

LM-79 Test Report

Relevant Standards

IES LM-79-2008
IES TM-30-2015
CIE 13.3-1995

Product SKU

FENCER® Series FOIL™ SELECT - Color Selectable Lighting System
SKU: DI-120V-FLSEL-32-WH

Test Conditions

Test Temperature: 26.5 °C
Luminaire Sample Length: 32.0 in.
Power Supply: Agilent E3634A DC Power Supply
Voltage: 120.00 VDC
Current: 0.21 A
Power Consumption: 25.2 W

Test Date

12/26/2019

Prepared By

Olivia Tanguileg

Olivia M. Tanguileg, Electrical Engineer

Approved By

Andrew Lassen

Andrew Lassen, Compliance Manager

Integrating Sphere

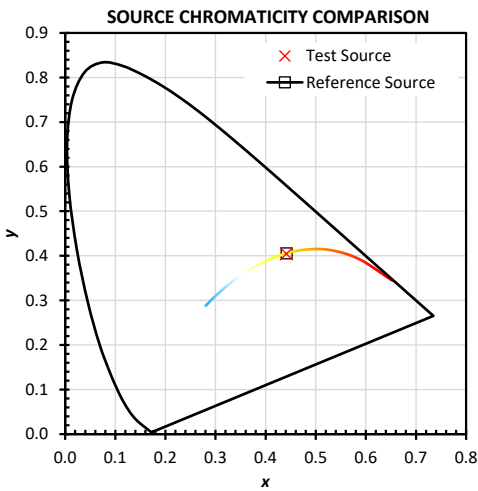
SUMMARY OF RESULTS

Metric	Test	Reference	Notes	Metric	Test	Reference	Notes
R_f	90	100	IES TM-30-15 Fidelity Index	CCT	2931	2932	Correlated Color Temperature
R_g	97	100	IES TM-30-15 Gamut Index	D_{uv}	-0.0005	0.0000	Distance from the blackbody locus
R_a (CRI)	92	100	CIE Test Color Method General Index	x	0.4412	0.4419	CIE 1931 chromaticity coordinate
R_9	54	100	CIE Test Color Method Sample Nine Score	y	0.4043	0.4057	CIE 1931 chromaticity coordinate
LER	293	160	Luminous Efficacy of Radiation	u	0.2532	0.2531	CIE 1960 chromaticity coordinate
Lumens	2092	1852	Luminous Flux	v	0.3481	0.3485	CIE 1960 chromaticity coordinate
$R_{f,skin}$	94	100	Average of CES15 and CES18 (skin)	u'	0.2532	0.2531	CIE 1976 chromaticity coordinate
				v'	0.5221	0.5228	CIE 1976 chromaticity coordinate

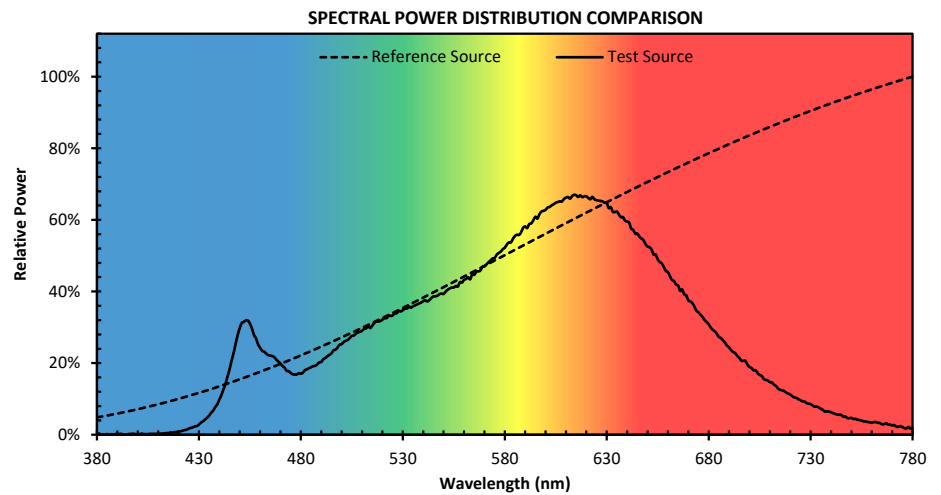
COLOR RENDERING INDEX

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
93.2	98.2	97.0	92.4	93.5	96.9	89.5	78.3	53.6	95.4	94.3	84.0	94.9	99.2

SOURCE PROPERTIES

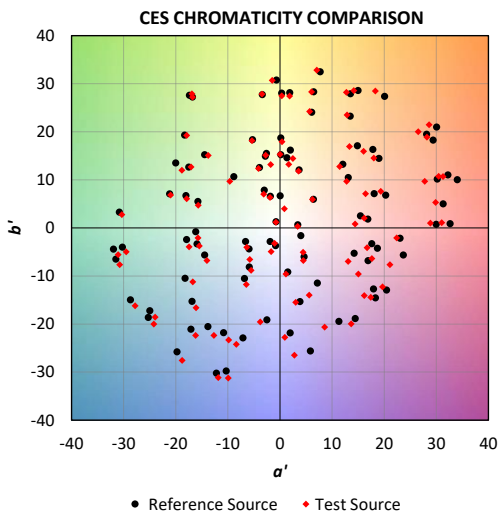


This chart plots the chromaticity of the test and reference sources in the CIE 1931 chromaticity space.

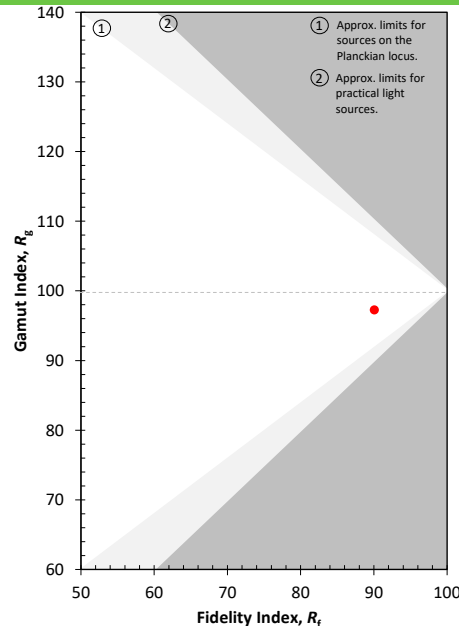


This chart displays the spectral power distributions for the test and reference source. Each SPD has been normalized so that the maximum values is 100%.

