



DesignLights Consortium Test Report

Reference Standards

UL1598-2008

ANSI C82.77-10-2014

IES LM-79-2008

Prepared For

Fulham Co., Inc.

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Test Laboratory:

UL-CCIC Company Limited

Test Laboratory Address:

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Catalog Number

VPR-24-MU-36-9TW-A

Project Number

4790617185

Report Number

4790617185_2

Test Date

2022-11-02~2022-11-08

Issue Date

2022-11-14

Revision Date

N/A

Prepared By

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Approved By

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Zhou, Maxine

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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	≥3000	-10%	3213.47
Minimum Luminaire Efficacy (lm/W)-Luminaires	IES LM-79-2008	≥110	-3%	124.22
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%	78.00%
Allowable CCT (3500K)	IES LM-79-2008/ANSI C78.377-2015	3465±245	N/A	3415
Allowable CCT (4000K)	IES LM-79-2008/ANSI C78.377-2015	3985±275	N/A	4004
Allowable CCT (5000K)	IES LM-79-2008/ANSI C78.377-2015	5029±283	N/A	4824
Allowable CCT (3500K)	IES LM-79-2008/ANSI C78.377-2015	3465±245	N/A	3407
Allowable CCT (3500K)	IES LM-79-2008/ANSI C78.377-2015	3465±245	N/A	3398
Minimum CRI	IES LM-79-2008/CIE 13.3-1995	≥80	-1	95
Minimum R9	IES LM-79-2008	≥0	-1	83.0
Minimum Rg	IES LM-79-2008	≥89	-1	101
Minimum Rf	IES LM-79-2008	≥70	-1	91
Rcs,h1	IES LM-79-2008	-12%-23%	-1%	-1%
Unified Glare Rating (UGR)	IES LM-79-2008	≤22	N/A	20.4
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	0.9230
Total Harmonic Distortion (A%)	ANSI C82.77-10-2014	≤20%	5%	13.56%
In-Situ Temperature Measurement Test for LED 1 (°C)	UL1598-2008	≤105	N/A	34.6
In-Situ Temperature Measurement Test for Driver 1 (°C)	UL1598-2008	≤90	N/A	54.5
Max Chromaticity Shift (1000-6000h)	N/A	≤0.004	0.0004	0.0017
Minimum Luminaire Warranty (Years)	N/A	≥5	N/A	≥5



Test List

Sample Received Date: 2022-10-27

Test Item	Test Date	Model Number	Tests Conducted By
Integrating Sphere Test	2022-11-07	VPR-24-MU-36-9TW-A	Yang, Gavin X
Integrating Sphere Test	2022-11-07	VPR-24-MU-36-9TW-A	Yang, Gavin X
Integrating Sphere Test	2022-11-07	VPR-24-MU-36-9TW-A	Yang, Gavin X
Integrating Sphere Test	2022-11-07	VPR-24-MU-36-9TW-A	Yang, Gavin X
Integrating Sphere Test	2022-11-07	VPR-24-MU-36-9TW-A	Yang, Gavin X
Goniophotometer Test	2022-11-02	VPR-24-MU-36-9TW-A	Yang, Gavin X
Goniophotometer Test	2022-11-02	VPR-24-MU-36-9TW-A	Yang, Gavin X
THD and PF Test	2022-11-02	VPR-24-MU-36-9TW-A	Yang, Gavin X
THD and PF Test	2022-11-02	VPR-24-MU-36-9TW-A	Yang, Gavin X
THD and PF Test	2022-11-02	VPR-24-MU-36-9TW-A	Yang, Gavin X
THD and PF Test	2022-11-02	VPR-24-MU-36-9TW-A	Yang, Gavin X
THD and PF Test	2022-11-02	VPR-24-MU-36-9TW-A	Yang, Gavin X
In-Situ Temperature Measurement Test	2022-11-08	VPR-24-MU-36-9TW-A	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.



Product Description

Lamp/Luminaire Description: Integrated Retrofit Kits for 2x4 Luminaires

Model Number: VPR-24-MU-36-9TW-A

Electrical Parameter: 120-277V, 50/60Hz

LED Package: BXFN-(A)G-13H-9RA

Dimming Information: Continuous dimming capability

Remark: Housing models: Lithonia 2GT8-4-32-A12-MVOLT-1/4

Products Scaled Value

Model Number	CCT	Luminous Flux	Power	Luminous Efficacy
VPR-24-MU-36-9TW-A	3500K	4500	36	125
VPR-24-MU-36-9TW-A	4000K	4860	36	135
VPR-24-MU-36-9TW-A	5000k	4572	36	127
VPR-24-MU-36-9TW-A	3500K	3840	30	128
VPR-24-MU-36-9TW-A	4000K	4140	30	138
VPR-24-MU-36-9TW-A	5000k	3900	30	130
VPR-24-MU-36-9TW-A	3500K	3036	23	132
VPR-24-MU-36-9TW-A	4000K	3266	23	142
VPR-24-MU-36-9TW-A	5000k	3082	23	134





Integrating Sphere Test

Model No.	VPR-24-MU-36-9TW-A	Sample ID.	5475174
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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.

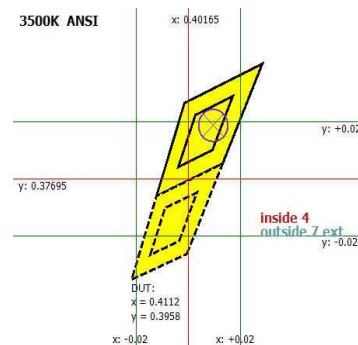
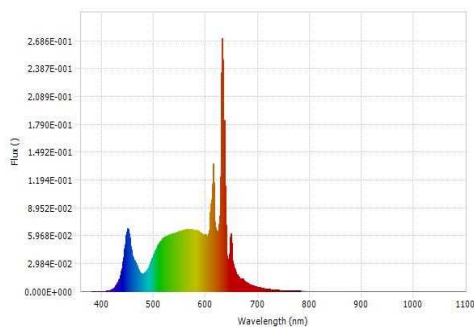
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption 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 ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	120.1	60	0.3158	37.656	0.9927	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3415	96	94.0	0.0009	4707.83	125.02	N/A



