1184	1174	1184	1196	1208	1212	1207	1192	1181	1179
19	1168	1170	1182	1195	1201	1198	1184	1173	1164	1173	1184	1198	1201	1195	1182	1170	1168
20	1156	1158	1171	1184	1190	1187	1173	1162	1151	1162	1173	1187	1190	1184	1171	1158	1156
25	1089	1094	1114	1134	1143	1136	1117	1099	1084	1099	1117	1136	1143	1134	1114	1094	1089
30	1025	1027	1052	1080	1092	1084	1060	1035	1012	1035	1060	1084	1092	1080	1052	1027	1025
35	952	956	988	1023	1038	1024	993	962	941	962	993	1024	1038	1023	988	956	952
40	863	878	917	960	977	962	923	886	868	886	923	962	977	960	917	878	863
45	775	791	835	885	907	888	843	800	782	800	843	888	907	885	835	791	775
50	681	699	749	806	831	808	756	708	687	708	756	808	831	806	749	699	681
55	580	605	662	728	760	730	671	615	598	615	671	730	760	728	662	605	580
60	485	510	572	648	684	653	582	521	500	521	582	653	684	648	572	510	485
65	386	415	487	565	600	570	496	426	404	426	496	570	600	565	487	415	386
70	297	328	405	474	506	479	413	338	314	338	413	479	506	474	405	328	297
75	212	244	314	373	402	378	323	254	228	254	323	378	402	373	314	244	212
80	135	162	212	253	270	259	222	172	144	172	222	259	270	253	212	162	135
85	58	74	92	100	103	106	104	84	64	84	104	106	103	100	92	74	58
90	1	2	2	2	3	2	2	3	2	3	2	2	3	2	2	2	1
95	1	1	2	2	2	2	2	1	1	1	2	2	2	2	2	1	1
100	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1
105	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
110	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
115	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
120	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
125	1	1	1	2	2	2	1	1	1	1	1	2	2	2	1	1	1
130	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
135	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
140	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
145	2	3	3	2	3	3	3	2	2	2	3	3	3	2	3	3	2
150	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
155	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
160	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3
165	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
170	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
175	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
180	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Goniophotometer Test

Model No.	VEKT2X2(20W/25W/30W)30W	Sample ID.	3033620
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using a type C goniophotometer and software.
3.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 reference standard lamp is rated current 3.8581A, 3.8558A, 3.8466A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
4.The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonallumen were calculated from the software taken at 1° vertical intervals and 22.5° horizontal intervals. Photometric distance was more than five times of the largest dimension of the test SSL product.

Goniophotometer Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.2	119.94	60	0.2528	30.138	0.9939	9.80%	Horizontal

Test Results

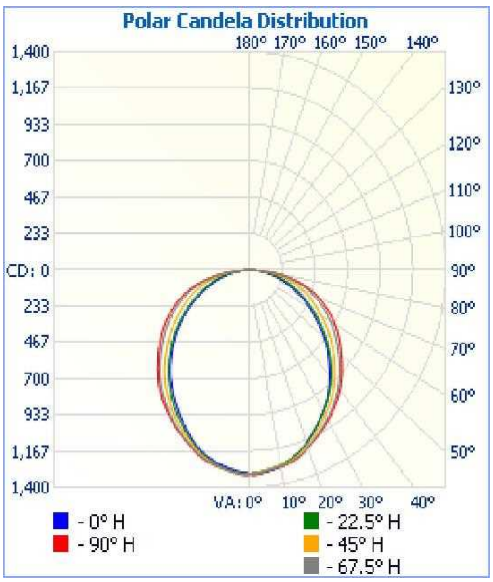
Luminous Flux (lm)	Zonal Lumen Requirement 1	Zonal Lumen Requirement 2	Beam Angle (50%)		Luminous Efficacy (lm/W)
	0°-60°	N/A	Horizontal Spread	Vertical Spread	
3880.9	75.20%	N/A	125.4	104.8	128.77