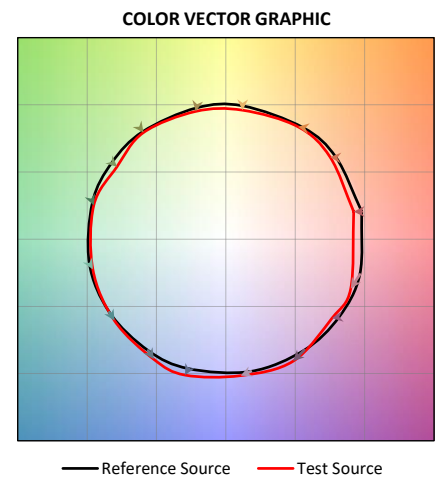
GENERAL COLOR RENDITION



This plot shows the shift in chromaticity for each individual CES.



This plot shows the R_f and R_g values relative to possible values.



This plot shows the average chromaticity shift for the samples within each of 16 hue bins. The values are normalized so that the reference is a circle.

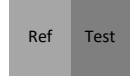
COLOR SAMPLE COMPARISON (APPROXIMATION)

CES 1 Type C	CES 2 Type C	CES 3 Type A	CES 4 Type A	CES 5 Type D	CES 6 Type C	CES 7 Type E	CES 8 Type D
CES 9 Type F	CES 10 Type G	CES 11 Type C	CES 12 Type A	CES 13 Type F	CES 14 Type E	CES 15 Type B	CES 16 Type C
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CES 97 Type F	CES 98 Type A	CES 99 Type E					

NOTE: CES stands for "Color Evaluation Sample", these 99 samples are used in place of the 16 R values. The colors shown are approximate and depend on proper monitor calibration. Some colors may be outside of the gamut of the monitor, and will not be displayed accurately. For each sample, the color on the left represents the reference source, and the color on the right represents the test source.

Sample Type:

- A - Nature
- B - Skin
- C - Textiles
- D - Paints

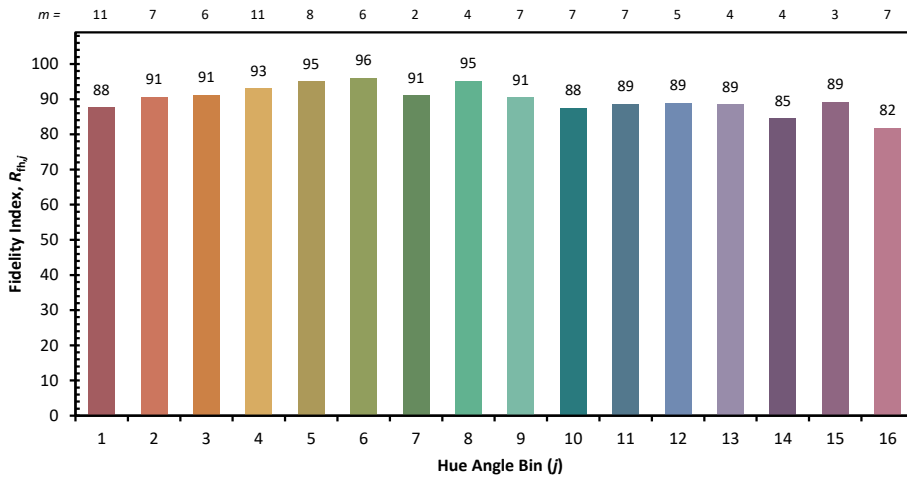


Elemental

Competitor



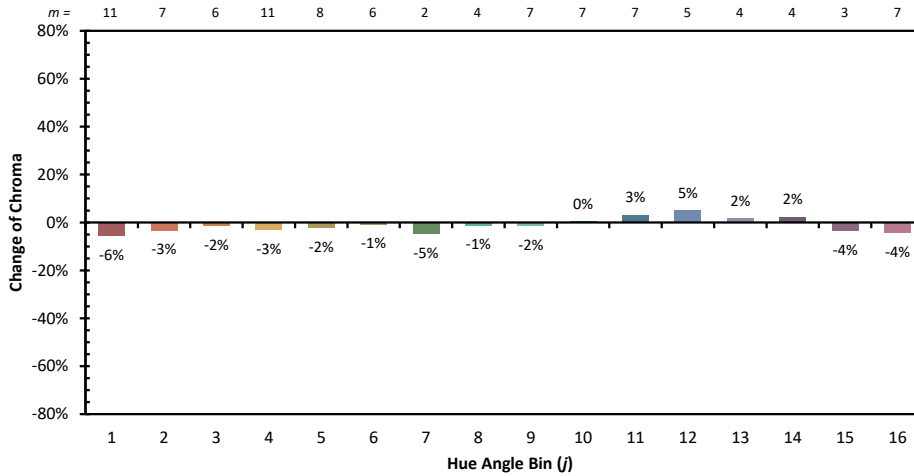
COLOR RENDITION BY HUE



j	Hue Angle
1	0.0°-22.5°
2	22.5° - 45.0°
3	45.0° - 67.5°
4	67.5° - 90.0°
5	90.0°-112.5°
6	112.5°-135.0°
7	135.0°-157.5°
8	157.5°-180.0°
9	180.0°-202.5°
10	202.5°-225.0°
11	225.0°-247.5°
12	247.5°-270.0°
13	270.0°-292.5°
14	292.5°-315.0°
15	315.0°-337.5°
16	337.5°-360.0°