Luminous Flux (lm)	4707.83	Chrom x	0.4112
Chrom y	0.3958	Chrom u	0.2374
Chrom v	0.3428	Duv	0.0009
Chrom u'	0.2374	Chrom v'	0.5142
CCT (K)	3415	Luminous Efficacy (lm/W)	125.02
Ra	96	R1	98.0
R2	97.0	R3	90.0
R4	93.0	R5	99.0
R6	97.0	R7	97.0
R8	98.0	R9	94.0
R10	90.0	R11	91.0
R12	81.0	R13	99.0
R14	93.0	R15	99.0
Rf	93	Rg	103
Rcs,h1	-1%		



Integrating Sphere Test (Cont'd)

TM-30 Report

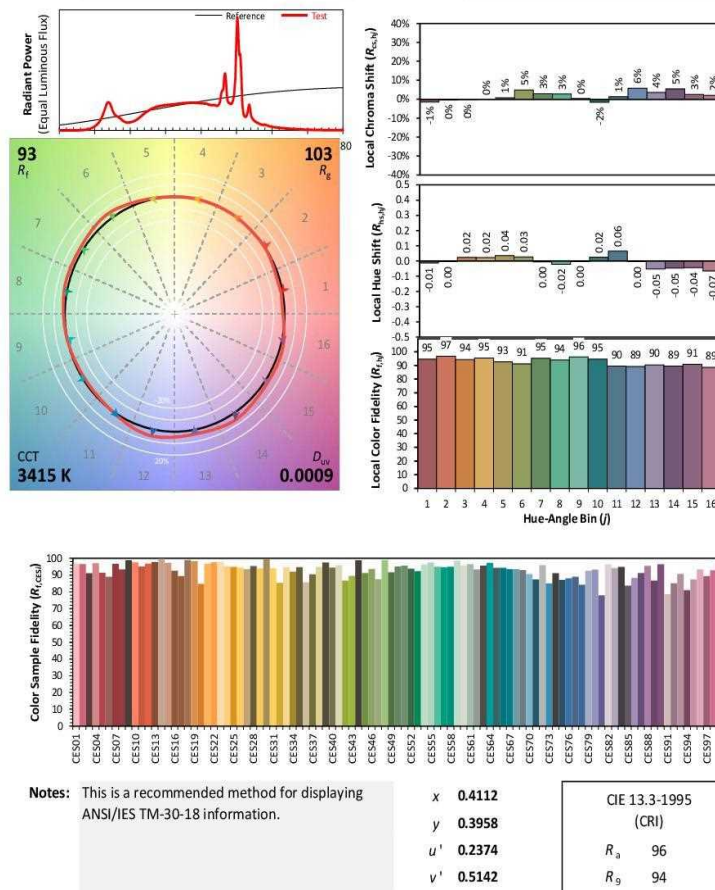
ANSI/IES TM-30-18 Color Rendition Report

Source: BXFN-(A)G-13H-9RA

Date: 11/7/2022

Manufacturer: Fulham Co., Inc.

Model: VPR-24-MU-36-9TW-A



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



Integrating Sphere Test

Model No.	VPR-24-MU-36-9TW-A		Sample ID.	5475174
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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.

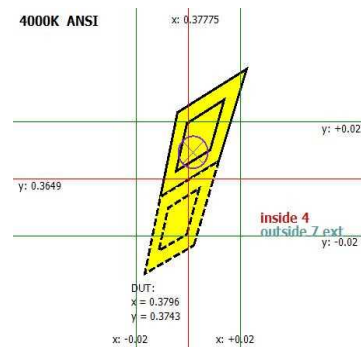
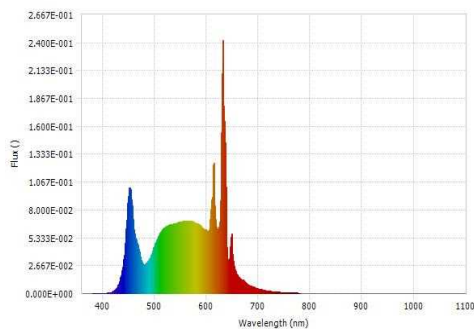
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption 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 ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	120.12	60	0.3037	36.22	0.9928	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
4004	97	96.0	-0.0009	4896.49	135.19	N/A



Luminous Flux (lm)	4896.49	Chrom x	0.3796
Chrom y	0.3743	Chrom u	0.2255
Chrom v	0.3336	Duv	-0.0009
Chrom u'	0.2255	Chrom v'	0.5004
CCT (K)	4004	Luminous Efficacy (lm/W)	135.19
Ra	97	R1	98.0
R2	98.0	R3	92.0
R4	97.0	R5	99.0
R6	95.0	R7	99.0
R8	100.0	R9	96.0
R10	92.0	R11	94.0
R12	74.0	R13	100.0
R14	94.0	R15	98.0
Rf	92	Rg	102
Rcs,h1	-2%		



Integrating Sphere Test (Cont'd)

TM-30 Report

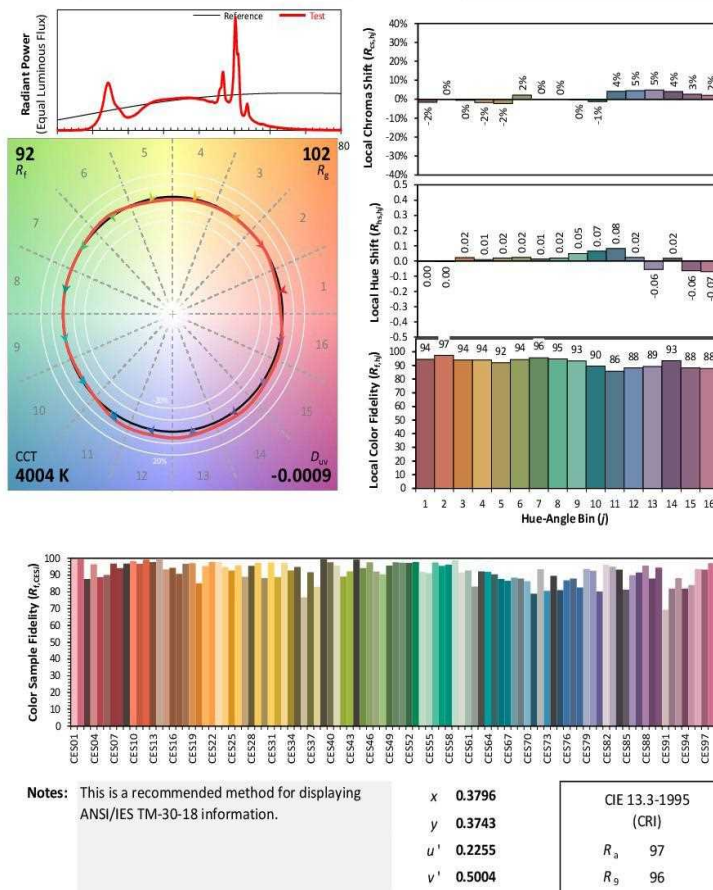
ANSI/IES TM-30-18 Color Rendition Report

Source: BXFN-(A)G-13H-9RA

Date: 11/7/2022

Manufacturer: Fulham Co., Inc.

