DesignLights Consortium Test Report

Reference Standards

UL1598-2008

ANSI C82.77-10-2014

IES LM-79-2008

Prepared For

Espen Technology Inc.

12257 Florence Ave., Santa Fe Springs, CA, 90650, United States

Eric Yu,562.529.2938,eric@espentech.com

Test Laboratory:

UL-CCIC Company Limited

Test Laboratory Address:

No.2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, China

Catalog Number

VEKT-DP1X4(18W/22W/25W)

Project Number

4790736618

Report Number

4790736618_5

Test Date

2022-05-10~2022-05-13

Issue Date

2023-02-28

Revision Date

N/A

Prepared By	**Approved By**
Zhao, Elaine	Zhou, Maxine

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**	≥1500	-10%	2263.07
Minimum Luminaire Efficacy (lm/W)-Luminaires	**IES LM-79-2008**	≥110	-3%	125.22
Spacing Criteria (0-180°)	**IES LM-79-2008**	1.0-2.0	±0.1	1.28
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%	78.50%
Allowable CCT (3500K)	**IES LM-79-2008/ANSI C78.377-2015**	3465±245	N/A	3356
Allowable CCT (4000K)	**IES LM-79-2008/ANSI C78.377-2015**	3985±275	N/A	4091
Allowable CCT (5000K)	**IES LM-79-2008/ANSI C78.377-2015**	5029±283	N/A	4861
Allowable CCT (3500K)	**IES LM-79-2008/ANSI C78.377-2015**	3465±245	N/A	3356
Allowable CCT (3500K)	**IES LM-79-2008/ANSI C78.377-2015**	3465±245	N/A	3354
Minimum CRI	**IES LM-79-2008/CIE 13.3-1995**	≥80	-1	84
Minimum R9	**IES LM-79-2008**	≥0	-1	44.0
Minimum Rg	**IES LM-79-2008**	≥89	-1	99
Minimum Rf	**IES LM-79-2008**	≥70	-1	81
Rcs,h1	**IES LM-79-2008**	-12%-23%	-1%	-7%
Unified Glare Rating (UGR)	**IES LM-79-2008**	≤22	N/A	21.9
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	0.9185
Total Harmonic Distortion (A%)	**ANSI C82.77-10-2014**	≤20%	5%	13.27%
In-Situ Temperature Measurement Test for LED 1 (°C)	**UL1598-2008**	≤105	N/A	38.3
In-Situ Temperature Measurement Test for Driver 1 (°C)	**UL1598-2008**	≤90	N/A	55.0
Max Chromaticity Shift (1000-6000h)	**N/A**	≤0.004	0.0004	0.0023
Minimum Luminaire Warranty (Years)	**N/A**	≥5	N/A	≥5

Test List

Sample Received Date: 2022-05-05

Test Item	Test Date	Model Number	Tests Conducted By
Integrating Sphere Test	2022-05-11	VEKT-DP1X4(18W/22W/25W) 25W 3500K	Yang, Gavin X
Integrating Sphere Test	2022-05-11	VEKT-DP1X4(18W/22W/25W) 25W 4000K	Yang, Gavin X
Integrating Sphere Test	2022-05-11	VEKT-DP1X4(18W/22W/25W) 25W 5000K	Yang, Gavin X
Integrating Sphere Test	2022-05-11	VEKT-DP1X4(18W/22W/25W) 22W 3500K	Yang, Gavin X
Integrating Sphere Test	2022-05-11	VEKT-DP1X4(18W/22W/25W) 18W 3500K	Yang, Gavin X
Goniophotometer Test	2022-05-10	VEKT-DP1X4(18W/22W/25W) 25W 3500K	Yang, Gavin X
Goniophotometer Test	2022-05-10	VEKT-DP1X4(18W/22W/25W) 25W 5000K	Yang, Gavin X
THD and PF Test	2022-05-10	VEKT-DP1X4(18W/22W/25W) 25W 3500K	Yang, Gavin X
THD and PF Test	2022-05-10	VEKT-DP1X4(18W/22W/25W) 25W 4000K	Yang, Gavin X
THD and PF Test	2022-05-10	VEKT-DP1X4(18W/22W/25W) 25W 5000K	Yang, Gavin X
THD and PF Test	2022-05-10	VEKT-DP1X4(18W/22W/25W) 22W 3500K	Yang, Gavin X
THD and PF Test	2022-05-10	VEKT-DP1X4(18W/22W/25W) 18W 3500K	Yang, Gavin X
In-Situ Temperature Measurement Test	2022-05-13	VEKT-DP1X4(18W/22W/25W) 25W 3500K	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 4790343548_59 issued on 2022-05-18.

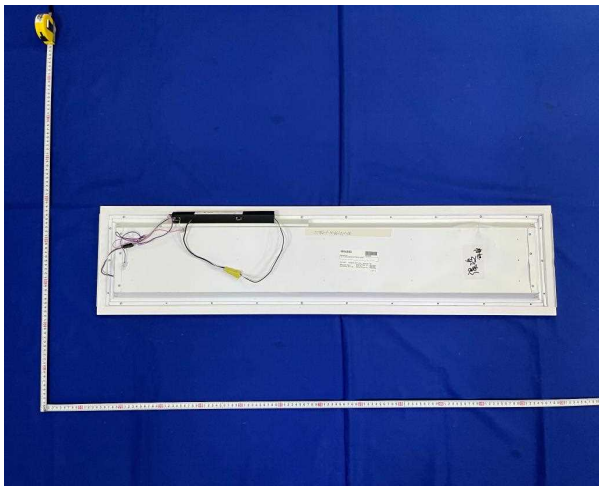
Product Description

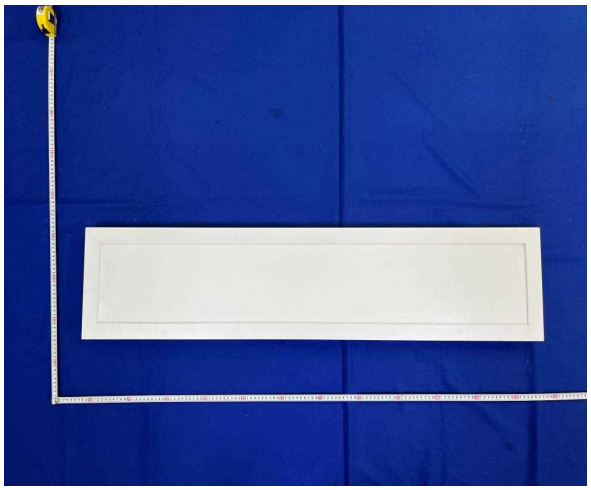
Lamp/Luminaire Description: Integrated Retrofit Kits for 1x4 Luminaires
Model Number: VEKT-DP1X4(18W/22W/25W)
Electrical Parameter: 120-277V, 50/60Hz
LED Package: P2835Y-WXXXXXXXXXXXXX-XXXX
Dimming Information: Continuous dimming capability
Remark: Housing model:GT8 2 32 A12 MVOLT GEB10IS