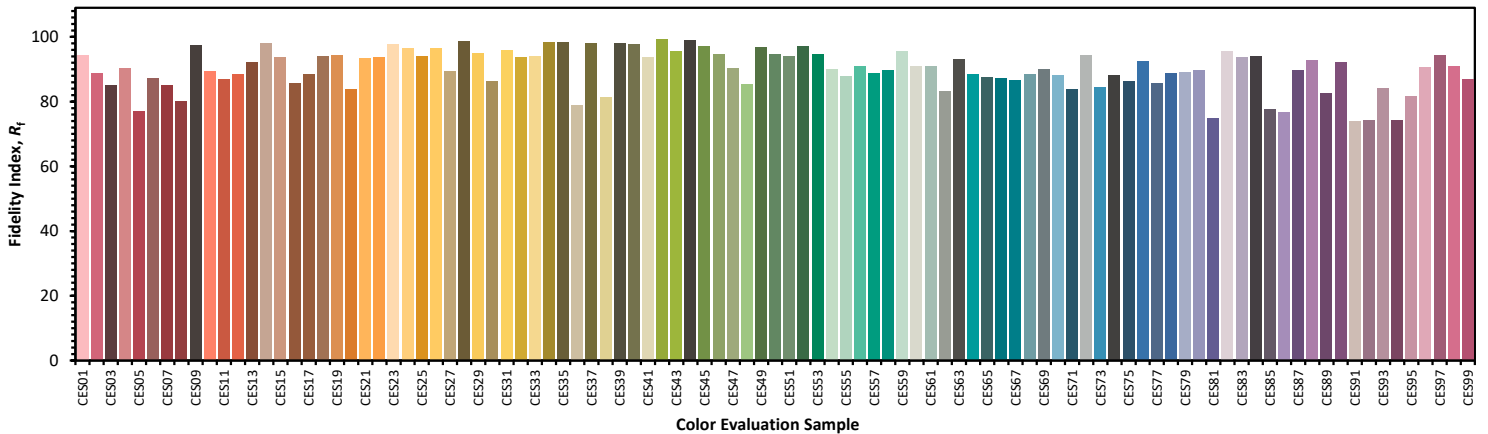
m = Samples per Angle Bin

This chart displays the average Fidelity Index for all samples within the hue bin. The number of samples per bin, which can vary based on the CCT used for the calculation, is shown at the top. The color of the bar is based on the average chromaticity under the 5000 K reference illuminant; the colors may not display accurately depending on the calibration of the monitor, and should be used for orientation only.



This chart displays the change in chroma for the average sample within each hue bin. The number of samples per bin, which can vary based on the CCT used for the calculation, is shown at the top. The color of the bar is based on the average chromaticity under the 5000 K reference illuminant; the colors may not display accurately depending on the calibration of the monitor, and should be used for orientation only.

COLOR FIDELITY BY SAMPLE



This chart displays the Fidelity Index for each of the 99 CES. The CES are arranged by their hue angle under the 5000 K reference source, which was also used to determine the color of each bar. The colors are approximate and depend on proper monitor calibration. Some colors may be outside of the gamut of the monitor, and will not be displayed accurately.

Goniophotometer Test

SUMMARY OF RESULTS

Luminaire: FENCER® Series FOIL™ SELECT - Color Selectable Lighting System

SKU: DI-120V-FLSEL-32-WH

Luminous Flux: 2093 Lumens

Power Consumption: 25.2 Watts

Efficacy: 83.05 Lumens/Watt

Spacing Criterion (0-180): 1.24

Spacing Criterion (90-270): 1.22

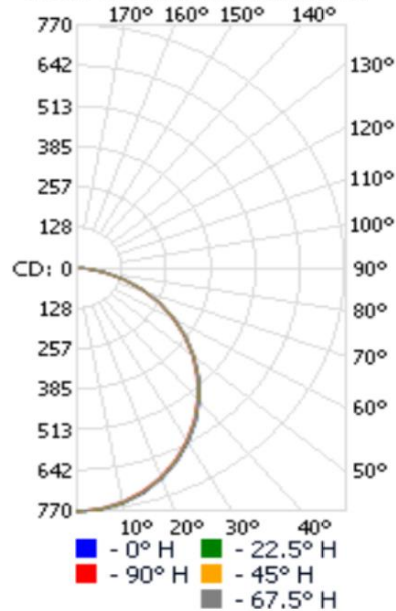
Graphs below are for reference, full IES files are available on Diode LED website

DISTRIBUTION CHARTS AND TABLES

Zonal Lumen Data

Zone	Lumens	%Luminaire
0-20	278.22	13.30
0-30	585.68	28.00
0-40	950.96	45.40
0-60	1659.29	79.30
0-80	2054.19	98.20
0-90	2092.65	100.00
20-40	672.73	32.10
20-50	1046.66	50.00
40-70	961.07	45.90
60-80	394.90	18.90
70-80	142.16	6.80
80-90	38.45	1.80
90-180	0.00	0.00
0-180	2092.65	100.00

Polar Candela Distribution



Illuminance at a Distance

	Center Beam fc	Beam Width	
2.5ft	123 fc	6.9 ft	6.9 ft
5.0ft	30.8 fc	13.8 ft	13.9 ft
7.5ft	13.7 fc	20.6 ft	20.8 ft
10.0ft	7.69 fc	27.5 ft	27.8 ft
12.5ft	4.92 fc	34.4 ft	34.7 ft
15.0ft	3.42 fc	41.3 ft	41.6 ft

■ Vert. Spread: 108.0°
 ■ Horiz. Spread: 108.5°



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IES TM-30-2015
CIE 13.3-1995

Product SKU

FENCER® Series FOIL™ SELECT - Color Selectable Lighting System
SKU: DI-120V-FLSEL-32-WH

Test Conditions

Test Temperature: 26.5 °C
Luminaire Sample Length: 32.0 in.
Power Supply: Agilent E3634A DC Power Supply
Voltage: 120.00 VDC
Current: 0.20 A
Power Consumption: 24 W

Test Date

12/26/2019

Prepared By



Olivia M. Tanguileg, Electrical Engineer

Approved By



Andrew Lassen, Compliance Manager

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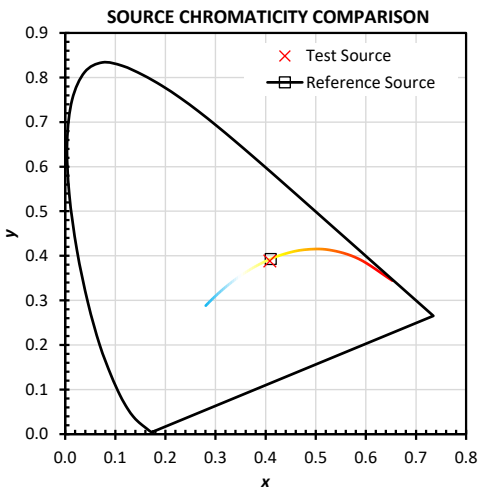
SUMMARY OF RESULTS