Backlight	Uplight	Glare
N/A	N/A	N/A

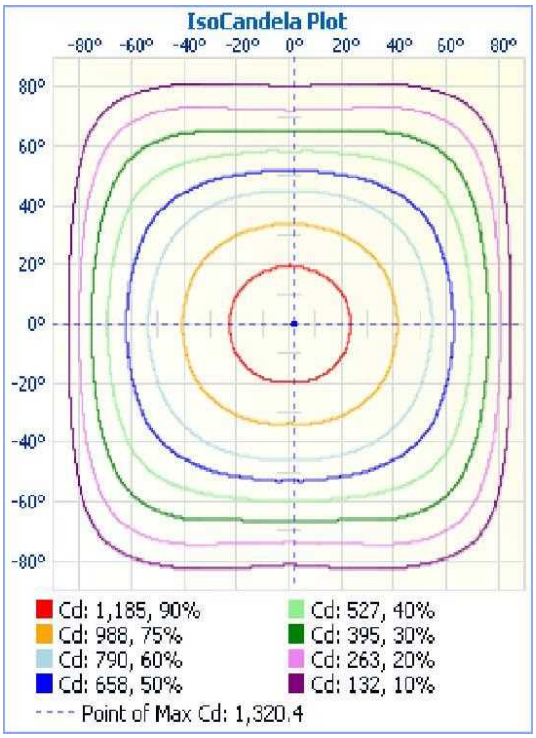
UGR		Spacing Criteria (0-180°)	Spacing Criteria (90°-270°)
Crosswise	Endwise		
N/A	N/A	1.20	1.28

Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot



Goniophotometer Test (Cont'd)

Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	1002.4	25.80%
0-40	1638.1	42.20%
0-60	2919.7	75.20%
60-90	949.5	24.50%
70-100	447.3	11.50%
90-120	4.1	0.10%
0-90	3869.2	99.70%
90-180	11.8	0.30%
0-180	3880.9	100.00%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	%Total	Zone	Lumens	%Total
0-5	31.3	0.80%	90-95	1.0	0.00%
5-10	92.4	2.40%	95-100	0.8	0.00%
10-15	150.2	3.90%	100-105	0.7	0.00%
15-20	202.0	5.20%	105-110	0.6	0.00%
20-25	245.3	6.30%	110-115	0.5	0.00%
25-30	281.2	7.20%	115-120	0.6	0.00%
30-35	308.7	8.00%	120-125	0.6	0.00%
35-40	327.0	8.40%	125-130	0.7	0.00%
40-45	334.7	8.60%	130-135	0.8	0.00%
45-50	331.0	8.50%	135-140	0.8	0.00%
50-55	318.3	8.20%	140-145	0.8	0.00%
55-60	297.6	7.70%	145-150	0.8	0.00%
60-65	269.2	6.90%	150-155	0.8	0.00%
65-70	234.8	6.00%	155-160	0.7	0.00%
70-75	194.4	5.00%	160-165	0.7	0.00%
75-80	145.7	3.80%	165-170	0.5	0.00%
80-85	85.7	2.20%	170-175	0.4	0.00%
85-90	19.6	0.50%	175-180	0.1	0.00%

Goniophotometer Test (Cont'd)

Intensity Data(cd)