Products Scaled Value

Model Number	CCT	Luminous Flux	Power	Luminous Efficacy
VEKT-DP1X4(18W/22W/25W)	3500k	3125	25	125
VEKT-DP1X4(18W/22W/25W)	4000k	3150	25	126
VEKT-DP1X4(18W/22W/25W)	5000k	3175	25	127

Photos of Products Characteristics





Integrating Sphere Test

Model No.	VEKT-DP1X4(18W/22W/25W) 25W 3500K		Sample ID.	4924899
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

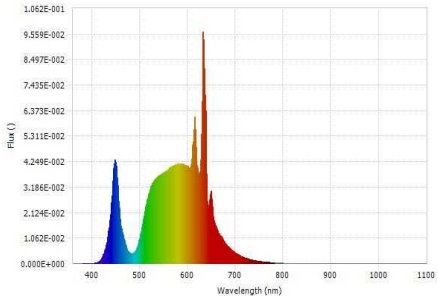
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. 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.

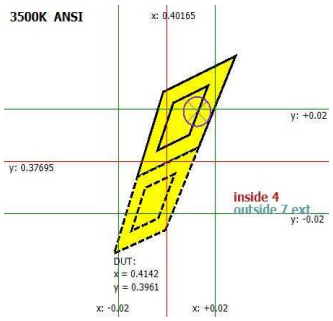
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.8	119.96	60	0.2102	24.902	0.9876	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3356	84	44.0	0.0005	3126.6	125.56	N/A





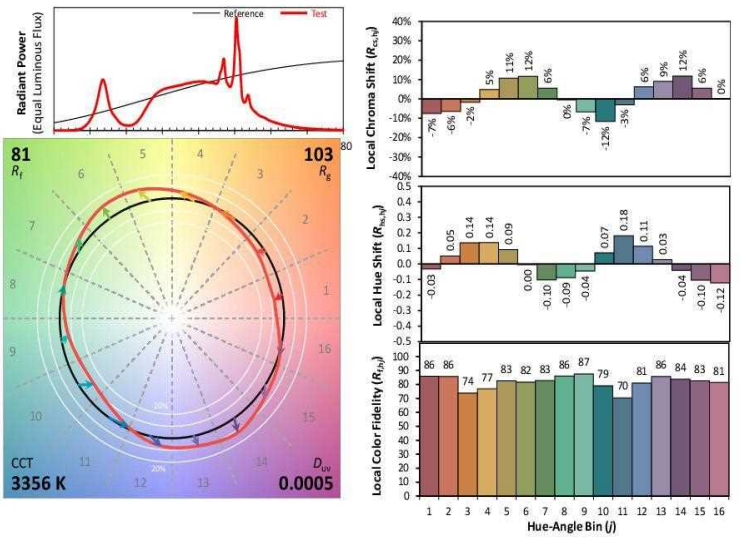
Luminous Flux (lm)	3126.6	Chrom x	0.4142
Chrom y	0.3961	Chrom u	0.2392
Chrom v	0.3432	Duv	0.0005
Chrom u’	0.2392	Chrom v’	0.5148
CCT (K)	3356	Luminous Efficacy (lm/W)	125.56
Ra	84	R1	86.0
R2	86.0	R3	83.0
R4	85.0	R5	83.0
R6	80.0	R7	88.0
R8	79.0	R9	44.0
R10	63.0	R11	85.0
R12	55.0	R13	85.0
R14	89.0	R15	83.0
Rf	81	Rg	103
Rcs,h1	-7%		

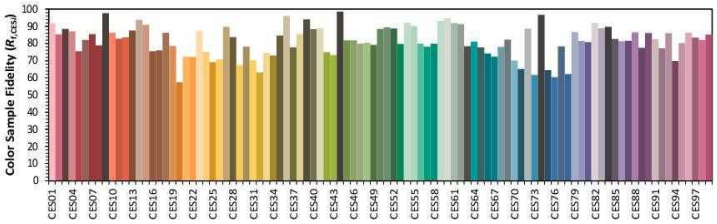
Integrating Sphere Test (Cont'd)

TM-30 Report

ANSI/IES TM-30-18 Color Rendition Report

Source:	P2835Y-WXXXXXXXXXXXX-XXXX	**Manufacturer:**	Espen Technology Inc.
Date:	5/11/2022	**Model:**	VEKT-DP1X4(18W/22W/25W) 25W 3500K





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

x	0.4142
y	0.3961
u'	0.2392
v'	0.5148

CIE 13.3-1995 (CRI)

R_a	84
R_9	44

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

Integrating Sphere Test

Model No.	VEKT-DP1X4(18W/22W/25W) 25W 4000K	Sample ID.	4924899
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

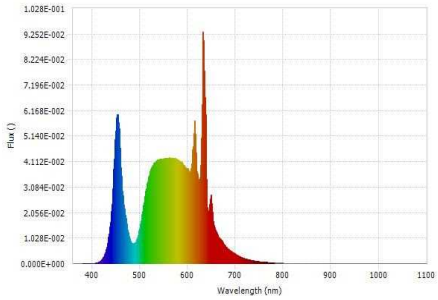
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. 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.