Metric	Test	Reference	Notes	Metric	Test	Reference	Notes
R_f	90	100	IES TM-30-15 Fidelity Index	CCT	3418	3417	Correlated Color Temperature
R_g	98	100	IES TM-30-15 Gamut Index	D_{uv}	-0.0016	0.0000	Distance from the blackbody locus
R_a (CRI)	94	100	CIE Test Color Method General Index	x	0.4083	0.4100	CIE 1931 chromaticity coordinate
R_9	63	100	CIE Test Color Method Sample Nine Score	y	0.3886	0.3930	CIE 1931 chromaticity coordinate
LER	294	178	Luminous Efficacy of Radiation	u	0.2385	0.2378	CIE 1960 chromaticity coordinate
Lumens	2242	1852	Luminous Flux	v	0.3406	0.3419	CIE 1960 chromaticity coordinate
$R_{f,skin}$	94	100	Average of CES15 and CES18 (skin)	u'	0.2385	0.2378	CIE 1976 chromaticity coordinate
				v'	0.5108	0.5129	CIE 1976 chromaticity coordinate

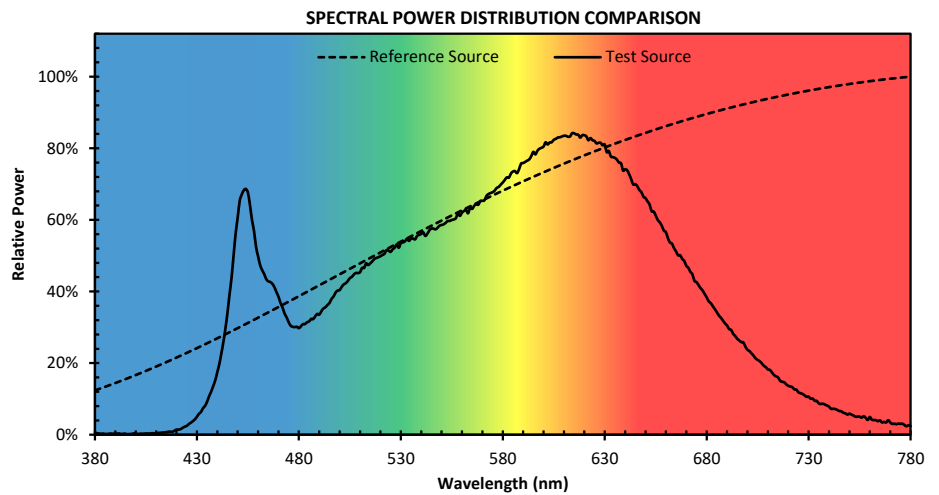
COLOR RENDERING INDEX

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
95.2	99.1	97.6	93.4	94.7	95.9	91.2	83.2	63.3	96.9	95.0	78.6	96.9	99.6

SOURCE PROPERTIES

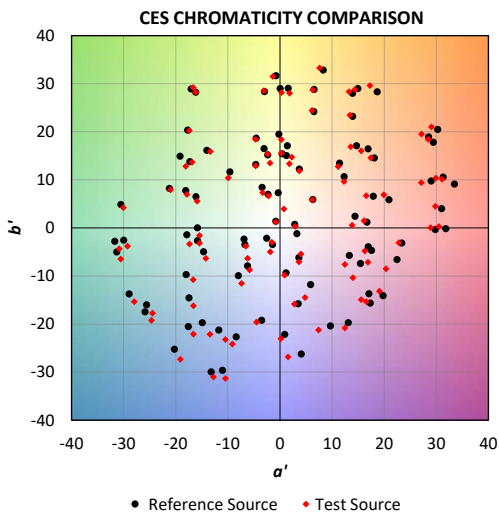


This chart plots the chromaticity of the test and reference sources in the CIE 1931 chromaticity

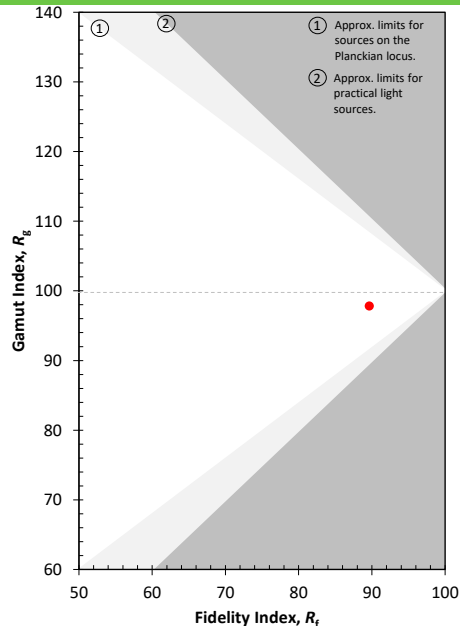


This chart displays the spectral power distributions for the test and reference source. Each SPD has been normalized so that the maximum values is 100%.

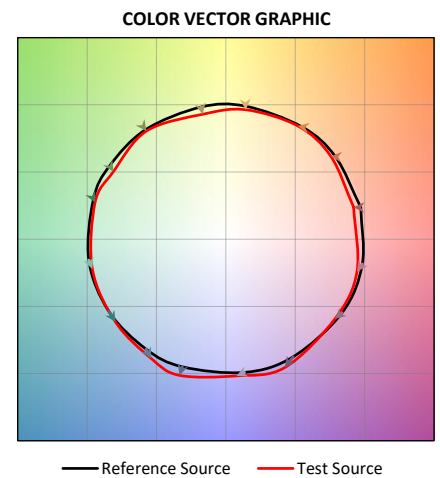
GENERAL COLOR RENDITION



This plot shows the shift in chromaticity for each individual CES.



This plot shows the R_f and R_g values relative to possible values.



This plot shows the average chromaticity shift for the samples within each of 16 hue bins. The values are normalized so that the reference is a circle.

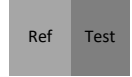
COLOR SAMPLE COMPARISON (APPROXIMATION)

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CES 97 Type F	CES 98 Type A	CES 99 Type E					

NOTE: CES stands for "Color Evaluation Sample", these 99 samples are used in place of the 16 R values. The colors shown are approximate and depend on proper monitor calibration. Some colors may be outside of the gamut of the monitor, and will not be displayed accurately. For each sample, the color on the left represents the reference source, and the color on the right represents the test source.

