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Test report of

IES LM-79-08

Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Rendered to:

Beyond LED Technology

For products:

2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces

Models No.:

BLT-FL22-K60-3065

May. 9, 2023 to May. 11, 2023

Address: 1939 Parker Court, Stone Mountain, GA 30087

Test Date:

Test Lab.:

Test Sites: 1/F., Building I, Technology and Enterprise Development Center, Guangyuan Road, Xiaolan, Zhongshan, Guangdong, China

Template No.: LC-RT-PL-092 Rev.1.1

Test Note: N/A

Compiled by:

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May. 13, 2023

Reviewed by:

Lin Qiu

May. 13, 2023

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1. General

1.1 Product Information

Brand Name	N/A
Category	Indoor
General Application	Troffer
Primary Use	2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces
Model Number	BLT-FL22-K60-3065
Rated Inputs	AC100-277V, 50/60Hz
Rated Power	40W/30W/20W
Rated Light output	5000lm/3750lm/2500lm
Declared CCT	3000K/3500K/4000K/5000K/6500K
Power Supply	ZS-GW40-950
LED Package, Array or Module	ZT2835WOM1, DONGGUAN SINOWIN OPTO-ELECTRONIC CO.,LTD
Dimming	Continuous Dimming
Integral Controls	No
Controls Controllability	No
Receipt Samples	1 unit
Sample Code of lab.	230508103001
Date of Receipt Samples	May. 8, 2023
Note	This is a color tunable and multi-power product, 3000K, 3500K, 4000K, 5000K and 6500K at 40W are selected for the test.

1.2 Standards or methods

The following standards are partly or totally used or referenced for test:

No.	Name
ANSI/NEMA/ ANSLG C78.377- 2017	Specifications for the Chromaticity of Solid State Lighting Products
ANSI/IES TM-30-18 ¹	IES Method for Evaluating Light Source Color Rendition
ANSI C82.77-2002	Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment
CIE Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
CIE Pub. No. 15:2004	Colorimetry
IES LM-79-08	Electrical and Photometric Measurements of Solid-State Lighting Products

Note:

1, For reference only and not in the scope of NVLAP.

1.3 Equipment list

Instrument	ID	Model name	Cal. date	Next cal. Date
AC Power supply	LC-I-987	APW-120N	2022-12-13	2023-12-12
AC Power supply	LC-I-989	APW-120N	2022-12-13	2023-12-12
Power analyzer	LC-I-PL-024	WT310E	2023-03-07	2024-03-06
Power analyzer	LC-I-954	WT210	2022-12-13	2023-12-12
Multimeter	LC-I-972	Fluke	2022-07-01	2023-06-30
Photometric colorimetric electric system ²	LC-I-956	HAAS-2000	Before use	Before use
Standard lamp ³	LC-I-963	24V50W	2022-07-12	2023-07-11
Luminous Flux Lamp ⁴	LC-I-PL-031	AC220V/200W	2022-07-21	2023-07-20
Goniophotometer(with mirror)	LC-I-902	GMS2000	2023-04-14	2024-04-13
Wireless temperature transmitter	LC-I-PL-009	DWLR-DLR	2022-12-15	2023-12-14
Wireless temperature transmitter	LC-I-PL-008	DWLR-DLR	2022-12-15	2023-12-14

Note:

2, Bandwidth of spectroradiometer is 1 nm.

3, Halogen lamp, 50W, omni-directional type, and its traceability to NIM.

4, Incandescent lamp, 200W, omni-directional type, and its traceability to NIM.

2. Test conducted and method

The luminaire was operated at least 2 hours to reach stabilization and temperature equilibrium before test.

2.1 Ambient Condition

The ambient temperature in which measurements are being taken was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$; the air flow around the sample(s) being tested did not affect the performance.

2.2 Power Supply Characteristics

The AC power supply had a sinusoidal voltage wave shape at the prescribed frequency (60 Hz) such that the RMS summation of the harmonic components does not exceed 3 percent of the fundamental during operation of the test item.

The voltage of AC power supply (RMS voltage) applied to the device under test was regulated to within ± 0.2 percent under load.

2.3 Seasoning and Stabilization

No seasoning was performed in accordance with IESNA LM-79-08. And before the measurement, the sample was stabilized until the light output and power variations were less than 0.5% in 30 minutes intervals (3 readings, 15 minutes apart).

2.4 Electrical Instrumentation

The calibration uncertainties of the instruments for AC voltage and current were less than 0.2 percent, and the calibration uncertainty of the AC power meter was less than 0.5 percent (95 % confidence interval, $k=2$).

2.5 Color Measurement Method

Spectral radiant flux was measured by a sphere (2 meter)-spectroradiometer system, and the color characteristics (Color rendering index, correlated color temperature, chromaticity coordinate) were calculated from these by software automatically.

2.6 Total Luminous Flux Measurement Method

Total luminous flux was measured by both sphere-spectroradiometer system and type C goniophotometer system.

Light intensity distribution was measured by a type C goniophotometer (with mirror) which can keep the sample in burn position when the tests conduct, and the total luminous flux was calculated from the intensity data by software automatically.

Spectral radiant flux was measured by a sphere (2 meter)-spectroradiometer system, and the total luminous flux was calculated from these by software automatically.

2.7 Luminous Intensity Distribution Measurement Method

Luminous intensity distribution was measured by a mirror-type goniophotometer (Type C) which can keep the sample in burn position when the tests conduct, and the kinds of graph were generated by software automatically.