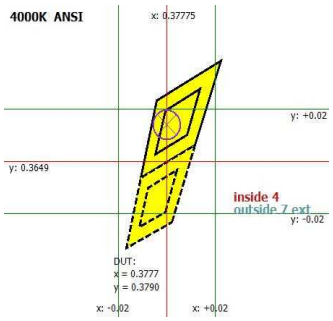
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.8	119.93	60	0.2033	24.077	0.9877	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
4091	86	53.0	0.0018	3320.43	137.91	N/A





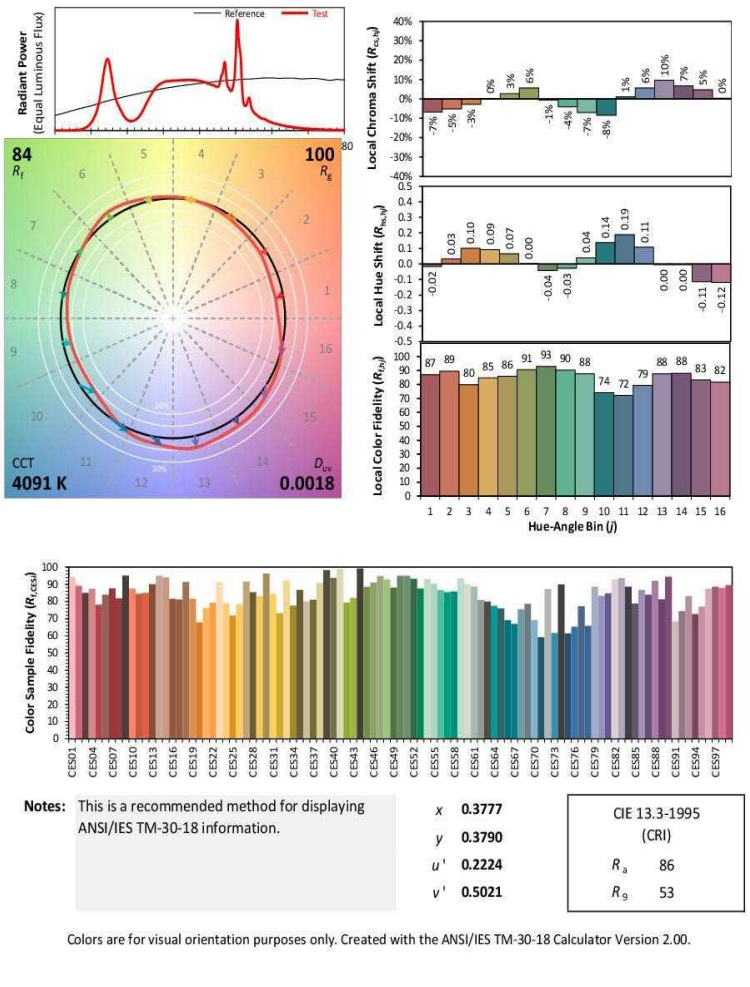
Luminous Flux (lm)	3320.43	Chrom x	0.3777
Chrom y	0.3790	Chrom u	0.2224
Chrom v	0.3348	Duv	0.0018
Chrom u’	0.2224	Chrom v’	0.5021
CCT (K)	4091	Luminous Efficacy (lm/W)	137.91
Ra	86	R1	87.0
R2	87.0	R3	84.0
R4	87.0	R5	85.0
R6	81.0	R7	92.0
R8	84.0	R9	53.0
R10	66.0	R11	85.0
R12	50.0	R13	87.0
R14	90.0	R15	86.0
Rf	84	Rg	100
Rcs,h1	-7%		

Integrating Sphere Test (Cont'd)

TM-30 Report

ANSI/IES TM-30-18 Color Rendition Report

Source:	P2835Y-WXXXXXXXXXXXX-XXXX	**Manufacturer:**	Espen Technology Inc.
Date:	5/11/2022	**Model:**	VEKT-DP1X4(18W/22W/25W) 25W 4000K



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

x	0.3777
y	0.3790
u'	0.2224
v'	0.5021

CIE 13.3-1995 (CRI)

R_a	86
R_9	53

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

Integrating Sphere Test

Model No.	VEKT-DP1X4(18W/22W/25W) 25W 5000K	Sample ID.	4924899
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

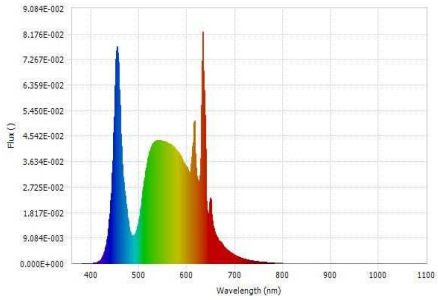
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. 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.

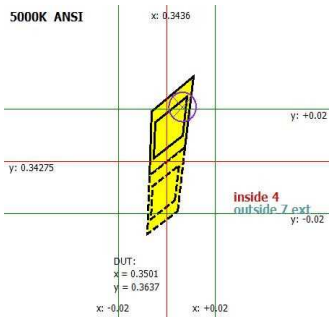
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.8	119.92	60	0.2089	24.744	0.9878	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
4861	85	49.0	0.0040	3181.97	128.60	N/A





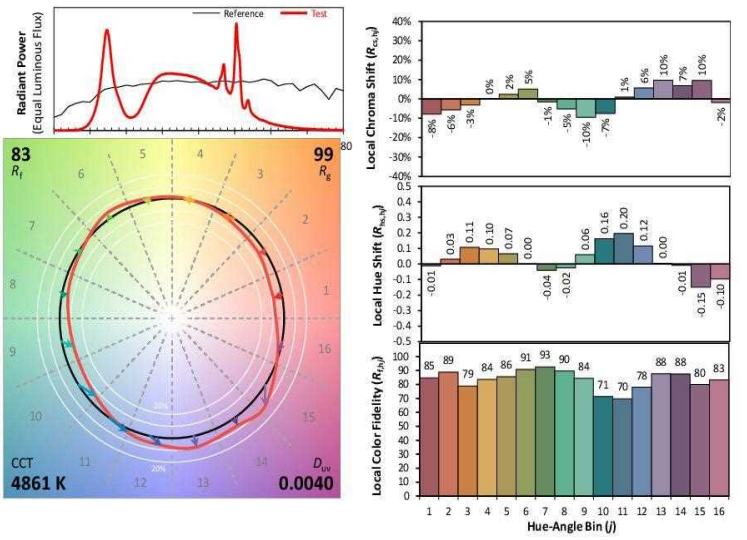
Luminous Flux (lm)	3181.97	Chrom x	0.3501
Chrom y	0.3637	Chrom u	0.2102
Chrom v	0.3274	Duv	0.0040
Chrom u’	0.2102	Chrom v’	0.4912
CCT (K)	4861	Luminous Efficacy (lm/W)	128.60
Ra	85	R1	85.0
R2	86.0	R3	83.0
R4	86.0	R5	83.0
R6	79.0	R7	93.0
R8	84.0	R9	49.0
R10	63.0	R11	82.0
R12	45.0	R13	85.0
R14	90.0	R15	84.0
Rf	83	Rg	99
Rcs,h1	-8%		