Sample Type:

- A - Nature
- B - Skin
- C - Textiles
- D - Paints

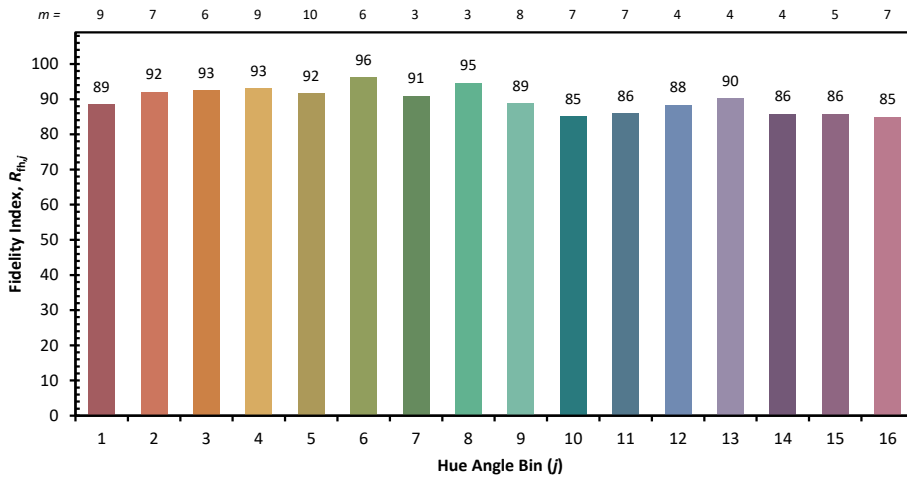


Elemental

Competitor



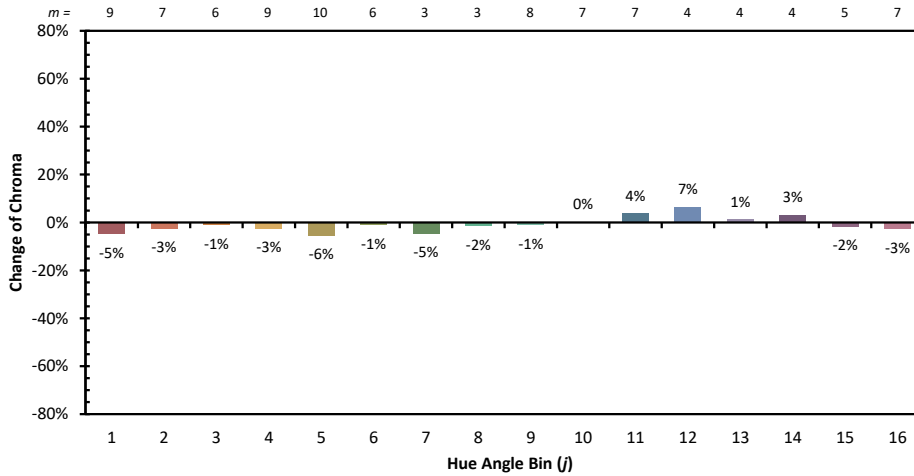
COLOR RENDITION BY HUE



j	Hue Angle
1	0.0°-22.5°
2	22.5° - 45.0°
3	45.0° - 67.5°
4	67.5° - 90.0°
5	90.0°-112.5°
6	112.5°-135.0°
7	135.0°-157.5°
8	157.5°-180.0°
9	180.0°-202.5°
10	202.5°-225.0°
11	225.0°-247.5°
12	247.5°-270.0°
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14	292.5°-315.0°
15	315.0°-337.5°
16	337.5°-360.0°

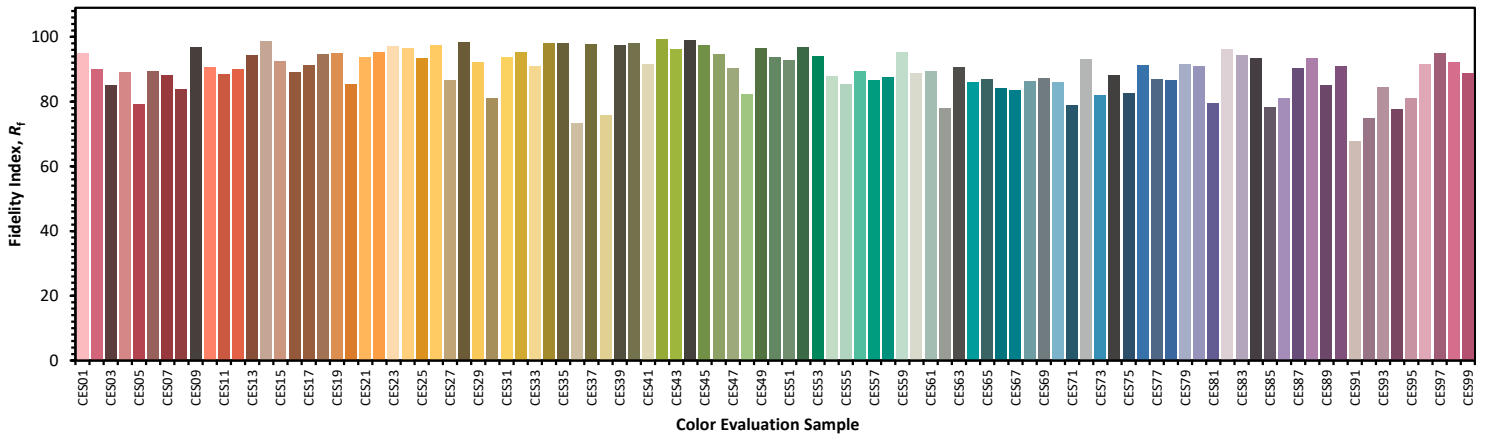
m = Samples per Angle Bin

This chart displays the average Fidelity Index for all samples within the hue bin. The number of samples per bin, which can vary based on the CCT used for the calculation, is shown at the top. The color of the bar is based on the average chromaticity under the 5000 K reference illuminant; the colors may not display accurately depending on the calibration of the monitor, and should be used for orientation only.



This chart displays the change in chroma for the average sample within each hue bin. The number of samples per bin, which can vary based on the CCT used for the calculation, is shown at the top. The color of the bar is based on the average chromaticity under the 5000 K reference illuminant; the colors may not display accurately depending on the calibration of the monitor, and should be used for orientation only.