2.8 Spatial Non-uniformity of Chromaticity

The customer did not require this measurement.

3. Test Result Summary

3.1 Electrical data

Criteria Item	Result				
	3000K	3500K	4000K	5000K	6500K
Input Voltage & Frequency	119.96 V ~60Hz	120.02 V ~60Hz	120.01 V ~60Hz	120.01 V ~60Hz	120.01 V ~60Hz
Input Current(A)	0.313	0.312	0.311	0.308	0.311
Total Power(W)	37.30	37.26	37.06	36.77	37.11
Power Factor	0.994	0.994	0.994	0.995	0.994
I-THD	3.87%	3.98%	3.91%	4.01%	4.01%
Off-state Power(W)	-	-	-	-	-

3.2 Photometric data

Criteria Item	Result				
	3000K	3500K	4000K	5000K	6500K
Total Lumens(lm)	4796.65	4804.68	4868.57	4945.83	4983.35
Luminaire Efficacy(lm/W)	128.60	128.95	131.37	134.51	134.29
Correlated Color Temperature (CCT)(K)	3000	3491	3875	5154	6389
Color Rendering Index (CRI)	84	85	87	85	84
R ₉	12	17	27	19	14
R _f	85	85	87	84	83
R _g	98	98	99	99	97
R _{cs,h1}	-11%	-11%	-9%	-11%	-12%
Chromaticity Coordinate (x,y)	0.4342 0.3983	0.4032 0.3839	0.3847 0.3753	0.3409 0.3478	0.3151 0.3269
Chromaticity Coordinate (u',v')	0.2513 0.5187	0.2371 0.5081	0.2285 0.5016	0.2101 0.4822	0.2003 0.4676
Duv	-0.0019	-0.0026	-0.0019	-0.0002	0.0009
Zone Lumens between 0-60°	77.23%	-	-	-	-
Spacing Criteria (0-180)	1.16	-	-	-	-
Spacing Criteria (90-270)	1.18	-	-	-	-
Maximum UGR ¹	20.9	-	-	-	-

Note:

1, Based on Room dimension: X=4H, Y=8H, Reflectance: 70/50/20%.



3.3 Electrical data on 277V

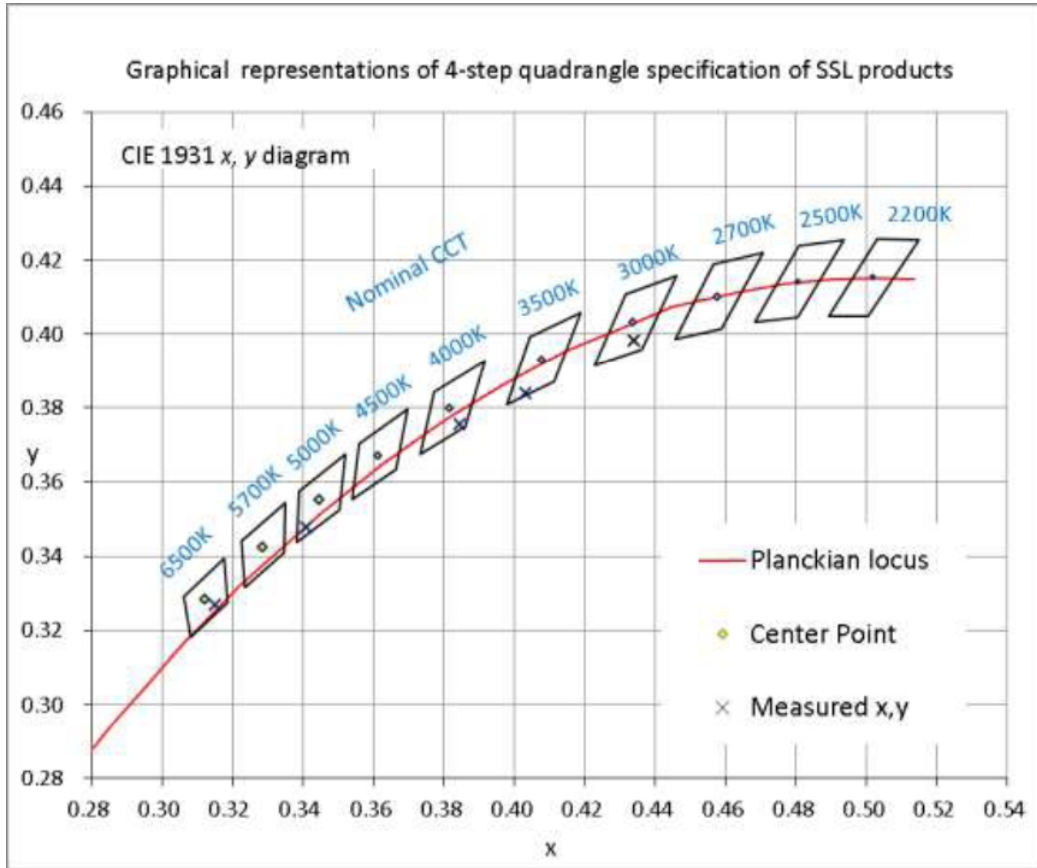
Criteria Item	Result				
	3000K	3500K	4000K	5000K	6500K
Input Voltage & Frequency	277.02 V ~60Hz	277.01 V ~60Hz	276.97 V ~60Hz	276.97 V ~60Hz	276.99 V ~60Hz
Power Factor	0.908	0.909	0.908	0.908	0.909
I-THD	11.71 %	11.63%	11.69%	11.84 %	11.67 %