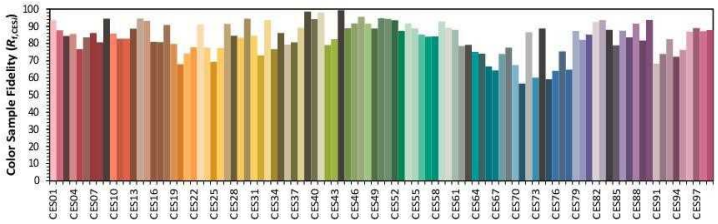
Integrating Sphere Test (Cont'd)

TM-30 Report

ANSI/IES TM-30-18 Color Rendition Report

Source:	P2835Y-WXXXXXXXXXXXX-XXXX	**Manufacturer:**	Espen Technology Inc.
Date:	5/11/2022	**Model:**	VEKT-DP1X4(18W/22W/25W) 25W 5000K





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

x	0.3501
y	0.3637
u'	0.2102
v'	0.4912

CIE 13.3-1995 (CRI)

R_a	85
R_9	49

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Integrating Sphere Test

Model No.	VEKT-DP1X4(18W/22W/25W) 22W 3500K		Sample ID.	4924899
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

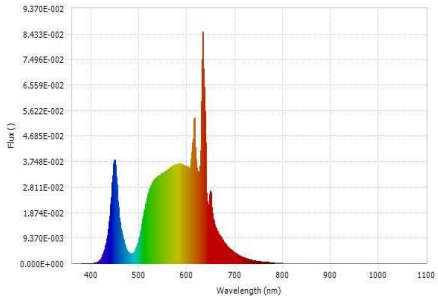
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. 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.

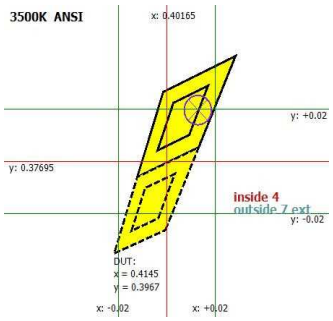
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.8	119.97	60	0.1820	21.496	0.9844	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3356	84	45.0	0.0007	2752.41	128.04	N/A





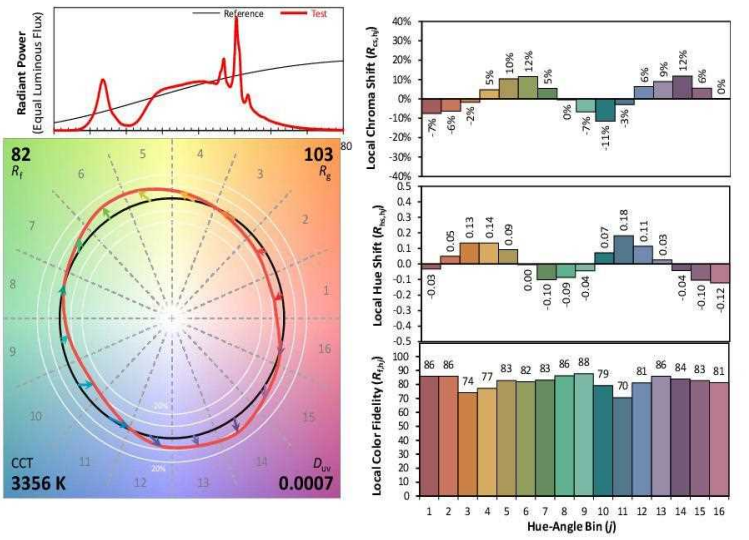
Luminous Flux (lm)	2752.41	Chrom x	0.4145
Chrom y	0.3967	Chrom u	0.2392
Chrom v	0.3434	Duv	0.0007
Chrom u’	0.2392	Chrom v’	0.5151
CCT (K)	3356	Luminous Efficacy (lm/W)	128.04
Ra	84	R1	86.0
R2	86.0	R3	83.0
R4	86.0	R5	83.0
R6	80.0	R7	88.0
R8	79.0	R9	45.0
R10	63.0	R11	85.0
R12	55.0	R13	85.0
R14	89.0	R15	83.0
Rf	82	Rg	103
Rcs,h1	-7%		

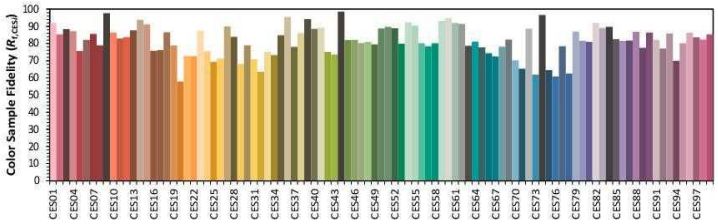
Integrating Sphere Test (Cont'd)

TM-30 Report

ANSI/IES TM-30-18 Color Rendition Report

Source:	P2835Y-WXXXXXXXXXXXX-XXXX	**Manufacturer:**	Espen Technology Inc.
Date:	5/11/2022	**Model:**	VEKT-DP1X4(18W/22W/25W) 22W 3500K





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

x	0.4145
y	0.3967
u'	0.2392
v'	0.5151

CIE 13.3-1995 (CRI)

R_a	84
R_9	45

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

Integrating Sphere Test

Model No.	VEKT-DP1X4(18W/22W/25W) 18W 3500K	Sample ID.	4924899
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

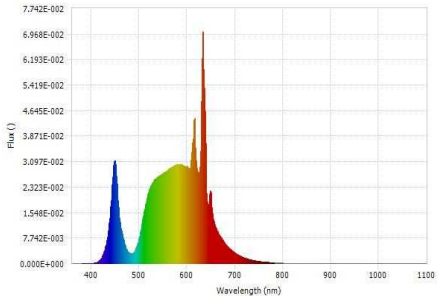
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. 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.