COLOR FIDELITY BY SAMPLE



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Goniophotometer Test

SUMMARY OF RESULTS

Luminaire: FENCER® Series FOIL™ SELECT - Color Selectable Lighting System

SKU: DI-120V-FLSEL-32-WH

Luminous Flux: 2367 Lumens

Power Consumption: 24 Watts

Efficacy: 98.62 Lumens/Watt

Spacing Criterion (0-180): 1.24

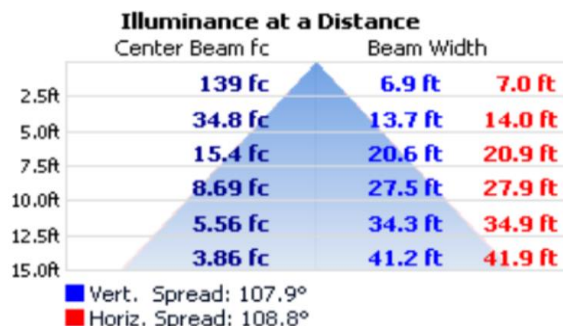
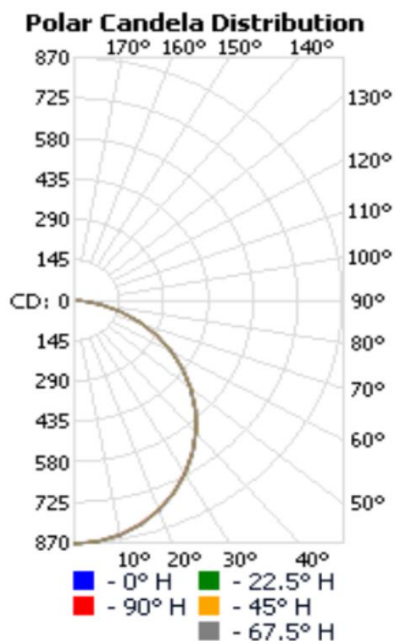
Spacing Criterion (90-270): 1.24

Graphs below are for reference, full IES files are available on Diode LED website

DISTRIBUTION CHARTS AND TABLES

Zonal Lumen Data

Zone	Lumens	%Luminaire
0-20	314.50	13.30
0-30	662.26	28.00
0-40	1075.52	45.40
0-60	1876.87	79.30
0-80	2323.66	98.20
0-90	2366.82	100.00
20-40	761.03	32.20
20-50	1183.95	50.00
40-70	1087.47	45.90
60-80	446.79	18.90
70-80	160.67	6.80
80-90	43.16	1.80
90-180	0.00	0.00
0-180	2366.82	100.00



LM-79 Test Report

Relevant Standards

IES LM-79-2008
IES TM-30-2015
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Product SKU

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SKU: DI-120V-FLSEL-32-WH

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Test Temperature: 26.5 °C
Luminaire Sample Length: 32.0 in.
Power Supply: Agilent E3634A DC Power Supply
Voltage: 120.00 VDC
Current: 0.20 A
Power Consumption: 24 W

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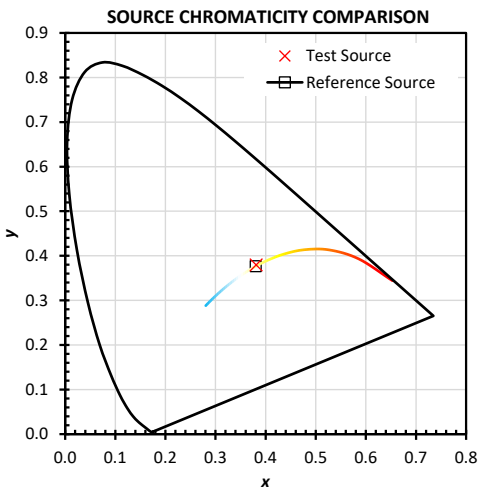
SUMMARY OF RESULTS

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R_f	89	100	IES TM-30-15 Fidelity Index	CCT	4009	4008	Correlated Color Temperature
R_g	97	100	IES TM-30-15 Gamut Index	D_{uv}	0.0012	0.0000	Distance from the blackbody locus
R_a (CRI)	93	100	CIE Test Color Method General Index	x	0.3809	0.3801	CIE 1931 chromaticity coordinate
R_9	61	100	CIE Test Color Method Sample Nine Score	y	0.3795	0.3765	CIE 1931 chromaticity coordinate
LER	298	191	Luminous Efficacy of Radiation	u	0.2243	0.2249	CIE 1960 chromaticity coordinate
Lumens	2244	1852	Luminous Flux	v	0.3352	0.3343	CIE 1960 chromaticity coordinate
$R_{f,skin}$	93	100	Average of CES15 and CES18 (skin)	u'	0.2243	0.2249	CIE 1976 chromaticity coordinate
				v'	0.5029	0.5014	CIE 1976 chromaticity coordinate

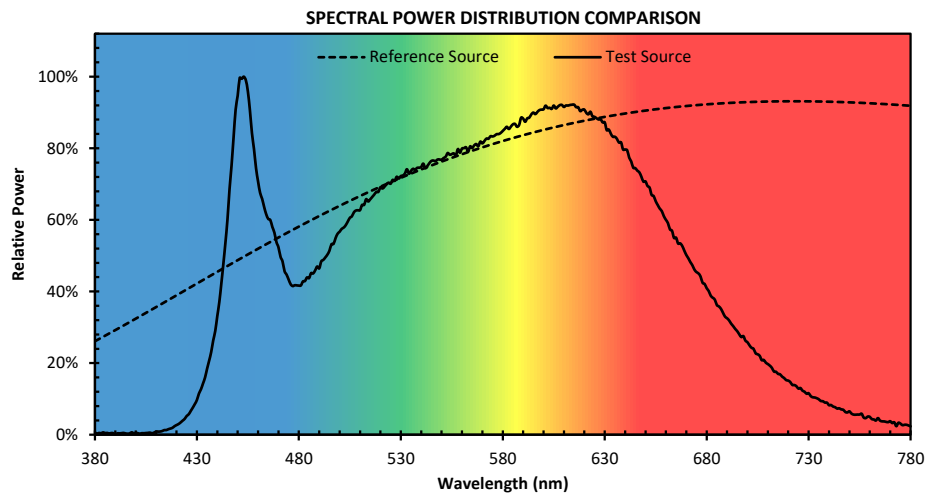
COLOR RENDERING INDEX

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
93.3	96.9	98.4	92.1	92.3	94.3	93.0	84.0	61.2	91.4	93.0	72.7	94.6	99.1