3.4 Color Rendering Details

3000K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
83	92	96	83	83	90	83	61	12	81	83	76	85	99	75
3500K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
84	91	96	84	84	88	85	66	17	79	84	71	86	98	78
4000K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
87	92	96	88	87	89	88	71	27	81	88	71	88	98	81
5000K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
84	89	91	86	86	84	87	72	19	73	87	67	85	95	80
6500K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
83	87	88	85	84	82	88	72	14	68	86	62	84	94	79

4. Test Data

4.1 ANSI Chromaticity Quadrangles Diagram



4.2 ANSI/IES TM-30-18 Color Rendition

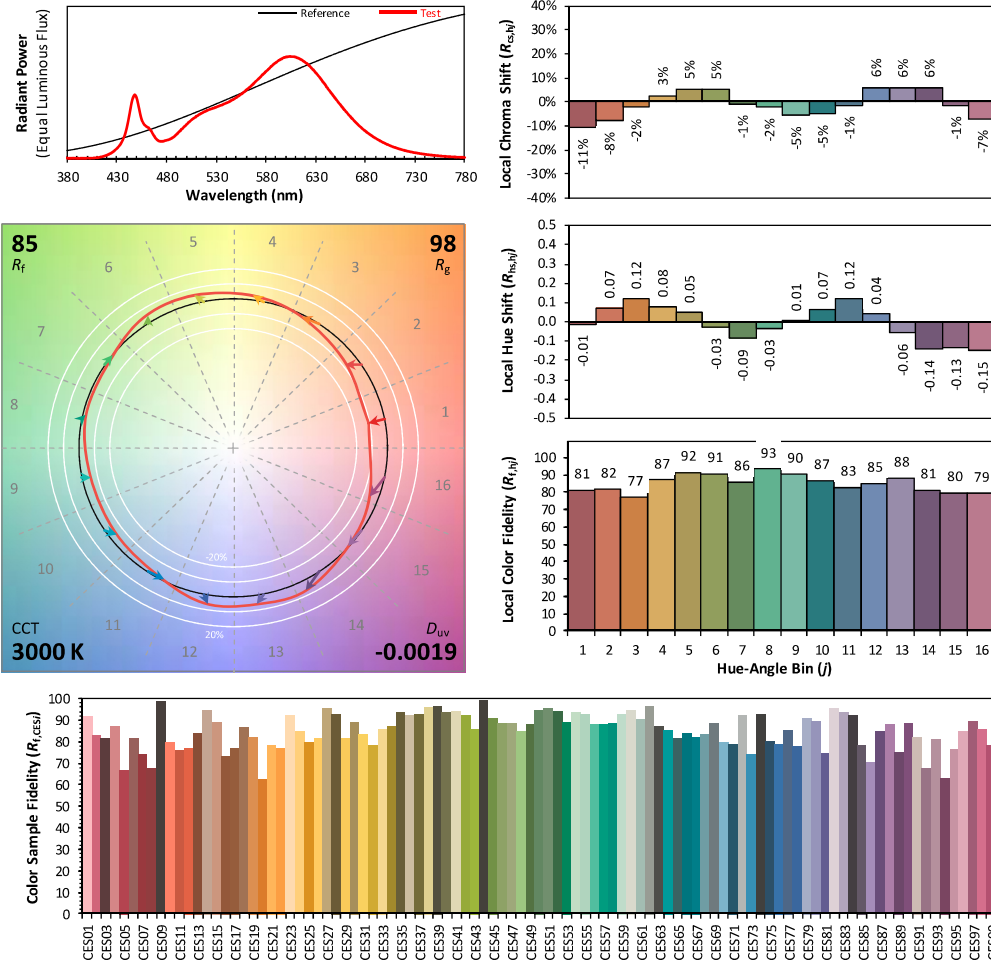
ANSI/IES TM-30-18 Color Rendition Report

Source: SPD

Manufacturer: Huizhou Zenith Technology Co Ltd

Date: 2023/5/13

Model: ZS-FL2*2-K40-3065 (3000K)



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

x 0.4342
 y 0.3983
 u' 0.2513
 v' 0.5187

CIE 13.3-1995
(CRI)

R_a 84
 R_9 12

Note:

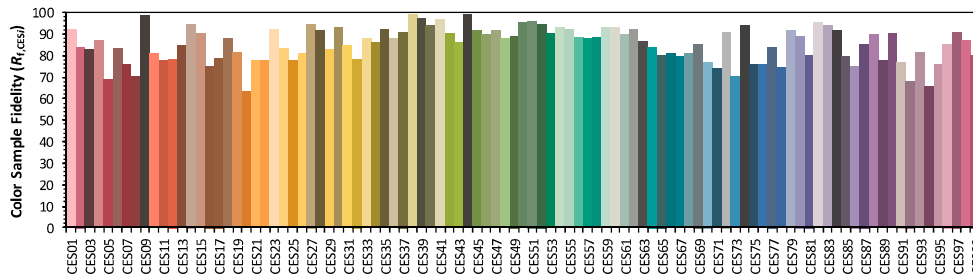
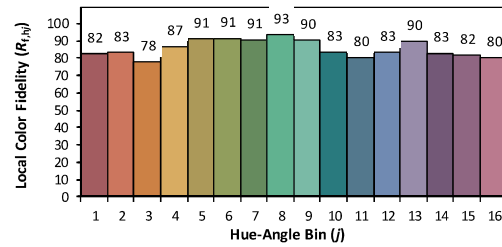
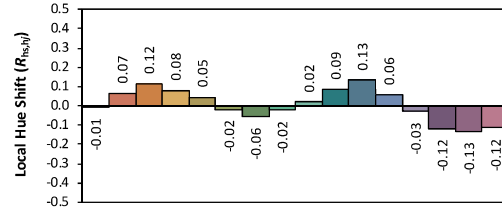
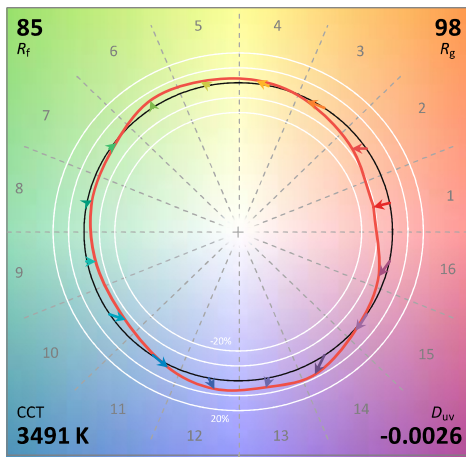
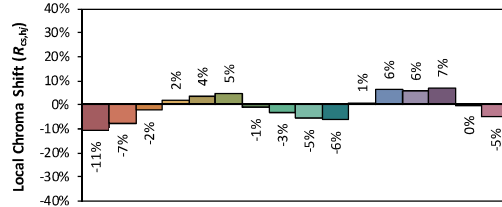
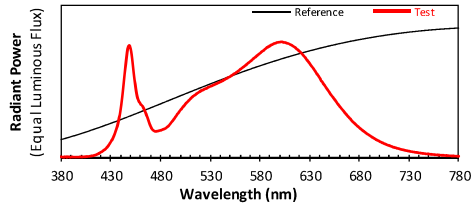
Colors are for visual orientation purposes only. Created with the IES TM-30-18 Calculator Version 2.00.

Source: SPD

Manufacturer: Huizhou Zenith Technology Co Ltd

Date: 2023/5/13

Model: ZS-FL2*2-K40-3065 (3500K)



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

x 0.4032
 y 0.3839
 u' 0.2371
 v' 0.5081

CIE 13.3-1995 (CRI)	
R_a	85
R_9	17

Note:

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



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ANSI/IES TM-30-18 Color Rendition Report

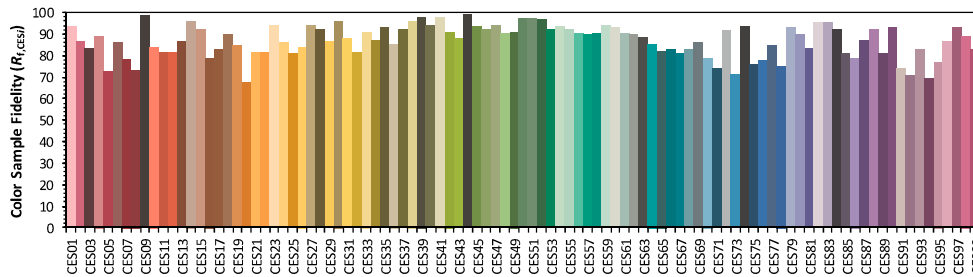
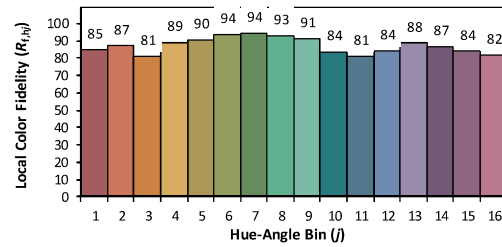
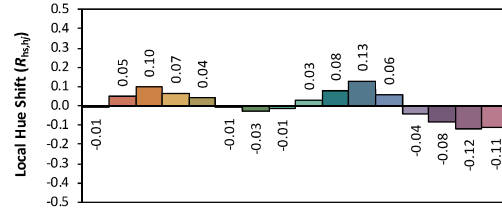
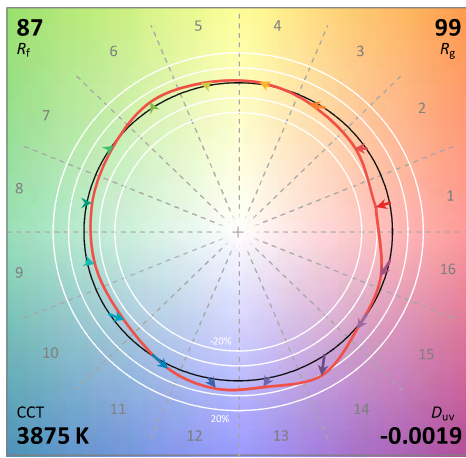
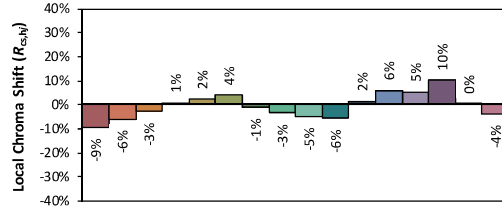
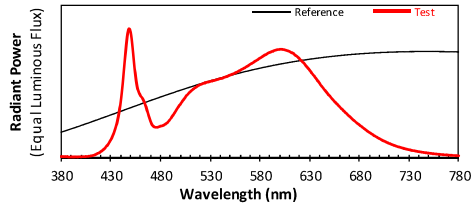
Ref. No.: LCZP23040039, V1.0