Model: VPR-24-MU-36-9TW-A



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Integrating Sphere Test

Model No.	VPR-24-MU-36-9TW-A		Sample ID.	5475174
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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.

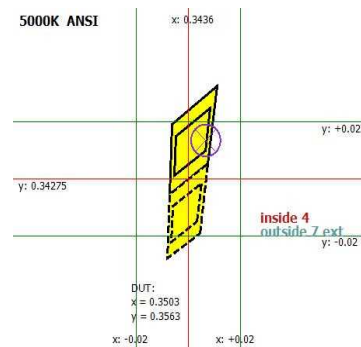
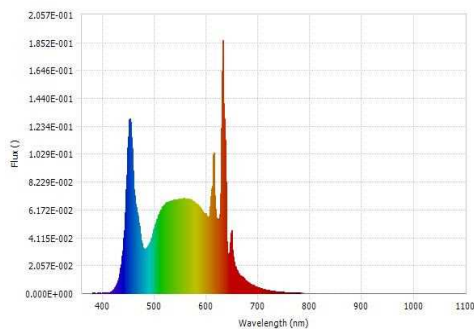
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption 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 ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	119.91	60	0.3159	37.606	0.9927	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
4824	95	83.0	0.0003	4781.15	127.14	N/A



Luminous Flux (lm)	4781.15	Chrom x	0.3503
Chrom y	0.3563	Chrom u	0.2131
Chrom v	0.3251	Duv	0.0003
Chrom u'	0.2131	Chrom v'	0.4877
CCT (K)	4824	Luminous Efficacy (lm/W)	127.14
Ra	95	R1	97.0
R2	96.0	R3	92.0
R4	96.0	R5	94.0
R6	92.0	R7	98.0
R8	95.0	R9	83.0
R10	87.0	R11	95.0
R12	65.0	R13	96.0
R14	95.0	R15	95.0
Rf	91	Rg	101
Rcs,h1	-4%		



Integrating Sphere Test (Cont'd)

TM-30 Report

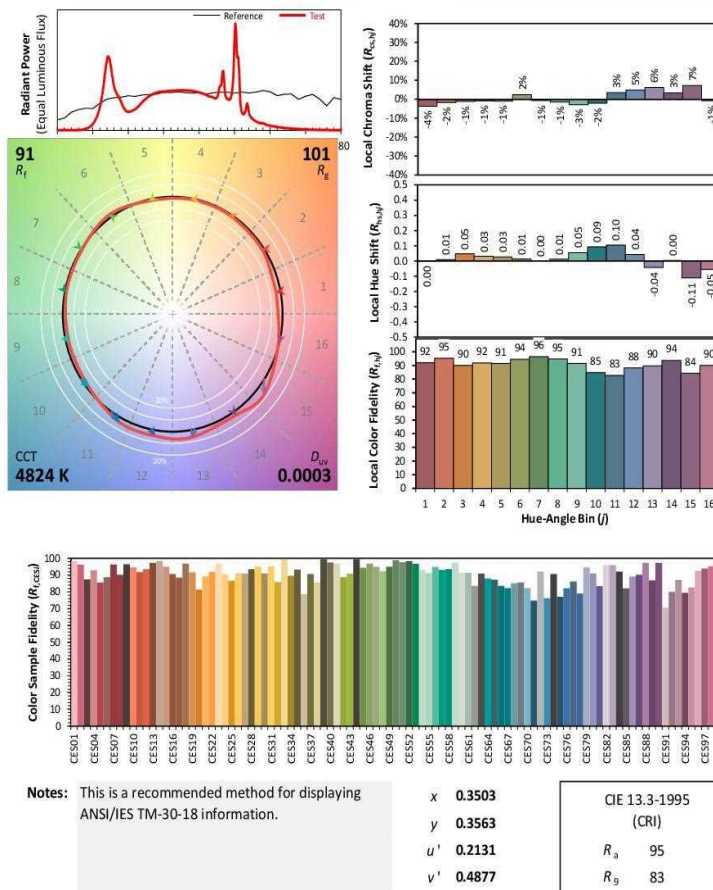
ANSI/IES TM-30-18 Color Rendition Report

Source: BXFN-(A)G-13H-9RA

Manufacturer: Fulham Co., Inc.

Date: 11/7/2022

Model: VPR-24-MU-36-9TW-A



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Integrating Sphere Test

Model No.	VPR-24-MU-36-9TW-A		Sample ID.	5475174
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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.

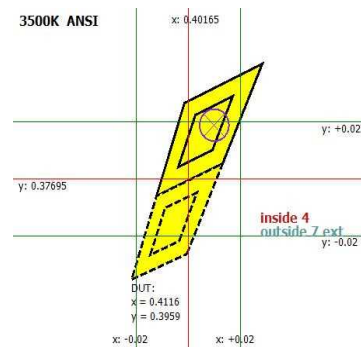
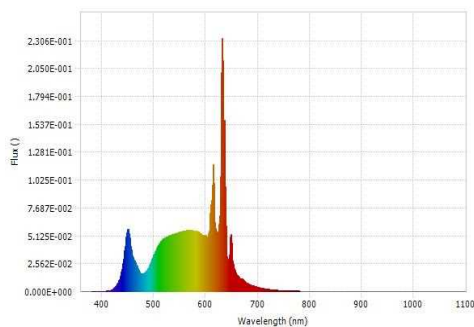
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption 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 ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	120.14	60	0.2609	31.012	0.9893	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3407	96	95.0	0.0009	3999.37	128.96	N/A



Luminous Flux (lm)	3999.37	Chrom x	0.4116
Chrom y	0.3959	Chrom u	0.2377
Chrom v	0.3429	Duv	0.0009
Chrom u'	0.2377	Chrom v'	0.5143
CCT (K)	3407	Luminous Efficacy (lm/W)	128.96
Ra	96	R1	98.0
R2	97.0	R3	90.0
R4	93.0	R5	99.0
R6	97.0	R7	97.0
R8	98.0	R9	95.0
R10	91.0	R11	91.0
R12	81.0	R13	99.0
R14	93.0	R15	99.0
Rf	93	Rg	103
Rcs,h1	-1%		