SOURCE PROPERTIES

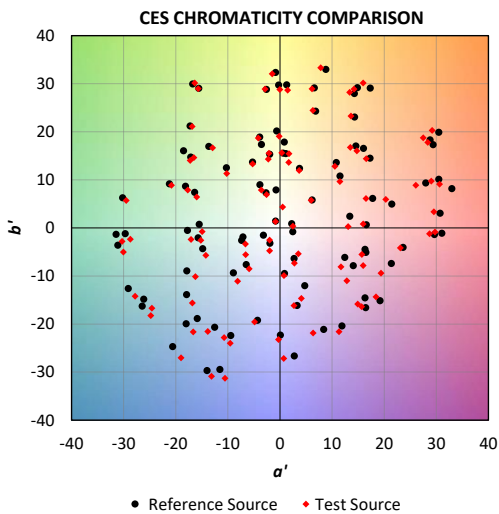


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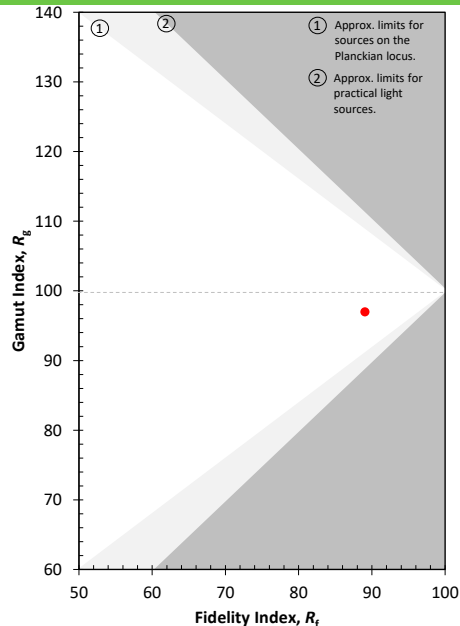


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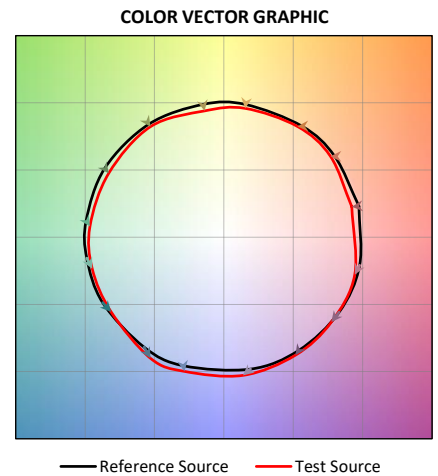
GENERAL COLOR RENDITION



This plot shows the shift in chromaticity for each individual CES.



This plot shows the R_f and R_g values relative to possible values.



This plot shows the average chromaticity shift for the samples within each of 16 hue bins. The values are normalized so that the reference is a circle.

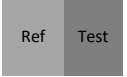
COLOR SAMPLE COMPARISON (APPROXIMATION)

CES 1 Type C	CES 2 Type C	CES 3 Type A	CES 4 Type A	CES 5 Type D	CES 6 Type C	CES 7 Type E	CES 8 Type D
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CES 25 Type A	CES 26 Type C	CES 27 Type A	CES 28 Type G	CES 29 Type C	CES 30 Type A	CES 31 Type D	CES 32 Type C
CES 33 Type D	CES 34 Type G	CES 35 Type G	CES 36 Type A	CES 37 Type A	CES 38 Type A	CES 39 Type F	CES 40 Type F
CES 41 Type C	CES 42 Type F	CES 43 Type C	CES 44 Type F	CES 45 Type G	CES 46 Type E	CES 47 Type C	CES 48 Type D
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CES 73 Type F	CES 74 Type C	CES 75 Type F	CES 76 Type F	CES 77 Type A	CES 78 Type F	CES 79 Type C	CES 80 Type G
CES 81 Type A	CES 82 Type C	CES 83 Type C	CES 84 Type F	CES 85 Type A	CES 86 Type C	CES 87 Type F	CES 88 Type F
CES 89 Type A	CES 90 Type E	CES 91 Type A	CES 92 Type A	CES 93 Type D	CES 94 Type C	CES 95 Type A	CES 96 Type A
CES 97 Type F	CES 98 Type A	CES 99 Type E					

NOTE: CES stands for "Color Evaluation Sample", these 99 samples are used in place of the 16 R values. The colors shown are approximate and depend on proper monitor calibration. Some colors may be outside of the gamut of the monitor, and will not be displayed accurately. For each sample, the color on the left represents the reference source, and the color on the right represents the test source.

Sample Type:

- A - Nature
- B - Skin
- C - Textiles
- D - Paints



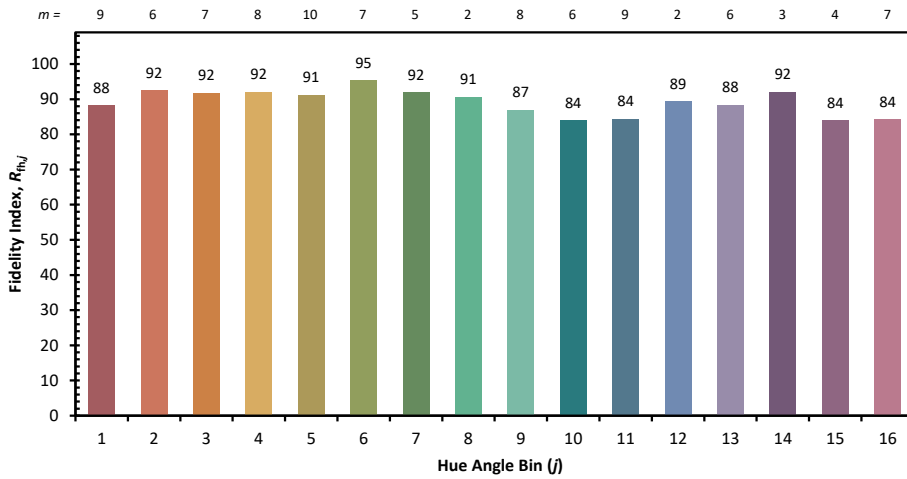
Elemental



Competitor



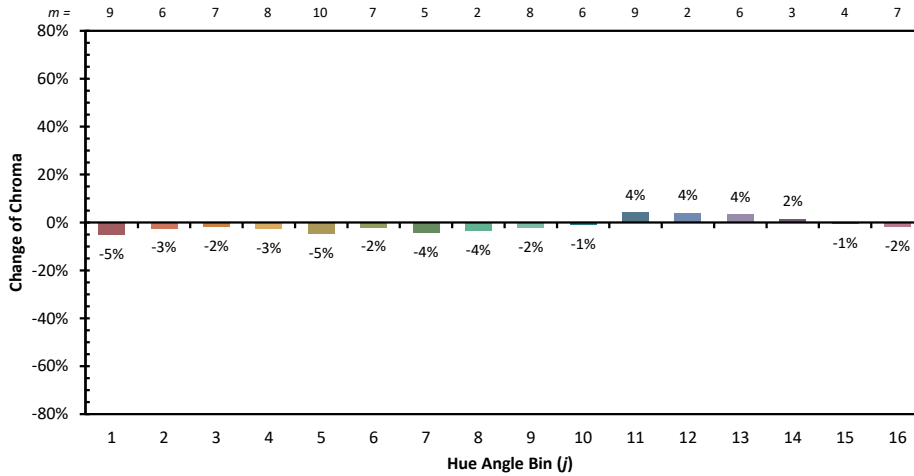
COLOR RENDITION BY HUE



j	Hue Angle
1	0.0°-22.5°
2	22.5° - 45.0°
3	45.0° - 67.5°
4	67.5° - 90.0°
5	90.0°-112.5°
6	112.5°-135.0°
7	135.0°-157.5°
8	157.5°-180.0°
9	180.0°-202.5°
10	202.5°-225.0°
11	225.0°-247.5°
12	247.5°-270.0°
13	270.0°-292.5°
14	292.5°-315.0°
15	315.0°-337.5°
16	337.5°-360.0°

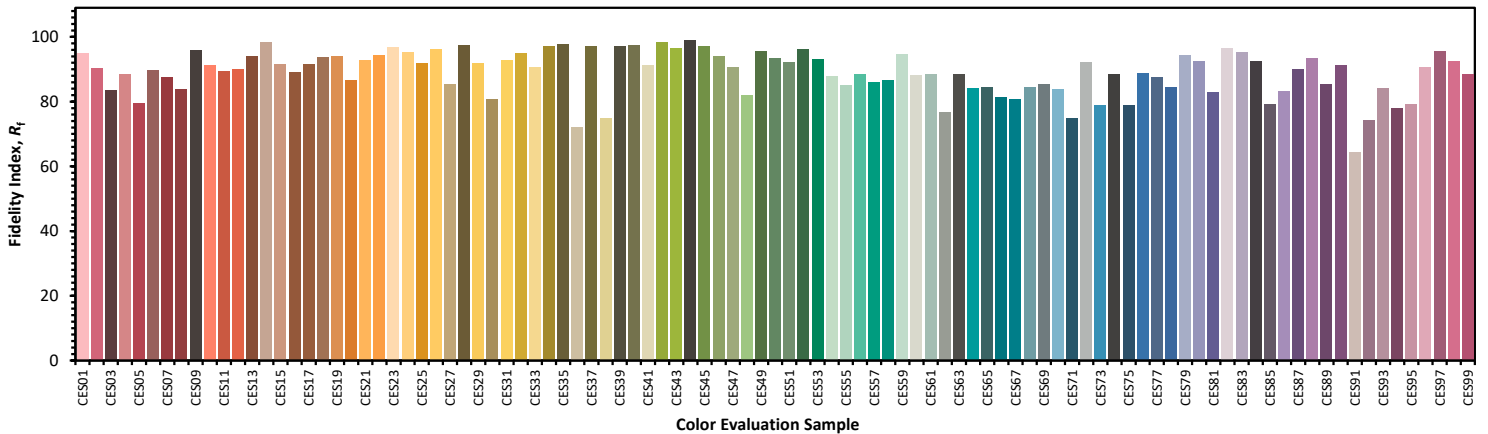
This chart displays the average Fidelity Index for all samples within the hue bin. The number of samples per bin, which can vary based on the CCT used for the calculation, is shown at the top. The color of the bar is based on the average chromaticity under the 5000 K reference illuminant; the colors may not display accurately depending on the calibration of the monitor, and should be used for orientation only.

m = Samples per Angle Bin



This chart displays the change in chroma for the average sample within each hue bin. The number of samples per bin, which can vary based on the CCT used for the calculation, is shown at the top. The color of the bar is based on the average chromaticity under the 5000 K reference illuminant; the colors may not display accurately depending on the calibration of the monitor, and should be used for orientation only.

COLOR FIDELITY BY SAMPLE



This chart displays the Fidelity Index for each of the 99 CES. The CES are arranged by their hue angle under the 5000 K reference source, which was also used to determine the color of each bar. The colors are approximate and depend on proper monitor calibration. Some colors may be outside of the gamut of the monitor, and will not be displayed accurately.

Goniophotometer Test

SUMMARY OF RESULTS

Luminaire: FENCER® Series FOIL™ SELECT - Color Selectable Lighting System

SKU: DI-120V-FLSEL-32-WH

Luminous Flux: 2282 Lumens

Power Consumption: 24 Watts

Efficacy: 95.08 Lumens/Watt

Spacing Criterion (0-180): 1.24

Spacing Criterion (90-270): 1.22

Graphs below are for reference, full IES files are available on Diode LED website

DISTRIBUTION CHARTS AND TABLES

Zonal Lumen Data

Zone	Lumens	%Luminaire
0-20	307.42	13.50
0-30	646.53	28.30
0-40	1048.52	45.90
0-60	1823.19	79.90
0-80	2244.87	98.40
0-90	2282.38	100.00
20-40	741.10	32.50
20-50	1151.01	50.40
40-70	1047.19	45.90
60-80	421.68	18.50
70-80	149.16	6.50
80-90	37.51	1.60
90-180	0.00	0.00
0-180	2282.38	100.00