Candela Table - Type C																	
	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	1315	1315	1315	1315	1315	1315	1315	1315	1315	1315	1315	1315	1315	1315	1315	1315	1315
1	1310	1309	1312	1318	1320	1320	1315	1310	1307	1310	1315	1320	1320	1318	1312	1309	1310
2	1310	1304	1309	1315	1318	1318	1315	1311	1304	1311	1315	1318	1318	1315	1309	1304	1310
3	1309	1303	1304	1310	1315	1317	1314	1309	1302	1309	1314	1317	1315	1310	1304	1303	1309
4	1308	1299	1301	1306	1310	1314	1311	1307	1298	1307	1311	1314	1310	1306	1301	1299	1308
5	1305	1295	1298	1300	1306	1309	1310	1304	1292	1304	1310	1309	1306	1300	1298	1295	1305
6	1302	1291	1292	1297	1301	1306	1305	1300	1289	1300	1305	1306	1301	1297	1292	1291	1302
7	1297	1287	1288	1292	1297	1301	1301	1296	1285	1296	1301	1301	1297	1292	1288	1287	1297
8	1292	1283	1284	1288	1294	1297	1296	1291	1280	1291	1296	1297	1294	1288	1284	1283	1292
9	1287	1279	1281	1286	1290	1292	1291	1285	1272	1285	1291	1292	1290	1286	1281	1279	1287
10	1282	1274	1277	1284	1286	1289	1285	1280	1269	1280	1285	1289	1286	1284	1277	1274	1282
11	1276	1269	1274	1280	1283	1284	1280	1273	1263	1273	1280	1284	1283	1280	1274	1269	1276
12	1266	1262	1269	1276	1279	1278	1273	1267	1255	1267	1273	1278	1279	1276	1269	1262	1266
13	1261	1256	1264	1272	1276	1274	1267	1260	1248	1260	1267	1274	1276	1272	1264	1256	1261
14	1250	1250	1258	1267	1270	1268	1259	1250	1241	1250	1259	1268	1270	1267	1258	1250	1250
15	1242	1240	1251	1261	1264	1261	1251	1240	1233	1240	1251	1261	1264	1261	1251	1240	1242
16	1231	1231	1242	1253	1257	1253	1243	1232	1222	1232	1243	1253	1257	1253	1242	1231	1231
17	1222	1220	1232	1244	1249	1244	1233	1222	1212	1222	1233	1244	1249	1244	1232	1220	1222
18	1210	1209	1221	1235	1240	1235	1222	1211	1200	1211	1222	1235	1240	1235	1221	1209	1210
19	1198	1199	1212	1224	1229	1224	1212	1198	1189	1198	1212	1224	1229	1224	1212	1199	1198
20	1187	1186	1200	1214	1218	1213	1200	1187	1176	1187	1200	1213	1218	1214	1200	1186	1187
25	1117	1121	1140	1162	1169	1161	1143	1122	1106	1122	1143	1161	1169	1162	1140	1121	1117
30	1052	1054	1080	1108	1120	1110	1084	1056	1033	1056	1084	1110	1120	1108	1080	1054	1052
35	976	982	1015	1050	1064	1049	1015	982	960	982	1015	1049	1064	1050	1015	982	976
40	886	904	943	985	1004	986	946	905	886	905	946	986	1004	985	943	904	886
45	796	814	860	909	931	911	863	818	799	818	863	911	931	909	860	814	796
50	703	720	772	829	854	829	775	725	704	725	775	829	854	829	772	720	703
55	597	625	684	749	781	751	688	630	613	630	688	751	781	749	684	625	597
60	501	526	591	668	703	670	597	533	512	533	597	670	703	668	591	526	501
65	401	429	504	583	618	586	509	436	412	436	509	586	618	583	504	429	401
70	306	340	419	490	523	495	424	345	320	345	424	495	523	490	419	340	306
75	221	254	326	386	416	390	333	260	232	260	333	390	416	386	326	254	221
80	139	167	221	263	281	269	229	176	146	176	229	269	281	263	221	167	139
85	61	77	96	103	107	110	107	87	64	87	107	110	107	103	96	77	61
90	1	2	2	2	3	3	2	3	2	3	2	3	3	2	2	2	1
95	2	1	1	2	2	2	2	1	1	1	2	2	2	2	1	1	2
100	1	1	1	1	2	2	2	1	1	1	2	2	2	1	1	1	1
105	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1
110	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
115	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
120	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
125	1	1	2	2	2	2	1	2	1	2	1	2	2	2	2	1	1
130	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
135	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
140	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
145	2	2	2	3	2	3	3	2	2	2	3	3	2	3	2	2	2
150	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
155	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
160	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
165	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
170	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
175	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
180	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

THD and PF Test

Model No.	VEKT2X2(20W/25W/30W) 20W		Sample ID.	3033620
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at 25 °C ± 1 °C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.1	119.98	60	0.1689	20.08	0.9908	12.94%	Horizontal
24.1	277.13	60	0.0799	20.41	0.9223	16.60%	Horizontal

THD and PF Test

Model No.	VEKT2X2(20W/25W/30W)25W		Sample ID.	3033620
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at 25 °C ± 1 °C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.1	119.97	60	0.2138	25.46	0.9931	10.56%	Horizontal
24.1	277.12	60	0.0982	25.77	0.9475	15.40%	Horizontal