Integrating Sphere Test (Cont'd)

TM-30 Report

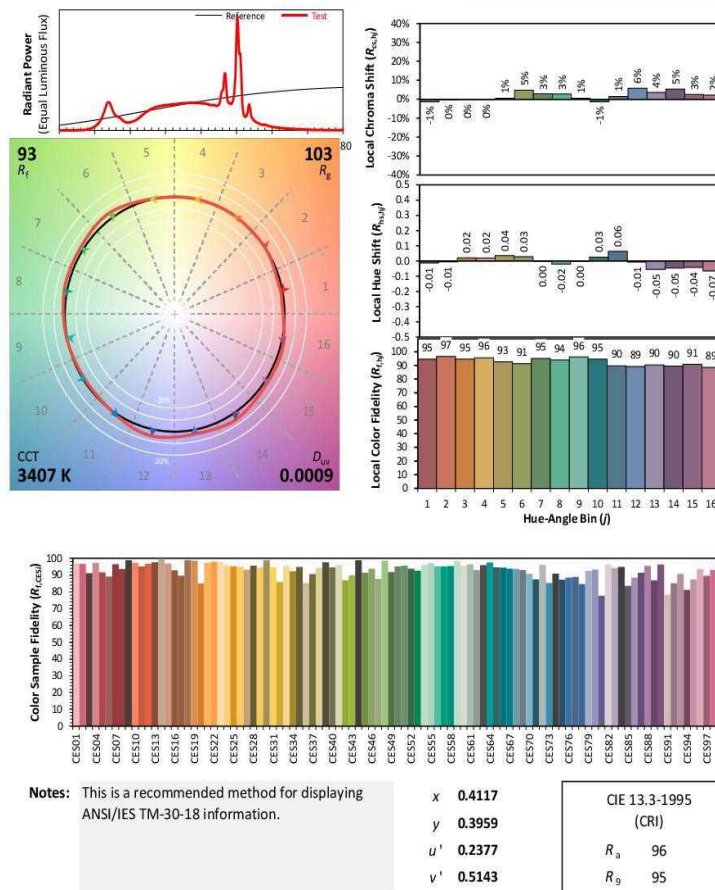
ANSI/IES TM-30-18 Color Rendition Report

Source: BXFN-(A)G-13H-9RA

Date: 11/7/2022

Manufacturer: Fulham Co., Inc.

Model: VPR-24-MU-36-9TW-A



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Integrating Sphere Test

Model No.	VPR-24-MU-36-9TW-A		Sample ID.	5475174
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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.

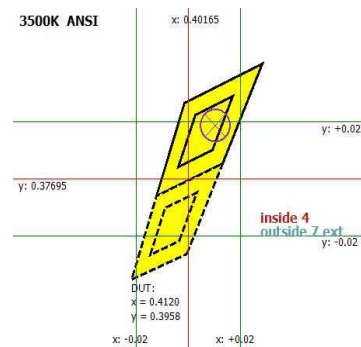
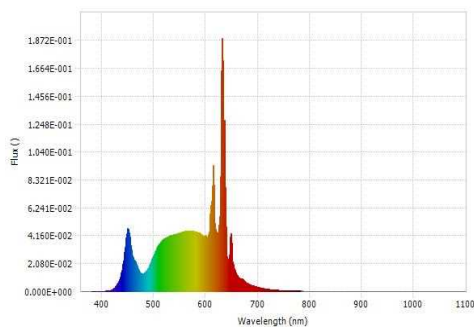
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption 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 ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	119.88	60	0.2051	24.177	0.9834	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3398	96	96.0	0.0008	3213.47	132.91	N/A



Luminous Flux (lm)	3213.47	Chrom x	0.4120
Chrom y	0.3958	Chrom u	0.2380
Chrom v	0.3429	Duv	0.0008
Chrom u'	0.2380	Chrom v'	0.5144
CCT (K)	3398	Luminous Efficacy (lm/W)	132.91
Ra	96	R1	97.0
R2	98.0	R3	90.0
R4	93.0	R5	99.0
R6	97.0	R7	97.0
R8	98.0	R9	96.0
R10	91.0	R11	91.0
R12	81.0	R13	99.0
R14	93.0	R15	99.0
Rf	93	Rg	103
Rcs,h1	-1%		



Integrating Sphere Test (Cont'd)

TM-30 Report

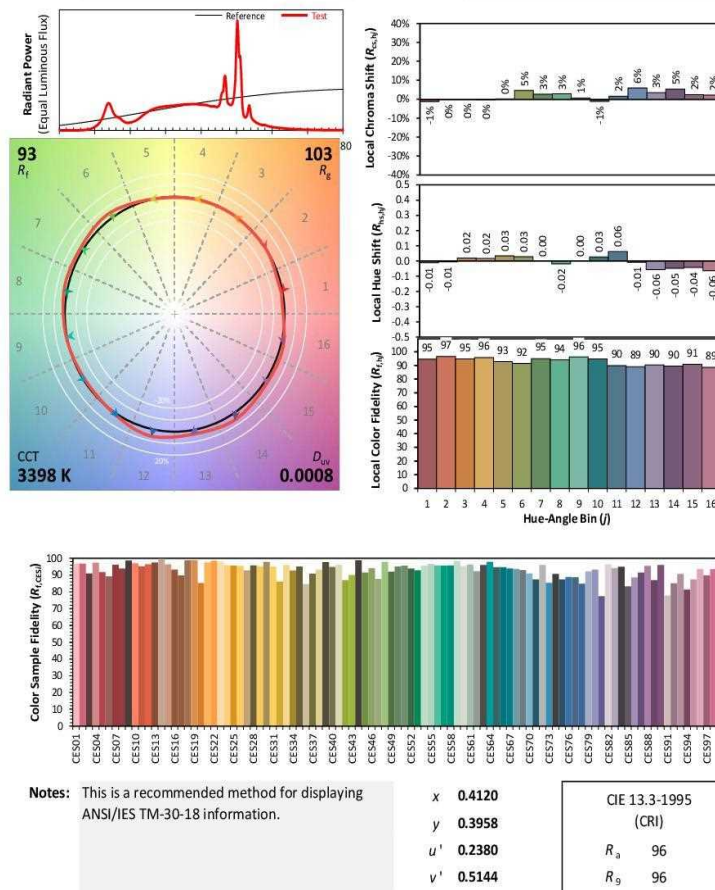
ANSI/IES TM-30-18 Color Rendition Report

Source: BXFN-(A)G-13H-9RA

Date: 11/7/2022

Manufacturer: Fulham Co., Inc.