Source: SPD

Manufacturer: Huizhou Zenith Technology Co Ltd

Date: 2023/5/13

Model: ZS-FL2*2-K40-3065 (4000K)



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

x 0.3847
 y 0.3753
 u' 0.2285
 v' 0.5016

CIE 13.3-1995 (CRI)	
R_a	87
R_9	27

Note:

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

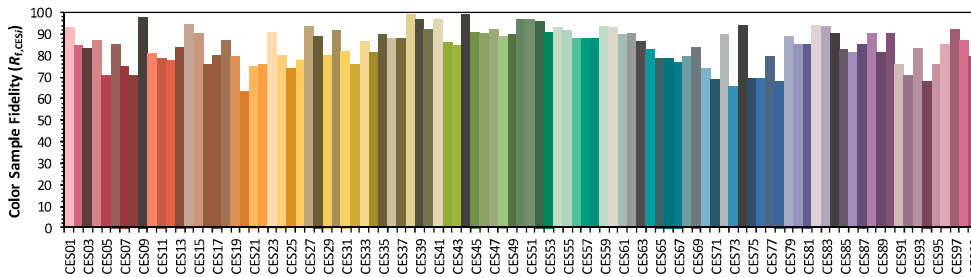
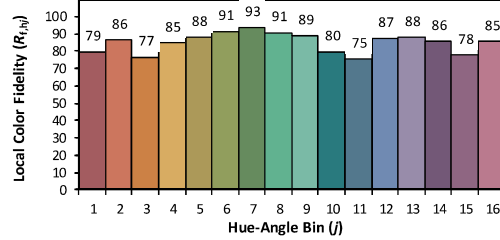
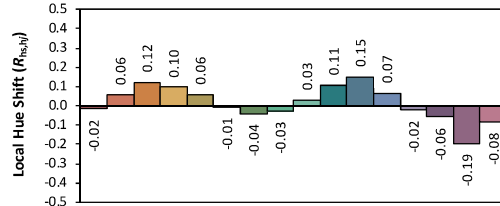
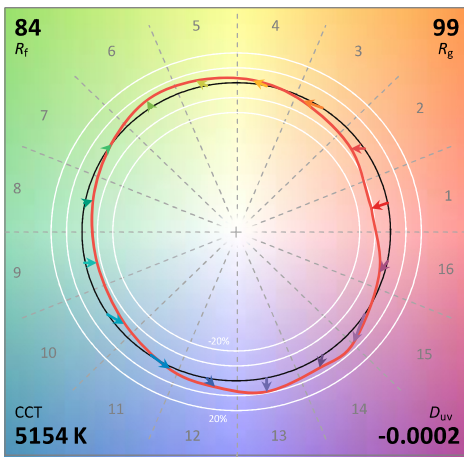
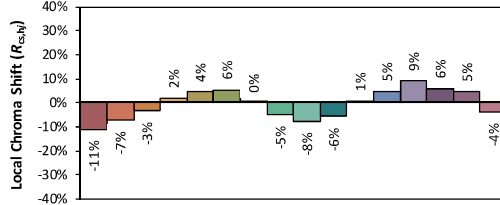
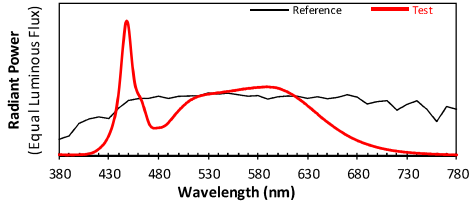
ANSI/IES TM-30-18 Color Rendition Report

Source: SPD

Manufacturer: Huizhou Zenith Technology Co Ltd

Date: 2023/5/13

Model: ZS-FL2*2-K40-3065 (5000K)



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

x 0.3409
 y 0.3478
 u' 0.2101
 v' 0.4822

CIE 13.3-1995 (CRI)	
R_a	85
R_9	19

Note:

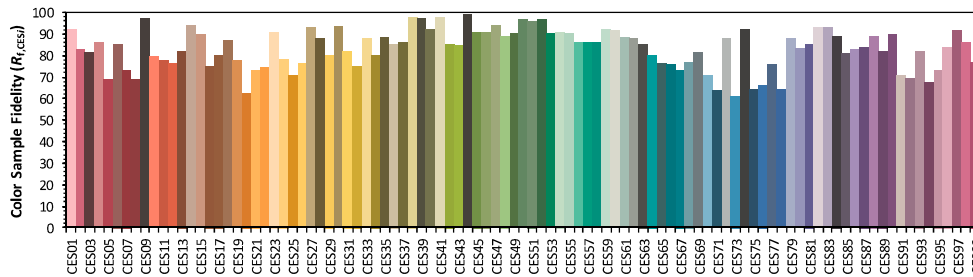
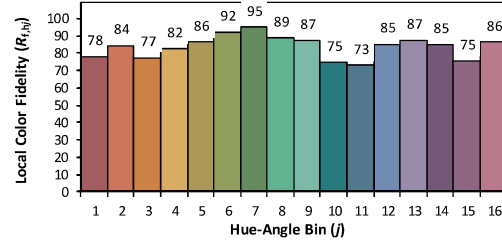
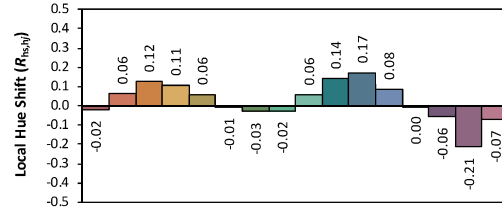
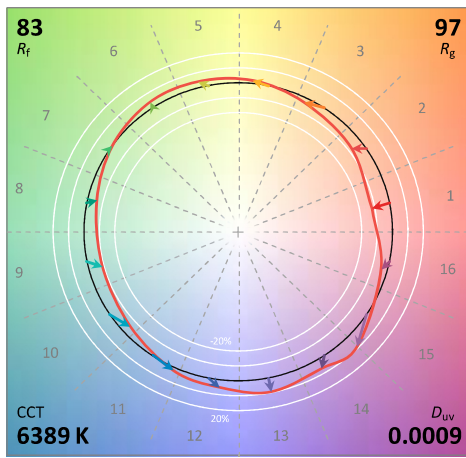
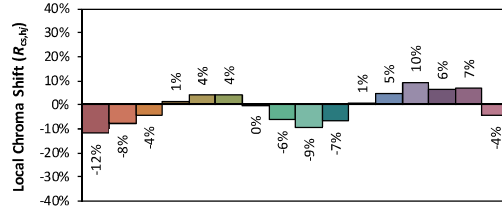
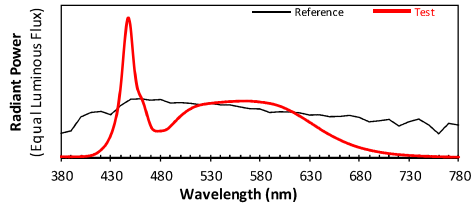
Colors are for visual orientation purposes only. Created with the IES TM-30-18 Calculator Version 2.00.