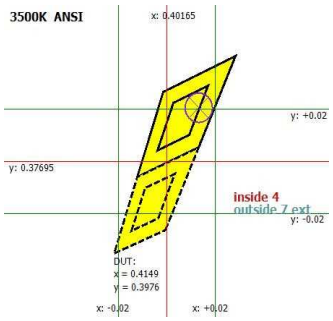
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.8	120	60	0.1473	17.282	0.9778	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3354	84	45.0	0.0010	2263.07	130.95	N/A





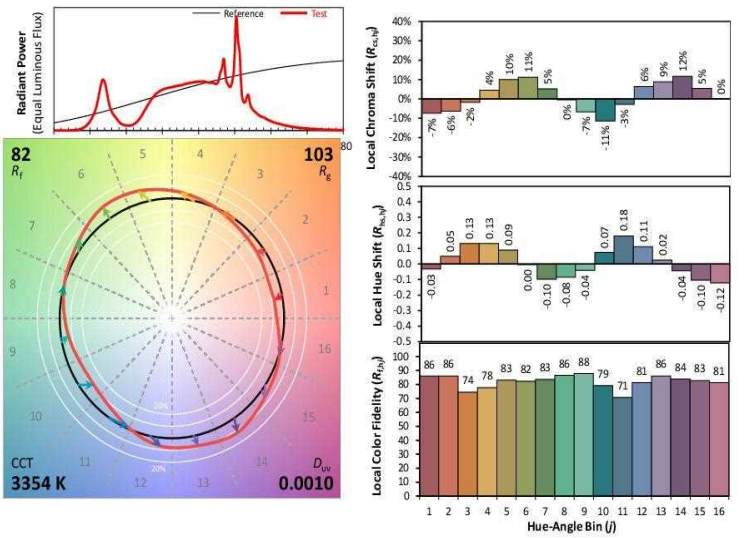
Luminous Flux (lm)	2263.07	Chrom x	0.4149
Chrom y	0.3976	Chrom u	0.2391
Chrom v	0.3437	Duv	0.0010
Chrom u’	0.2391	Chrom v’	0.5155
CCT (K)	3354	Luminous Efficacy (lm/W)	130.95
Ra	84	R1	86.0
R2	86.0	R3	83.0
R4	86.0	R5	83.0
R6	80.0	R7	89.0
R8	80.0	R9	45.0
R10	64.0	R11	85.0
R12	54.0	R13	85.0
R14	89.0	R15	83.0
Rf	82	Rg	103
Rcs,h1	-7%		

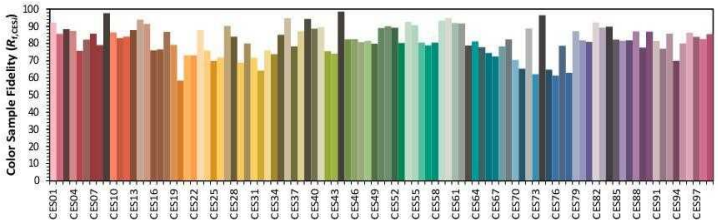
Integrating Sphere Test (Cont'd)

TM-30 Report

ANSI/IES TM-30-18 Color Rendition Report

Source:	P2835Y-WXXXXXXXXXXXX-XXXX	**Manufacturer:**	Espen Technology Inc.
Date:	5/11/2022	**Model:**	VEKT-DP1X4(18W/22W/25W) 18W 3500K





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

x	0.4149
y	0.3976
u'	0.2391
v'	0.5155

CIE 13.3-1995 (CRI)

R_a	84
R_9	45

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

Goniophotometer Test

Model No.	VEKT-DP1X4(18W/22W/25W) 25W 3500K	Sample ID.	4924899
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
24.7	120.04	60	0.2100	24.953	0.9898	10.57%	Horizontal

Test Results

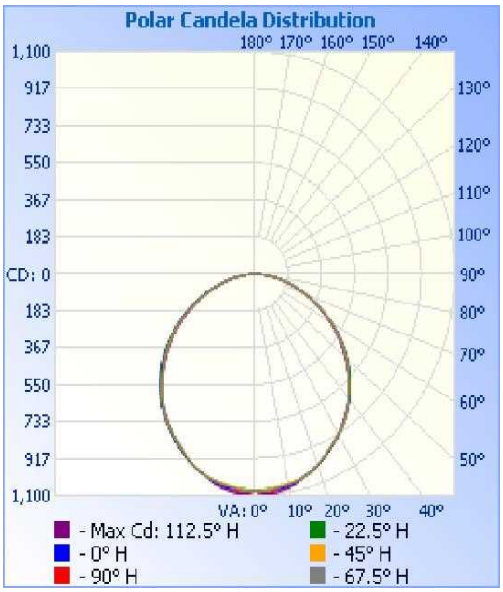
Luminous Flux (lm)	Zonal Lumen Requirement 1	Zonal Lumen Requirement 2	Beam Angle (50%)		Luminous Efficacy (lm/W)
	0°-60°	N/A	Horizontal Spread	Vertical Spread	
3124.7	78.50%	N/A	111.8	113.6	125.22

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

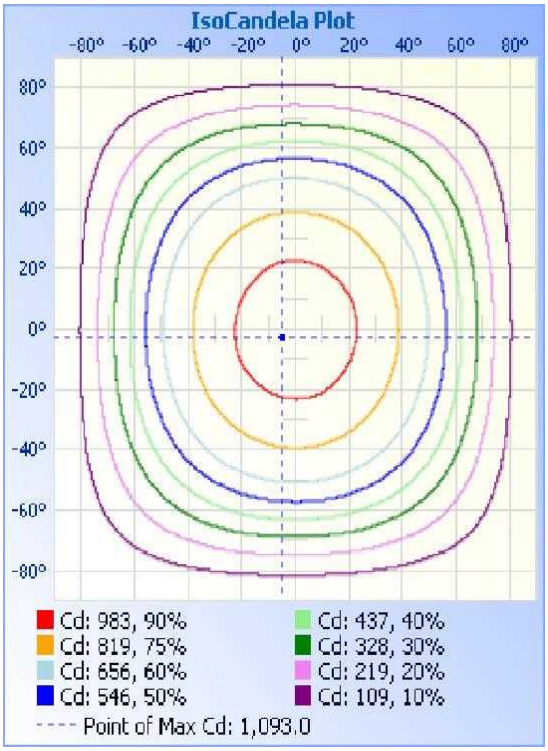
UGR		Spacing Criteria (0-180°)	Spacing Criteria (90°-270°)
Crosswise	Endwise		
21.9	21.5	1.28	1.28

Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot



Goniophotometer Test (Cont'd)

Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	840.7	26.90%
0-40	1381.0	44.20%
0-60	2453.6	78.50%
60-90	662.0	21.20%
70-100	280.2	9.00%
90-120	2.9	0.10%
0-90	3115.6	99.70%
90-180	9.1	0.30%
0-180	3124.7	100.00%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	%Total	Zone	Lumens	%Total
0-5	25.8	0.80%	90-95	0.7	0.00%
5-10	76.7	2.50%	95-100	0.6	0.00%
10-15	125.0	4.00%	100-105	0.5	0.00%
15-20	168.8	5.40%	105-110	0.4	0.00%
20-25	206.5	6.60%	110-115	0.4	0.00%
25-30	237.8	7.60%	115-120	0.4	0.00%
30-35	262.4	8.40%	120-125	0.5	0.00%
35-40	277.9	8.90%	125-130	0.5	0.00%
40-45	283.4	9.10%	130-135	0.6	0.00%
45-50	279.6	8.90%	135-140	0.6	0.00%
50-55	266.4	8.50%	140-145	0.7	0.00%
55-60	243.3	7.80%	145-150	0.6	0.00%
60-65	211.0	6.80%	150-155	0.6	0.00%
65-70	172.1	5.50%	155-160	0.6	0.00%
70-75	130.4	4.20%	160-165	0.5	0.00%
75-80	88.3	2.80%	165-170	0.5	0.00%
80-85	47.3	1.50%	170-175	0.3	0.00%
85-90	12.9	0.40%	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	1077	1077	1077	1077	1077	1077	1077	1077	1077	1077	1077	1077	1077	1077	1077	1077	1077
1	1074	1073	1077	1083	1086	1082	1078	1075	1075	1073	1076	1082	1086	1081	1076	1075	1074
2	1074	1071	1075	1083	1089	1087	1083	1079	1076	1071	1075	1081	1089	1086	1082	1079	1074
3	1075	1070	1072	1080	1089	1090	1086	1082	1075	1069	1073	1079	1089	1089	1086	1081	1075
4	1074	1068	1070	1079	1088	1093	1089	1083	1075	1068	1070	1078	1087	1091	1089	1083	1074
5	1075	1067	1066	1075	1086	1093	1090	1084	1074	1066	1066	1074	1084	1093	1090	1084	1075
6	1074	1065	1062	1071	1082	1093	1091	1084	1072	1064	1062	1070	1082	1091	1090	1084	1074
7	1073	1064	1060	1067	1078	1089	1090	1083	1073	1063	1058	1066	1079	1088	1090	1082	1073
8	1071	1063	1057	1063	1078	1085	1088	1079	1071	1061	1056	1062	1074	1085	1085	1080	1071
9	1069	1062	1055	1061	1073	1082	1083	1078	1068	1060	1053	1059	1070	1080	1082	1077	1069
10	1066	1060	1054	1058	1070	1077	1080	1074	1065	1057	1052	1056	1066	1074	1077	1073	1066
11	1063	1057	1053	1056	1067	1071	1073	1069	1062	1055	1049	1053	1064	1070	1071	1069	1063
12	1059	1054	1051	1053	1061	1065	1066	1062	1058	1051	1048	1050	1058	1062	1065	1063	1059
13	1053	1050	1050	1051	1056	1057	1058	1056	1051	1048	1046	1046	1053	1055	1058	1056	1053
14	1047	1045	1047	1047	1049	1049	1050	1049	1046	1044	1044	1043	1047	1048	1049	1049	1047
15	1040	1040	1044	1043	1043	1043	1042	1041	1040	1038	1041	1040	1040	1040	1041	1042	1040
16	1035	1035	1038	1039	1038	1036	1034	1034	1034	1032	1035	1037	1035	1033	1032	1035	1035
17	1028	1029	1032	1034	1034	1030	1026	1027	1028	1027	1029	1031	1029	1024	1024	1027	1028
18	1023	1024	1025	1028	1027	1023	1019	1020	1020	1021	1022	1024	1023	1018	1016	1020	1023
19	1017	1018	1019	1019	1021	1015	1012	1012	1014	1012	1012	1017	1016	1011	1010	1012	1017
20	1009	1012	1009	1011	1013	1009	1003	1004	1008	1005	1004	1007	1009	1006	1003	1003	1009
25	968	966	962	960	964	966	965	965	965	962	958	954	958	961	962	966	968
30	922	922	918	917	918	919	920	921	919	916	911	908	911	912	916	921	922
35	871	871	870	867	864	863	864	866	867	864	861	858	858	858	862	867	871
40	808	807	802	801	802	804	804	805	806	801	795	791	793	795	798	804	808
45	739	739	731	728	729	731	736	739	739	731	721	718	717	719	728	735	739
50	665	667	660	656	651	651	655	662	662	657	648	644	640	640	647	657	665
55	584	583	578	572	568	568	571	577	578	577	567	560	559	560	565	574	584
60	491	492	486	483	479	480	484	488	488	484	478	471	466	470	478	488	491
65	394	397	393	390	386	386	391	395	394	389	381	377	374	374	381	391	394
70	302	303	298	296	293	295	299	302	300	297	288	283	282	283	288	295	302
75	215	212	211	208	208	208	209	212	212	208	202	197	195	199	203	209	215
80	130	132	129	126	125	125	126	130	129	125	118	116	114	116	120	128	130
85	57	56	54	54	54	54	54	55	55	51	47	45	46	45	47	52	57
90	2	3	2	2	3	3	3	3	2	1	2	1	2	2	1	1	2
95	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1
100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
105	1	0	1	1	1	1	1	1	1	0	0	1	1	0	1	1	1
110	0	1	1	0	1	1	0	1	1	0	0	1	1	1	1	1	0
115	1	1	0	1	1	0	1	1	1	1	1	0	0	0	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	1	1	1	1	2	2	1	1	1	1	1	1	1	1
130	1	2	2	2	1	2	1	1	1	1	2	1	1	2	1	1	1
135	1	2	1	2	2	2	2	2	2	1	2	2	2	2	1	2	1
140	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
145	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
150	2	2	2	2	2	3	2	2	2	2	3	2	3	3	3	3	2
155	2	2	3	3	3	2	3	2	3	3	2	3	2	2	3	3	2
160	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
165	4	4	4	3	3	4	4	4	4	4	4	3	3	3	4	3	4
170	4	4	4	5	4	4	4	4	4	4	4	4	5	4	4	4	4
175	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
180	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Goniophotometer Test

Model No.	VEKT-DP1X4(18W/22W/25W) 25W 5000K	Sample ID.	4924899
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
24.7	120.03	60	0.2088	24.806	0.9898	10.52%	Horizontal