Model: VPR-24-MU-36-9TW-A



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Goniophotometer Test

Model No.	VPR-24-MU-36-9TW-A	Sample ID.	5475174
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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, 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 ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.7	120.09	60	0.3148	37.56	0.9936	8.16%	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	
4665.7	78.00%	N/A	113.9	113.9	124.22

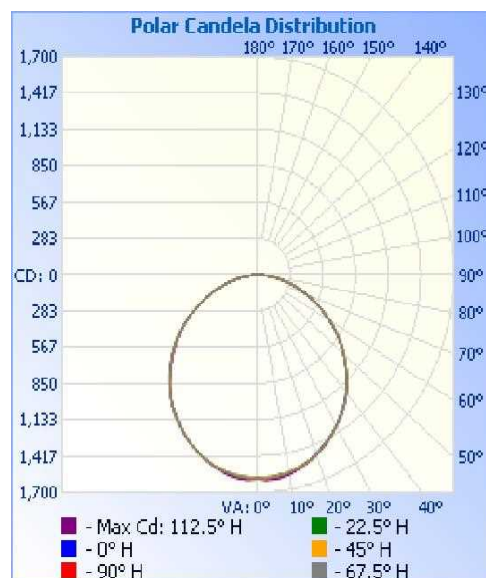
Backlight	Uplight	Glare
N/A	N/A	N/A

UGR		Spacing Criteria (0 - 180°)	Spacing Criteria (90° - 270°)
Crosswise	Endwise		
20.1	20.4	1.28	1.28

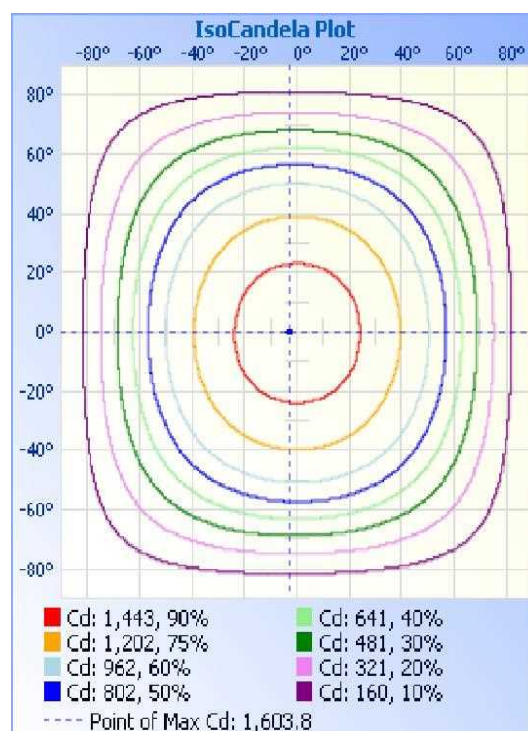


Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot





Goniophotometer Test (Cont'd)

Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	1243.7	26.70%
0-40	2045.4	43.80%
0-60	3640.5	78.00%
60-90	1012.1	21.70%
70-100	439.4	9.40%
90-120	4.9	0.10%
0-90	4652.6	99.70%
90-180	13.1	0.30%
0-180	4665.7	100.00%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	%Total	Zone	Lumens	%Total
0-5	38.1	0.80%	90-95	1.2	0.00%
5-10	113.2	2.40%	95-100	0.9	0.00%
10-15	184.3	4.00%	100-105	0.8	0.00%
15-20	249.3	5.30%	105-110	0.7	0.00%
20-25	306.0	6.60%	110-115	0.7	0.00%
25-30	352.9	7.60%	115-120	0.6	0.00%
30-35	389.0	8.30%	120-125	0.6	0.00%
35-40	412.7	8.80%	125-130	0.7	0.00%
40-45	420.9	9.00%	130-135	0.8	0.00%
45-50	414.9	8.90%	135-140	0.9	0.00%
50-55	396.3	8.50%	140-145	0.9	0.00%
55-60	363.0	7.80%	145-150	0.8	0.00%
60-65	315.4	6.80%	150-155	0.8	0.00%
65-70	259.4	5.60%	155-160	0.8	0.00%
70-75	199.2	4.30%	160-165	0.7	0.00%
75-80	136.8	2.90%	165-170	0.6	0.00%
80-85	77.4	1.70%	170-175	0.4	0.00%
85-90	23.9	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	1588	1588	1588	1588	1588	1588	1588	1588	1588	1588	1588	1588	1588	1588	1588	1588	1588
1	1586	1583	1587	1595	1600	1597	1588	1585	1587	1582	1587	1595	1599	1595	1589	1585	1586
2	1586	1582	1584	1597	1603	1598	1593	1588	1585	1582	1586	1594	1601	1598	1594	1590	1586
3	1585	1581	1585	1593	1603	1603	1600	1591	1586	1582	1587	1595	1602	1603	1597	1590	1585
4	1586	1582	1583	1592	1600	1603	1603	1592	1584	1580	1580	1590	1601	1602	1600	1595	1586
5	1581	1577	1581	1588	1599	1604	1603	1593	1586	1578	1582	1589	1598	1602	1601	1590	1581
6	1579	1573	1580	1585	1596	1603	1602	1593	1584	1574	1578	1586	1592	1601	1598	1588	1579
7	1577	1570	1576	1582	1594	1601	1600	1592	1582	1574	1576	1582	1588	1596	1594	1587	1577
8	1576	1569	1572	1578	1587	1594	1592	1585	1579	1570	1571	1576	1585	1592	1592	1584	1576
9	1573	1568	1567	1575	1584	1587	1588	1582	1572	1564	1568	1569	1582	1587	1585	1582	1573
10	1568	1561	1565	1567	1574	1585	1582	1576	1568	1562	1560	1566	1571	1580	1582	1575	1568
11	1562	1557	1557	1564	1573	1573	1575	1568	1565	1556	1558	1561	1567	1572	1574	1568	1562
12	1555	1551	1553	1557	1565	1570	1566	1562	1556	1552	1551	1555	1560	1564	1563	1561	1555
13	1546	1546	1547	1555	1556	1558	1560	1554	1550	1544	1548	1550	1553	1555	1555	1549	1546
14	1542	1540	1544	1546	1547	1552	1548	1546	1544	1542	1540	1542	1546	1544	1546	1543	1542
15	1532	1532	1536	1540	1542	1541	1539	1537	1530	1532	1534	1536	1537	1536	1536	1533	1532
16	1523	1525	1530	1534	1536	1533	1531	1524	1523	1522	1530	1530	1528	1530	1527	1524	1523
17	1516	1517	1522	1526	1527	1523	1520	1515	1516	1515	1517	1520	1520	1519	1516	1515	1516
18	1508	1509	1511	1517	1516	1512	1508	1507	1507	1508	1507	1509	1513	1506	1506	1505	1508
19	1497	1500	1501	1507	1505	1501	1497	1498	1496	1497	1498	1499	1499	1497	1494	1495	1497
20	1486	1488	1492	1494	1495	1493	1487	1488	1484	1486	1488	1490	1488	1486	1483	1484	1486
25	1427	1427	1430	1430	1434	1438	1433	1428	1428	1428	1427	1428	1426	1429	1427	1428	1427
30	1361	1362	1364	1364	1362	1364	1363	1361	1360	1360	1357	1356	1353	1355	1355	1359	1361
35	1281	1284	1287	1289	1290	1288	1284	1284	1283	1281	1281	1280	1277	1277	1276	1277	1281
40	1190	1194	1196	1197	1198	1197	1194	1191	1190	1186	1185	1182	1182	1185	1187	1190	1190
45	1088	1088	1090	1087	1086	1089	1089	1086	1082	1076	1075	1073	1074	1080	1086	1088	1088
50	976	979	980	977	974	974	973	974	974	971	967	966	961	958	963	969	976
55	856	861	861	860	858	856	852	852	854	851	850	844	844	842	843	849	856
60	721	726	727	729	726	724	719	717	716	716	715	710	710	711	711	716	721
65	581	584	588	589	588	586	581	575	573	574	576	573	573	573	573	579	581
70	446	448	453	455	456	456	450	445	440	437	439	441	442	440	442	442	446
75	313	318	322	329	331	327	321	314	309	310	310	311	315	315	315	312	313
80	194	198	203	208	209	207	203	196	190	189	190	196	195	196	193	193	194
85	88	91	95	97	99	98	92	88	85	83	84	86	88	88	86	86	88
90	4	5	7	9	9	7	6	4	3	4	4	4	4	4	4	4	4
95	2	1	2	2	2	2	2	1	2	2	2	2	1	2	2	2	2
100	2	2	1	2	2	2	2	1	2	2	1	2	1	2	2	1	2
105	2	2	1	2	2	1	2	1	2	1	1	1	1	2	2	2	2
110	2	1	2	1	1	2	2	1	1	2	2	1	1	1	1	2	2
115	2	1	1	2	1	2	1	1	1	1	1	1	1	2	1	1	2
120	2	2	1	1	1	1	1	1	2	2	1	2	1	2	2	1	2
125	1	1	1	1	1	2	2	2	2	1	1	2	2	2	2	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	3	3	3	2	2	2	3	2	2	2	2	2	2	2
145	3	3	2	3	3	3	2	2	3	3	2	3	3	3	3	3	3
150	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
155	4	4	4	3	3	4	4	3	4	3	3	3	4	4	3	4	4
160	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
165	5	5	5	5	5	5	5	4	5	4	5	5	5	4	5	4	5
170	6	5	6	5	6	5	5	5	6	6	5	5	6	6	5	5	6
175	5	5	6	6	5	5	5	6	5	6	6	5	5	5	5	6	5
180	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6



Goniophotometer Test

Model No.	VPR-24-MU-36-9TW-A	Sample ID.	5475174
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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, 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 ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.6	120.09	60	0.3140	37.46	0.9936	8.07%	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	
4720.2	78.00%	N/A	113.7	113.7	126.01

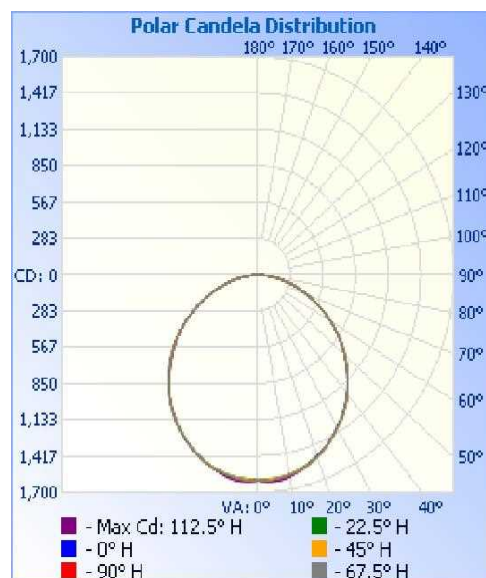
Backlight	Uplight	Glare
N/A	N/A	N/A

UGR		Spacing Criteria (0 - 180°)	Spacing Criteria (90° - 270°)
Crosswise	Endwise		
20.1	20.4	1.28	1.28

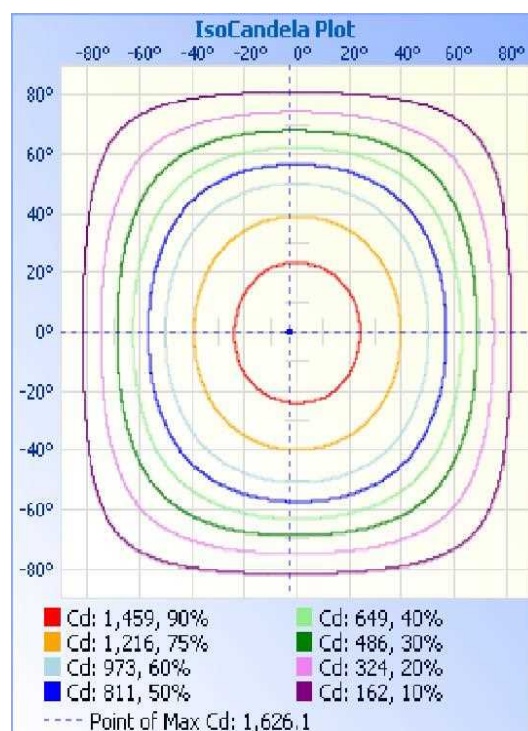


Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot





Goniophotometer Test (Cont'd)

Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	1258.7	26.70%
0-40	2069.9	43.90%
0-60	3683.6	78.00%
60-90	1023.4	21.70%
70-100	444.1	9.40%
90-120	4.9	0.10%
0-90	4707.0	99.70%
90-180	13.3	0.30%
0-180	4720.2	100.00%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	%Total	Zone	Lumens	%Total
0-5	38.5	0.80%	90-95	1.2	0.00%
5-10	114.5	2.40%	95-100	0.9	0.00%
10-15	186.5	4.00%	100-105	0.7	0.00%
15-20	252.3	5.30%	105-110	0.7	0.00%
20-25	309.7	6.60%	110-115	0.6	0.00%
25-30	357.2	7.60%	115-120	0.6	0.00%
30-35	393.7	8.30%	120-125	0.6	0.00%
35-40	417.6	8.80%	125-130	0.8	0.00%
40-45	425.8	9.00%	130-135	0.8	0.00%
45-50	419.8	8.90%	135-140	0.9	0.00%
50-55	400.9	8.50%	140-145	0.9	0.00%
55-60	367.2	7.80%	145-150	0.9	0.00%
60-65	319.0	6.80%	150-155	0.8	0.00%
65-70	262.4	5.60%	155-160	0.8	0.00%
70-75	201.7	4.30%	160-165	0.7	0.00%
75-80	138.5	2.90%	165-170	0.6	0.00%
80-85	78.0	1.70%	170-175	0.4	0.00%
85-90	23.9	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	1607	1607	1607	1607	1607	1607	1607	1607	1607	1607	1607	1607	1607	1607	1607	1607	1607	1607	1607
1	1604	1604	1605	1612	1616	1614	1609	1603	1604	1601	1607	1614	1618	1614	1610	1604	1604	1603	1603
2	1603	1600	1606	1614	1620	1620	1614	1608	1606	1600	1604	1615	1621	1621	1613	1607	1603	1603	1603
3	1601	1601	1604	1613	1622	1623	1620	1612	1602	1600	1603	1613	1619	1623	1615	1609	1601	1601	1601
4	1602	1596	1600	1614	1618	1626	1619	1610	1605	1595	1601	1611	1621	1623	1620	1609	1602	1602	1602
5	1601	1598	1600	1605	1620	1622	1623	1615	1601	1595	1597	1607	1616	1625	1621	1610	1601	1601	1601
6	1598	1593	1598	1602	1618	1620	1623	1614	1598	1594	1594	1601	1613	1620	1618	1609	1598	1598	1598
7	1599	1591	1594	1599	1614	1617	1620	1609	1596	1589	1591	1600	1609	1618	1616	1607	1599	1599	1599
8	1594	1588	1590	1595	1608	1614	1614	1605	1596	1586	1587	1594	1602	1613	1613	1606	1594	1594	1594
9	1593	1585	1587	1594	1598	1609	1608	1603	1592	1582	1584	1589	1600	1606	1606	1601	1593	1593	1593
10	1587	1580	1582	1587	1596	1601	1601	1594	1587	1579	1579	1584	1594	1599	1600	1591	1587	1587	1587
11	1581	1576	1576	1584	1587	1594	1593	1588	1580	1575	1573	1577	1584	1591	1593	1588	1581	1581	1581
12	1575	1571	1572	1578	1582	1585	1585	1582	1572	1566	1570	1573	1579	1583	1583	1580	1575	1575	1575
13	1568	1564	1566	1574	1575	1578	1577	1572	1566	1562	1564	1570	1570	1573	1573	1573	1568	1568	1568
14	1558	1556	1564	1564	1571	1569	1569	1565	1558	1556	1558	1563	1563	1564	1564	1563	1558	1558	1558
15	1552	1552	1555	1560	1560	1561	1559	1554	1550	1548	1551	1555	1557	1558	1554	1552	1552	1552	1552
16	1545	1545	1548	1553	1551	1551	1548	1544	1542	1541	1543	1548	1550	1547	1545	1545	1545	1545	1545
17	1535	1532	1542	1545	1543	1540	1537	1535	1534	1533	1536	1540	1537	1535	1534	1534	1535	1535	1535
18	1525	1523	1532	1537	1534	1529	1527	1525	1526	1522	1527	1530	1529	1525	1523	1522	1525	1525	1525
19	1513	1515	1521	1526	1523	1520	1516	1514	1514	1511	1516	1519	1519	1515	1512	1511	1513	1513	1513
20	1501	1507	1511	1512	1514	1512	1506	1502	1503	1500	1506	1506	1507	1507	1502	1500	1501	1501	1501
25	1446	1450	1449	1450	1452	1454	1449	1447	1444	1445	1440	1442	1444	1446	1444	1445	1446	1446	1446
30	1375	1379	1383	1380	1381	1378	1378	1377	1377	1375	1372	1372	1372	1374	1374	1373	1375	1375	1375
35	1299	1301	1305	1306	1303	1302	1299	1298	1294	1296	1298	1297	1292	1292	1290	1292	1299	1299	1299
40	1206	1207	1209	1211	1210	1211	1210	1205	1206	1200	1199	1198	1198	1200	1200	1202	1206	1206	1206
45	1100	1101	1101	1102	1102	1102	1101	1099	1101	1095	1092	1089	1086	1088	1091	1095	1100	1100	1100
50	985	990	991	992	990	984	985	984	986	982	981	976	970	971	973	978	985	985	985
55	866	872	870	871	869	862	861	862	860	862	858	855	852	852	853	858	866	866	866
60	730	733	734	734	734	730	728	726	727	725	721	722	721	719	721	725	730	730	730
65	585	589	596	598	598	596	592	586	584	581	581	580	579	580	579	583	585	585	585
70	449	454	460	464	464	462	456	451	444	443	446	445	445	446	445	446	449	449	449
75	320	323	326	331	332	330	324	318	313	313	314	318	320	320	319	318	320	320	320
80	196	199	205	210	211	210	204	198	192	191	194	197	199	197	196	194	196	196	196
85	87	91	95	99	100	98	94	90	86	84	86	86	86	87	85	84	87	87	87
90	5	6	7	8	8	7	5	4	4	4	4	4	4	4	4	4	5	5	5
95	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2
100	2	1	1	2	2	2	1	1	2	2	2	1	2	2	1	2	2	2	2
105	1	2	1	1	2	2	1	2	1	2	1	1	1	2	1	1	1	1	1
110	2	2	1	2	1	1	1	1	1	1	2	2	1	2	1	1	2	2	2
115	2	1	1	1	1	1	1	2	1	1	2	2	2	2	1	1	2	2	2
120	1	2	2	1	1	1	1	1	2	1	2	1	1	2	1	1	1	1	1
125	1	1	2	1	2	2	2	1	2	2	2	2	2	2	1	1	1	1	1
130	2	2	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	2	2
140	3	3	3	2	2	2	3	3	3	2	3	3	2	3	2	2	3	3	3
145	3	2	2	3	3	2	3	3	3	3	2	3	2	3	3	3	3	3	3
150	3	3	3	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
155	4	4	4	4	4	4	3	4	4	3	3	3	3	4	4	3	4	4	4
160	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
165	5	4	4	4	4	4	5	4	5	5	4	5	4	5	5	5	5	5	5
170	6	5	6	6	5	6	6	5	6	5	6	6	5	6	6	6	6	6	6
175	5	5	5	6	6	5	6	5	6	6	5	6	6	6	6	6	5	5	5
180	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6