Source: SPD

Manufacturer: Huizhou Zenith Technology Co Ltd

Date: 2023/5/13

Model: ZS-FL2*2-K40-3065 (6500K)



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

x 0.3151
 y 0.3269
 u' 0.2003
 v' 0.4676

CIE 13.3-1995 (CRI)	
R_a	84
R_9	14

Note:

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

4.3 Goniometry Test Data of 3000K

CIE Type	Direct	Basic Luminous Shape	Rectangular w/Sides
Spacing Criteria (0-180)	1.16	Luminous Length	0.58 m
Spacing Criteria (90-270)	1.18	Luminous Width	0.58 m
Spacing Criteria (Diagonal)	1.28	Luminous Height	0.01 m
Test Distance	29.97 m		

4.4 Zonal Lumen Summary of 3000K

Zone	Lumens	%Lamp	%Fixt
0-20	671.46	14.00	14.00
0-30	1396.54	29.10	29.10
0-40	2221.9	46.30	46.30
0-60	3704.33	77.20	77.20
0-80	4534.99	94.50	94.50
0-90	4688.57	97.70	97.70
10-90	4512.71	94.10	94.10
20-40	1550.44	32.30	32.30
20-50	2351.1	49.00	49.00
40-70	1991.16	41.50	41.50
60-80	830.66	17.30	17.30
70-80	321.94	6.70	6.70
80-90	153.58	3.20	3.20
90-110	56.75	1.20	1.20
90-120	73.77	1.50	1.50
90-130	86.69	1.80	1.80
90-150	99.94	2.10	2.10
90-180	108.08	2.30	2.30
110-180	51.33	1.10	1.10
0-180	4796.65	100.00	100.00

Total Luminaire Efficiency = 100.00%

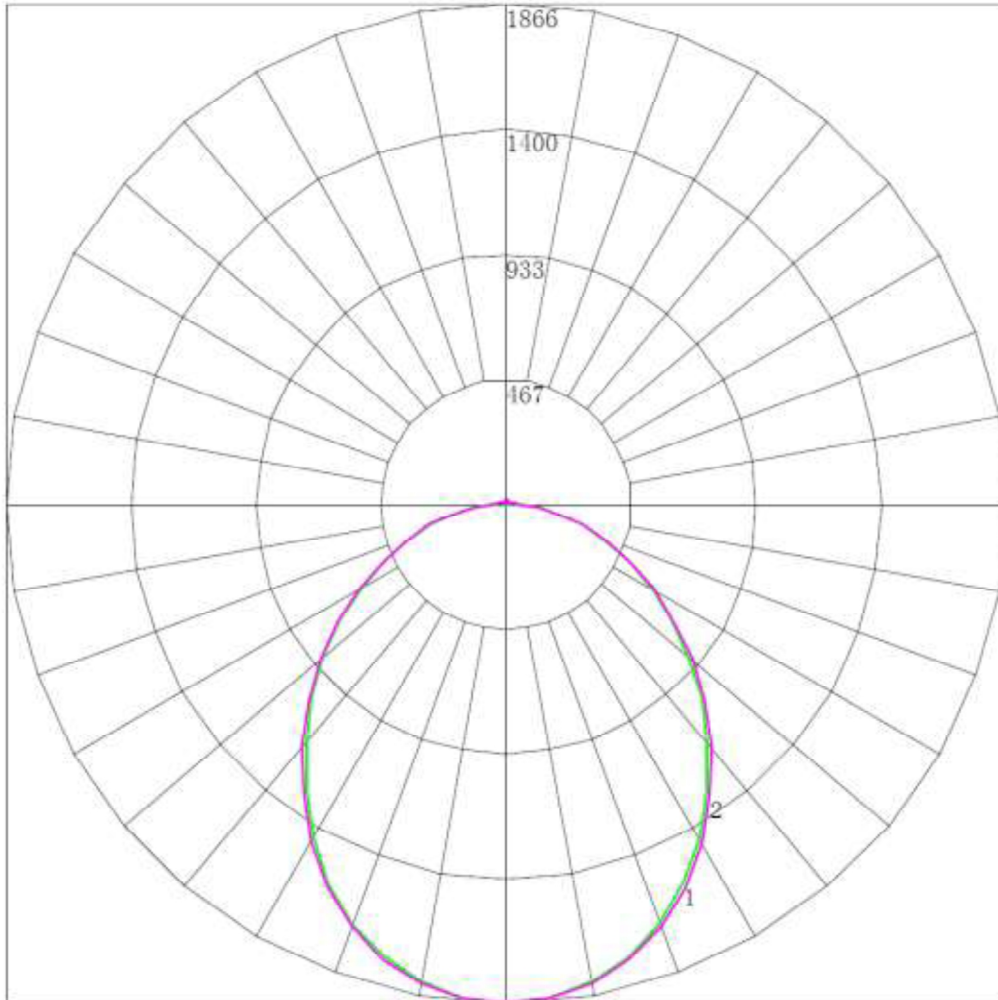
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	175.85
10-20	495.61
20-30	725.08
30-40	825.36
40-50	800.67
50-60	681.77
60-70	508.72
70-80	321.94
80-90	153.58
90-100	36.81
100-110	19.94
110-120	17.01
120-130	12.92
130-140	8.22
140-150	5.04
150-160	4.18
160-170	2.90
170-180	1.06