Test Results

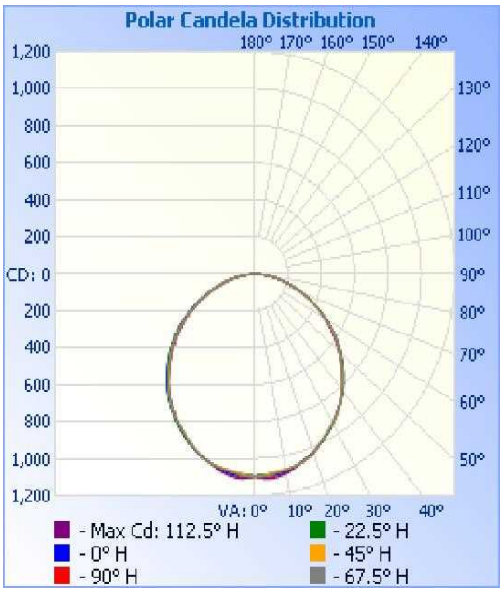
Luminous Flux (lm)	Zonal Lumen Requirement 1	Zonal Lumen Requirement 2	Beam Angle (50%)		Luminous Efficacy (lm/W)
			Horizontal Spread	Vertical Spread	
	0°-60°	N/A			
3173.3	78.50%	N/A	111.6	113.4	127.92

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

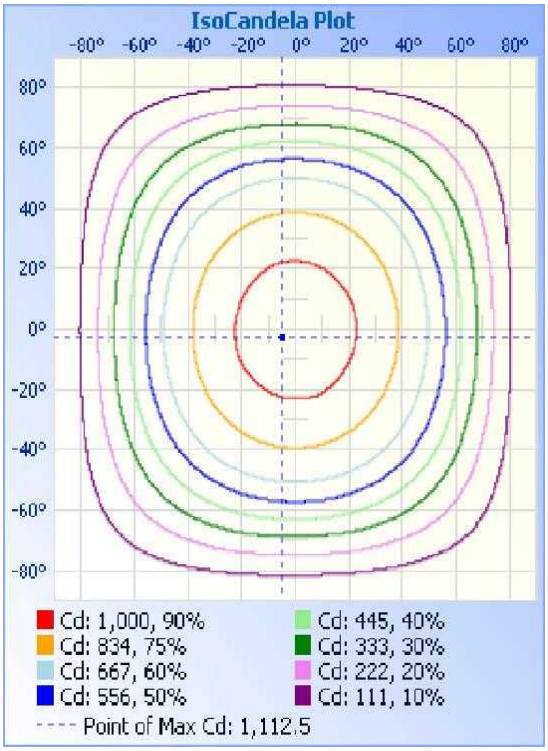
UGR		Spacing Criteria (0-180°)	Spacing Criteria (90°-270°)
Crosswise	Endwise		
21.9	21.5	1.28	1.28

Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot



Goniophotometer Test (Cont'd)

Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	854.8	26.90%
0-40	1403.7	44.20%
0-60	2493.0	78.60%
60-90	670.9	21.10%
70-100	283.5	8.90%
90-120	3.2	0.10%
0-90	3163.9	99.70%
90-180	9.4	0.30%
0-180	3173.3	100.00%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	%Total	Zone	Lumens	%Total
0-5	26.3	0.80%	90-95	0.7	0.00%
5-10	78.0	2.50%	95-100	0.6	0.00%
10-15	127.1	4.00%	100-105	0.5	0.00%
15-20	171.6	5.40%	105-110	0.5	0.00%
20-25	210.0	6.60%	110-115	0.4	0.00%
25-30	241.8	7.60%	115-120	0.5	0.00%
30-35	266.5	8.40%	120-125	0.5	0.00%
35-40	282.4	8.90%	125-130	0.5	0.00%
40-45	288.1	9.10%	130-135	0.6	0.00%
45-50	284.0	8.90%	135-140	0.7	0.00%
50-55	270.4	8.50%	140-145	0.7	0.00%
55-60	246.8	7.80%	145-150	0.6	0.00%
60-65	213.9	6.70%	150-155	0.6	0.00%
65-70	174.8	5.50%	155-160	0.6	0.00%
70-75	132.3	4.20%	160-165	0.5	0.00%
75-80	89.3	2.80%	165-170	0.5	0.00%
80-85	47.7	1.50%	170-175	0.3	0.00%
85-90	12.9	0.40%	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	1096	1096	1096	1096	1096	1096	1096	1096	1096	1096	1096	1096	1096	1096	1096	1096	1096
1	1090	1091	1094	1101	1106	1101	1095	1095	1093	1091	1095	1101	1105	1098	1095	1094	1090
2	1092	1090	1093	1100	1107	1106	1103	1098	1093	1089	1093	1100	1107	1105	1101	1098	1092
3	1092	1088	1091	1099	1107	1110	1106	1101	1093	1087	1090	1098	1108	1108	1104	1100	1092
4	1093	1086	1088	1097	1106	1111	1109	1103	1094	1085	1086	1095	1106	1110	1107	1101	1093
5	1092	1083	1085	1093	1104	1112	1109	1103	1092	1084	1082	1091	1103	1111	1109	1103	1092
6	1091	1083	1081	1088	1102	1111	1110	1104	1092	1082	1079	1087	1099	1109	1108	1103	1091
7	1091	1081	1076	1085	1097	1108	1107	1102	1092	1080	1076	1083	1097	1105	1106	1100	1091
8	1089	1080	1074	1082	1095	1104	1106	1099	1089	1078	1074	1080	1093	1103	1102	1097	1089
9	1087	1078	1072	1079	1092	1100	1102	1096	1087	1077	1070	1076	1090	1098	1100	1095	1087
10	1083	1077	1072	1078	1088	1096	1098	1093	1082	1075	1069	1074	1085	1093	1095	1091	1083
11	1079	1074	1071	1073	1083	1090	1092	1088	1080	1072	1067	1070	1081	1088	1090	1087	1079
12	1076	1071	1070	1071	1078	1082	1083	1082	1074	1070	1065	1067	1075	1080	1082	1081	1076
13	1069	1067	1067	1068	1073	1075	1075	1075	1069	1065	1064	1064	1069	1072	1074	1072	1069
14	1063	1061	1064	1064	1066	1067	1067	1067	1064	1061	1061	1061	1063	1065	1065	1065	1063
15	1057	1057	1060	1062	1062	1060	1059	1060	1057	1055	1057	1058	1058	1057	1056	1057	1057
16	1050	1052	1056	1058	1057	1053	1051	1053	1051	1050	1052	1052	1052	1050	1047	1050	1050
17	1044	1046	1050	1052	1051	1047	1043	1045	1046	1043	1046	1047	1046	1042	1040	1043	1044
18	1039	1040	1043	1046	1046	1041	1037	1038	1038	1037	1038	1040	1040	1035	1034	1036	1039
19	1032	1034	1035	1039	1040	1034	1028	1030	1030	1030	1029	1033	1034	1028	1026	1028	1032
20	1025	1027	1026	1029	1030	1026	1020	1021	1023	1022	1021	1023	1026	1021	1018	1021	1025
25	984	983	979	977	981	983	983	982	983	979	974	971	974	976	978	981	984
30	936	937	932	932	934	935	937	938	934	932	925	924	925	928	932	934	936
35	883	883	883	880	879	879	880	880	881	880	875	871	869	870	874	879	883
40	822	820	816	814	816	818	818	820	821	814	807	805	806	808	811	817	822
45	752	750	742	740	740	742	747	751	748	743	732	728	729	733	741	749	752
50	675	675	669	665	662	661	666	673	671	668	658	653	650	650	658	669	675
55	590	591	585	581	578	578	581	587	589	586	577	570	565	566	571	583	590
60	498	499	494	490	486	487	491	495	497	492	483	476	473	476	483	491	498
65	401	400	398	394	392	393	397	401	398	394	387	381	378	380	388	397	401
70	306	306	303	300	298	300	303	307	304	301	294	288	284	287	294	302	306
75	215	215	213	210	208	210	213	216	216	210	203	199	197	200	204	212	215
80	132	132	129	127	126	127	129	132	131	127	120	117	115	117	120	128	132
85	56	56	55	55	55	55	54	56	55	52	48	46	45	46	48	52	56
90	2	2	2	2	3	2	3	2	2	2	2	2	2	1	1	1	2
95	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1
100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
105	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1
110	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
115	1	1	1	0	0	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	1	1	1	1	1	1	1	1	1	1	2	1	1	1
130	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1
135	2	1	2	2	1	1	2	2	2	2	1	2	2	1	1	2	2
140	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
145	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
150	2	3	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2
155	3	3	3	2	2	3	2	3	2	3	3	2	3	3	3	3	3
160	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
165	4	3	4	4	4	4	4	4	4	4	3	4	4	3	4	4	4
170	4	4	5	4	4	4	4	4	4	4	4	4	4	5	4	4	4
175	4	4	4	4	4	4	4	4	4	4	4	4	5	4	4	4	4
180	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