THD and PF Test

Model No.	VPR-24-MU-36-9TW-A		Sample ID.	5475174
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 $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. 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 ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.7	120.09	60	0.3148	37.56	0.9936	8.16%	Horizontal
24.7	277.07	60	0.1389	36.89	0.9602	10.25%	Horizontal



THD and PF Test

Model No.	VPR-24-MU-36-9TW-A		Sample ID.	5475174
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 $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. 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 ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.7	120.16	60	0.3006	35.91	0.9938	7.60%	Horizontal
24.7	277.07	60	0.1336	35.40	0.9567	10.64%	Horizontal



THD and PF Test

Model No.	VPR-24-MU-36-9TW-A	Sample ID.	5475174
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 $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. 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 ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.7	120.08	60	0.3139	37.45	0.9936	8.07%	Horizontal
24.7	277.06	60	0.1382	36.76	0.9599	10.27%	Horizontal



THD and PF Test

Model No.	VPR-24-MU-36-9TW-A	Sample ID.	5475174
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	120.09	60	0.2580	30.70	0.9905	9.83%	Horizontal
24.7	277.07	60	0.1195	31.32	0.9465	11.20%	Horizontal



THD and PF Test

Model No.	VPR-24-MU-36-9TW-A		Sample ID.	5475174
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 $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. 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 ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.7	120.12	60	0.2021	23.92	0.9851	11.95%	Horizontal
24.7	277.11	60	0.1004	25.66	0.9230	13.56%	Horizontal



In-Situ Temperature Measurement Test

Model No.	VPR-24-MU-36-9TW-A	Sample ID.	5475174
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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
23.1	120.09	60	0.3148	37.56	0.9936	8.16%	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	23.1	25.0				
TMP of Location 1	30	32.7	34.6	0.0017	BXFN-(A)G-13H-9RA	120	105

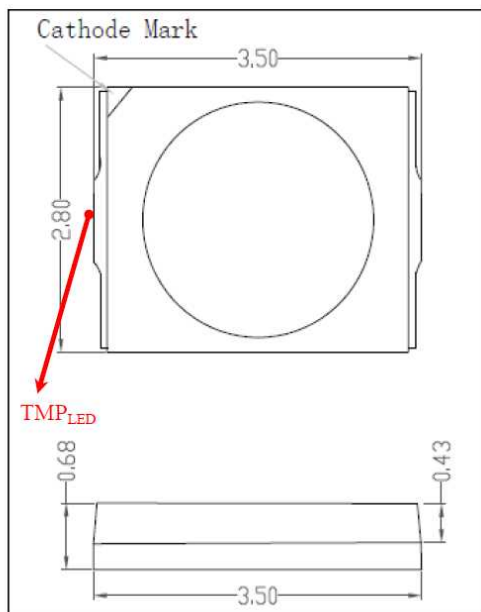
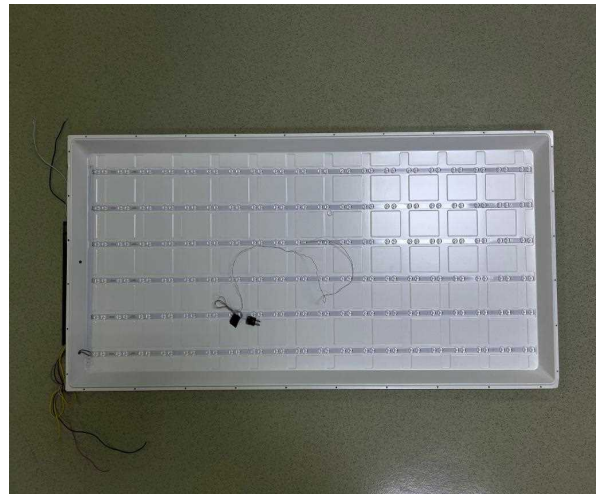
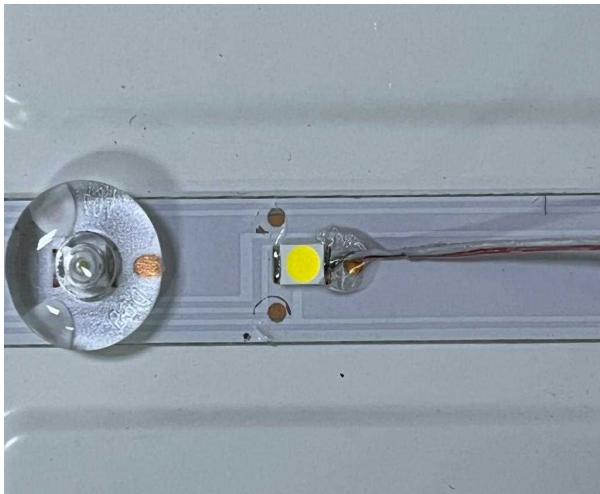
Test Results (Drivers)

Thermocouple Location	Temperature for Driver (°C)		Driver Model Number	Driver Limit Temp (°C)
	Test Result	Test Result (Correct to 25 °C)		
Ambient TEMP	23.1	25.0		
TMP of Location 1	52.6	54.5	T1M1UNV095S-40L-A	90



In-Situ Temperature Measurement Test (Cont'd)

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





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