LCTECH

4.5 Polar Curves of 3000K



Maximum Candela = 1866.461 Located At Horizontal Angle = 0, Vertical Angle = 0
1 - Vertical Plane Through Horizontal Angles (0 - 180)
2 - Vertical Plane Through Horizontal Angles (90 - 270)



4.6 UGR Table of 3000K

Reflectances		70	70	50	50	30	70	70	50	50	30
Ceiling Cavity		70	70	50	50	30	70	70	50	50	30
Walls		50	30	50	30	30	50	30	50	30	30
Floor Cavity		20	20	20	20	20	20	20	20	20	20

Room Size		UGR Viewed Crosswise					UGR Viewed Endwise				
X=2H	Y=2H	16.2	17.7	16.6	18.1	18.5	16.3	17.8	16.7	18.2	18.5
	3H	17.9	19.4	18.3	19.7	20.1	18.0	19.4	18.4	19.8	20.2
	4H	18.7	20.0	19.1	20.4	20.8	18.8	20.1	19.2	20.5	20.9
	6H	19.3	20.6	19.8	21.0	21.4	19.4	20.6	19.8	21.0	21.5
	8H	19.6	20.8	20.1	21.2	21.7	19.7	20.8	20.1	21.3	21.7
	12H	19.8	21.0	20.3	21.4	21.9	19.9	21.0	20.3	21.5	21.9
4H	2H	16.8	18.1	17.2	18.5	18.9	16.8	18.2	17.3	18.6	19.0
	3H	18.8	19.9	19.2	20.4	20.8	18.9	20.0	19.3	20.4	20.9
	4H	19.7	20.7	20.2	21.2	21.7	19.8	20.8	20.2	21.2	21.7
	6H	20.5	21.4	21.0	21.9	22.4	20.6	21.5	21.1	21.9	22.4
	8H	20.9	21.7	21.4	22.2	22.7	20.9	21.7	21.4	22.2	22.7
	12H	21.2	22.0	21.7	22.5	23.0	21.2	22.0	21.7	22.5	23.0
8H	4H	20.1	20.9	20.6	21.4	21.9	20.1	21.0	20.6	21.5	22.0
	6H	21.1	21.8	21.6	22.3	22.8	21.1	21.8	21.6	22.3	22.9
	8H	21.5	22.2	22.1	22.7	23.3	21.6	22.2	22.1	22.8	23.3
	12H	22.0	22.6	22.6	23.1	23.7	22.1	22.6	22.6	23.2	23.8
12H	4H	20.2	20.9	20.7	21.4	21.9	20.2	21.0	20.7	21.5	22.0
	6H	21.2	21.8	21.7	22.3	22.9	21.2	21.9	21.8	22.4	23.0
	8H	21.8	22.3	22.3	22.9	23.5	21.8	22.4	22.3	22.9	23.5

Maximum UGR = 23.8

Note:

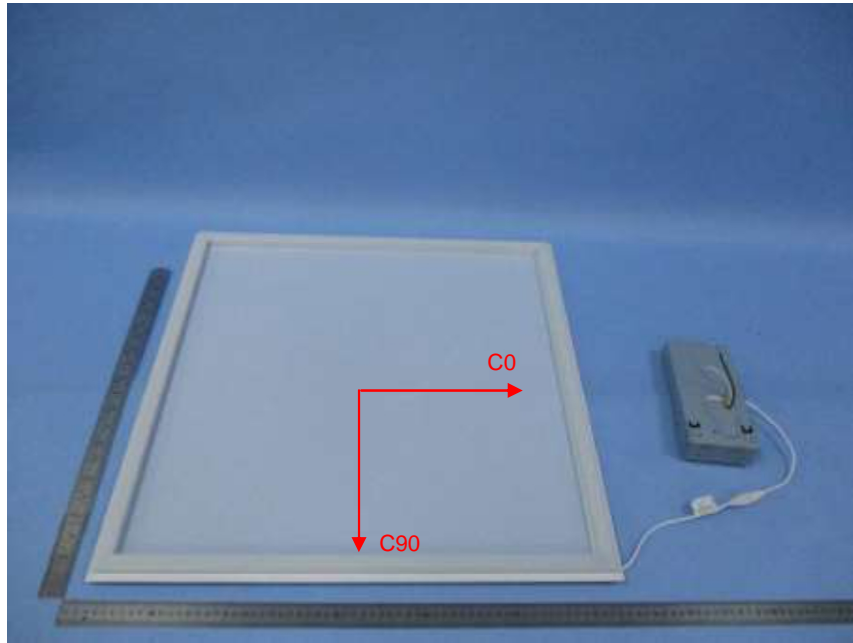
The Corrected UGR values generated by Photometric Toolbox 32(Lighting Analysts, Inc., version 2.8), based on Spacing to height ratio (S/H): 1.