THD and PF Test

Model No.	VEKT2X2(20W/25W/30W)30W		Sample ID.	3033620
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at 25 °C ± 1 °C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.1	120.06	60	0.2526	30.14	0.9938	9.84%	Horizontal
24.1	277.10	60	0.1145	30.55	0.9637	13.77%	Horizontal

THD and PF Test

Model No.	VEKT2X2(20W/25W/30W) 30W		Sample ID.	3033620
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at 25 °C ± 1 °C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.1	119.94	60	0.2473	29.33	0.9887	10.11%	Horizontal
24.1	277.07	60	0.1123	29.65	0.9533	9.98%	Horizontal

THD and PF Test

Model No.	VEKT2X2(20W/25W/30W)30W		Sample ID.	3033620
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at 25 °C ± 1 °C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.1	119.94	60	0.2528	30.13	0.9939	9.80%	Horizontal
24.1	277.07	60	0.1144	30.51	0.9627	9.15%	Horizontal

In-Situ Temperature Measurement Test

Model No.	VEKT2X2(20W/25W/30W)30W	Sample ID.	3033620

Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL 1598-2008, Section 14.
2. The testing was conducted in a room with ambient temperature of 25 °C ± 5 °C. The apparatus construction followed those described in UL1598-2008 for normal temperature testing. Thermocouples were placed on the LED package in the locations indicated by LM-80 report. Thermocouples were placed on the LED driver case in the locations specified by the manufacture if necessary. The temperature was recorded after the lamp was operated by 7.5 hours.
3.The data and photos in LM-80 test report is provided by the customer/ The data and photos in driver specification is provided by the customer.

In-Situ Temperature Measurement Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.3	120.06	60	0.2526	30.142	0.9938	9.84%	Horizontal

Test Results (LEDs)

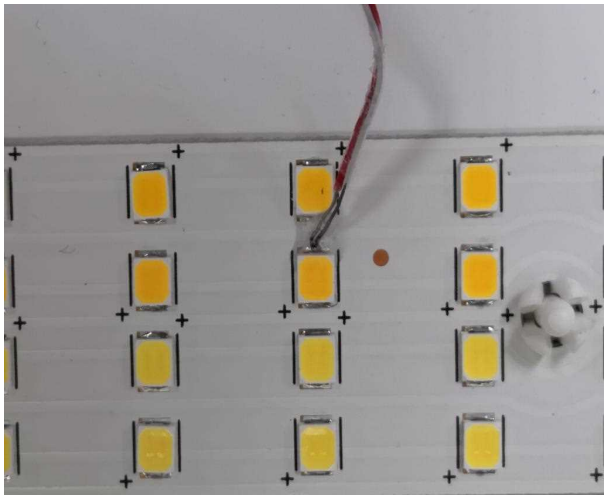
Thermocouple Location	Declared Light Source Current (mA)	Temperature for Light Source (°C)		Max Chromaticity Shift （1000-6000h)	LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp (°C)
		Test Result	Test Result (Correct to 25 °C)				
Ambient TEMP	N/A	24.3	25.0				
TMP of Location 1	110	48.6	49.3	0.0024	STW8A2PD-XX	200	105

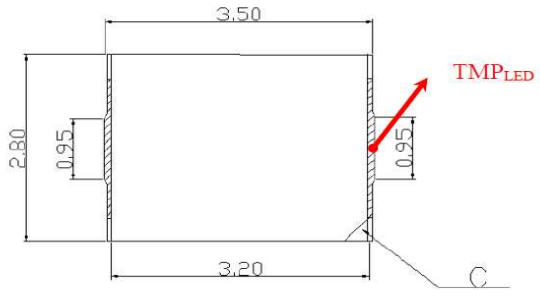
Test Results (Drivers)

Thermocouple Location	Temperature for Driver (°C)		Driver Model Number	Driver Limit Temp (°C)
	Test Result	Test Result (Correct to 25 °C)		
Ambient TEMP	24.3	25.0		
TMP of Location 1	37.8	38.5	VEL46090MVHDA-MD-99	90

In-Situ Temperature Measurement Test (Cont'd)

Test Photos for Ts Point of Light Sources & Tc Point of Drivers





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