THD and PF Test

Model No.	VEKT-DP1X4(18W/22W/25W) 25W 3500K		Sample ID.	4924899
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
24.7	120.04	60	0.2100	24.95	0.9898	10.57%	Horizontal
24.7	277.08	60	0.0966	25.50	0.9531	9.58%	Horizontal

THD and PF Test

Model No.	VEKT-DP1X4(18W/22W/25W) 25W 4000K		Sample ID.	4924899
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
24.7	120.03	60	0.2027	24.08	0.9898	10.32%	Horizontal
24.7	277.09	60	0.0950	25.07	0.9523	9.56%	Horizontal

THD and PF Test

Model No.	VEKT-DP1X4(18W/22W/25W) 25W 5000K		Sample ID.	4924899
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
24.7	120.02	60	0.2088	24.80	0.9898	10.51%	Horizontal
24.7	277.06	60	0.0958	25.27	0.9519	9.67%	Horizontal

THD and PF Test

Model No.	VEKT-DP1X4(18W/22W/25W) 22W 3500K		Sample ID.	4924899
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
24.7	120.04	60	0.1807	21.40	0.9868	11.71%	Horizontal
24.7	277.08	60	0.0866	22.56	0.9407	10.63%	Horizontal

THD and PF Test

Model No.	VEKT-DP1X4(18W/22W/25W) 18W 3500K		Sample ID.	4924899
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
24.7	120.08	60	0.1489	17.55	0.9818	13.27%	Horizontal
24.7	277.11	60	0.0747	19.01	0.9185	12.84%	Horizontal

In-Situ Temperature Measurement Test

Model No.	VEKT-DP1X4(18W/22W/25W) 25W 3500K	Sample ID.	4924899

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
23.5	120.04	60	0.2100	24.953	0.9898	10.57%	Horizontal

Test Results (LEDs)

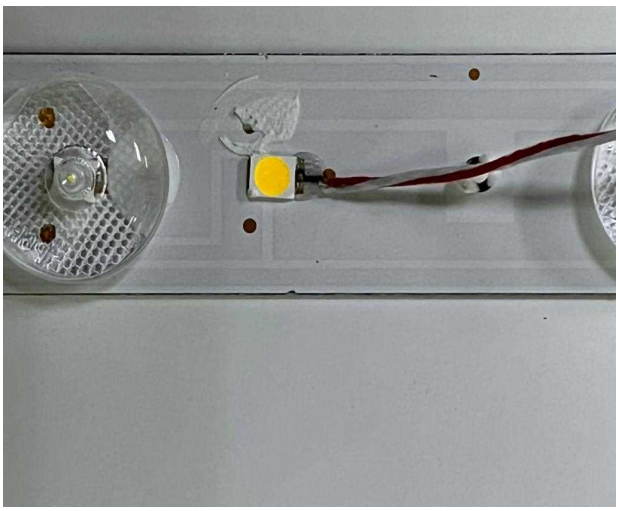
Thermocouple Location	Declared Light Source Current (mA)	Temperature for Light Source (°C)		Max Chromaticity Shift （1000-6000h)	LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp (°C)
		Test Result	Test Result (Correct to 25 °C)				
Ambient TEMP	N/A	23.5	25.0				
TMP of Location 1	30	36.8	38.3	0.0023	P2835Y-WXXXXXXXX XXXXX-XXXX	100	105

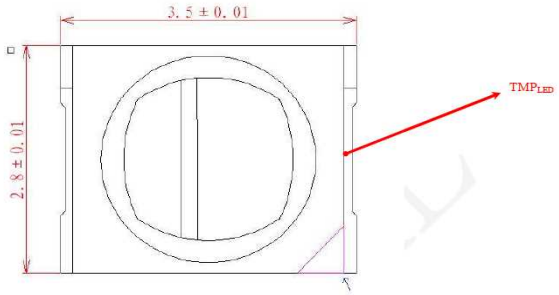
Test Results (Drivers)

Thermocouple Location	Temperature for Driver (°C)		Driver Model Number	Driver Limit Temp (°C)
	Test Result	Test Result (Correct to 25 °C)		
Ambient TEMP	23.5	25.0		
TMP of Location 1	53.5	55.0	SIF 30-I0650 120-277 W D1-S1S2	90

In-Situ Temperature Measurement Test (Cont'd)

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





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