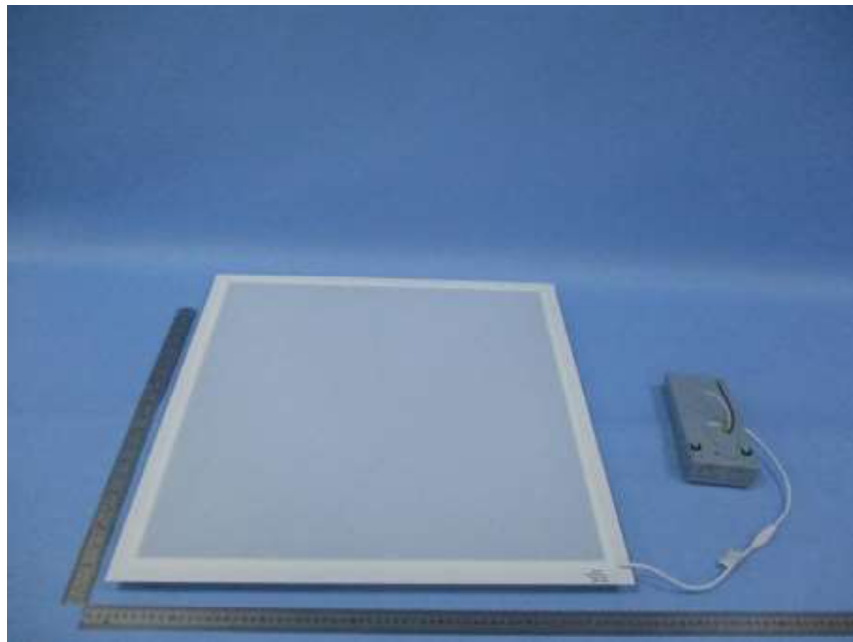
4.7 Candela Tabulation of 3000K

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	1866.461	1866.461	1866.461	1866.461	1866.461	1866.461	1866.461
5	1853.431	1853.652	1854.749	1854.534	1854.093	1854.137	1853.580
10	1817.486	1816.576	1818.483	1817.855	1819.463	1819.408	1818.934
15	1759.524	1755.903	1759.466	1759.345	1762.120	1762.048	1761.190
20	1672.806	1671.636	1678.827	1677.881	1681.165	1681.832	1683.902
25	1565.869	1568.042	1574.307	1576.614	1580.196	1580.780	1580.407
30	1444.104	1445.124	1453.569	1457.569	1475.397	1459.560	1461.810
35	1308.410	1309.621	1317.289	1321.647	1323.613	1325.346	1324.113
40	1166.426	1167.828	1175.830	1177.623	1182.616	1184.409	1187.748
45	1029.834	1029.631	1029.864	1047.338	1040.496	1043.919	1045.609
50	888.748	890.309	891.784	888.224	895.002	902.309	903.026
55	755.301	755.933	756.633	759.727	762.551	766.751	766.218
60	625.449	624.475	642.002	633.031	633.248	635.450	633.407
65	501.887	506.053	509.301	512.863	516.987	511.989	511.256
70	391.804	395.270	400.730	405.293	406.124	401.301	397.545
75	290.259	306.291	302.518	307.402	305.605	300.248	295.382
80	200.845	208.983	218.499	223.688	221.052	210.622	200.327
85	128.055	136.851	149.346	153.251	148.642	136.232	124.372
90	71.891	59.552	68.938	72.466	69.708	63.637	53.746
95	19.770	21.573	22.753	24.529	28.559	29.800	29.316
100	6.740	10.113	17.796	19.804	22.038	23.303	23.098
105	17.973	17.303	19.598	20.929	21.363	20.166	19.988
110	16.175	14.382	18.021	20.253	20.239	17.701	18.212
115	15.726	14.606	17.120	18.903	19.339	16.581	17.323
120	15.726	14.831	16.218	17.778	16.866	15.685	15.991
125	15.277	14.382	12.389	16.203	13.043	14.564	15.102
130	14.378	13.483	11.713	11.927	11.693	13.220	13.770
135	13.480	12.584	10.361	5.626	10.344	12.100	12.437
140	10.784	10.337	6.532	6.301	6.296	8.963	11.105
145	8.088	7.865	7.659	7.651	7.421	7.394	7.551
150	8.986	8.764	8.560	8.551	8.545	8.514	8.439
155	9.436	9.213	9.010	9.002	8.995	8.963	8.884
160	9.885	9.663	9.461	9.452	9.445	9.411	9.328
165	10.334	10.337	10.362	10.352	10.344	10.083	10.216
170	11.233	11.011	11.488	11.252	11.019	10.979	11.105
175	12.581	12.359	12.164	11.927	11.918	12.324	12.437
180	6.283	6.283	6.283	6.283	6.283	6.283	6.283

Appendix A Product Photo



Picture 1



Picture 2

****End of test report****