

# Photometric Test Report

## Relevant Standards

- ☒ IES LM-79-2008
- ☒ ANSI C82.77:2017

## Prepared For

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## Project Number

**DLF2211104**

## Report Number

**DLF2211104-38a**

## Test Date

**2022/11/23**

## Issue Date

**2022/11/29**

## Prepared By



Wangzun Zhu

## Approved By



Kevin Jia

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## 1.0 Test Summary

DLC Technical Requirements v5.1

Indoor - Linear Ambient - Direct Linear Ambient Luminaires				
Requirement Category	Test Method	Requirements		Test value
Luminaire Output (lm) (Goniophotometer - Section 4.2)	IES LM-79-2008	-		1496
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	$\geq 375$		567
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	-		94.7
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		15.8
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%		8.67%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9		0.995
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	3465 $\pm$ 245	3435
		4 step	3465 $\pm$ 124	
Minimum CRI (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	$\geq 80$		97
Minimum R9 (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	$\geq 0$		81
Minimum Rf (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	$\geq 70$		92
Minimum Rg (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	$\geq 89$		100
Minimum IES Rcs,h1 (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	-12% $\leq$ IES Rcs,h1 $\leq$ +23%		-3%
Zonal Lumen Requirement (0°-60°) (Goniophotometer - Section 4.2)	IES LM-79-2008	$\geq 40\%$		78.78%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		26.3

## 2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/11/23	KNOOKFA32 / 16W / 3500K	AL1
2	Goniophotometer Test	2022/11/23	KNOOKFA32 / 16W / 3500K	AL1
3	THD and PF Test	2022/11/23	KNOOKFA32 / 16W / 3500K	AL1

### Remark(If any)

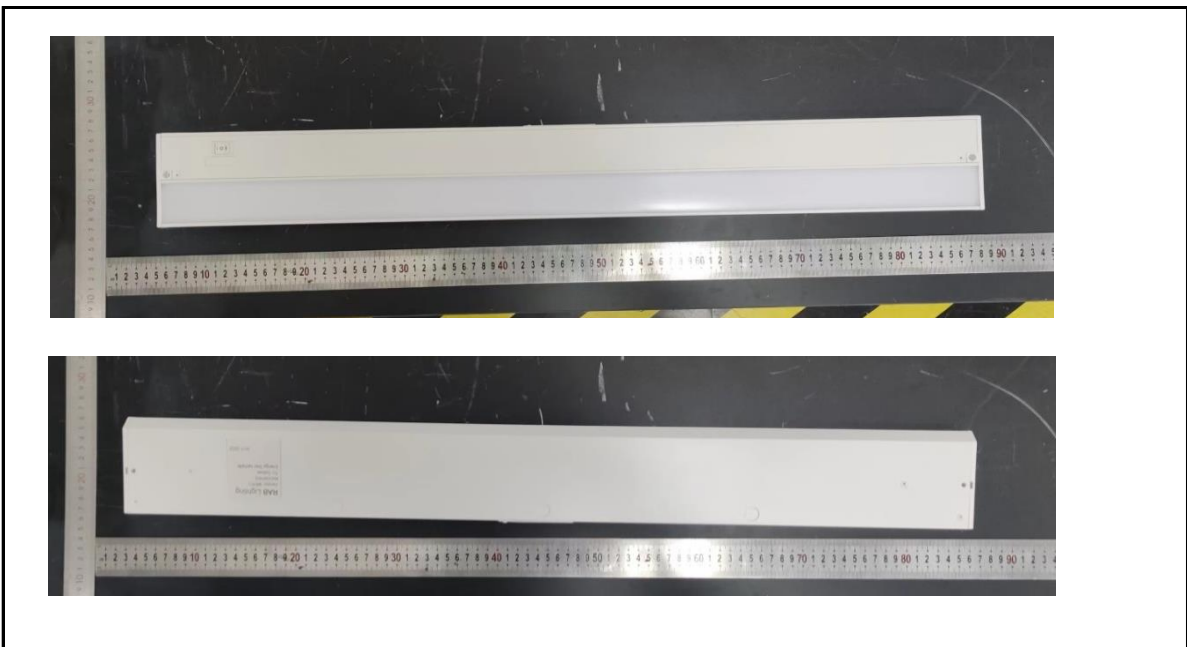
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## 3.0 Production Description

**Luminaire Description:** KNOOKFA32 / 16W / 3500K

**Electrical Specification:** 120V,50/60HZ

### Photos of Luminaire Characteristics



## 4.0 LM-79 Measurement and Test Results

### 4.1 Integrating Sphere Test

Model No.	KNOOKFA32 / 16W / 3500K	Sample ID.	AL1
Operate time (Min.)	90	Stabilization time (Min.)	45
Temperature (°C)	25.3	Humidity (%RH)	55.4

#### Test Method

The samples were tested according to the IES LM-79-2008.

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 sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere.

The voltage of an AC power supply (RMS voltage) or DC power supply (instantaneous voltage) applied to the device under test shall be regulated to within  $\pm 0.2$  percent under load.

The sample was measured using  $4\pi$  geometry and 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.

#### Test Result

Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.01	60	0.132	15.8	0.995

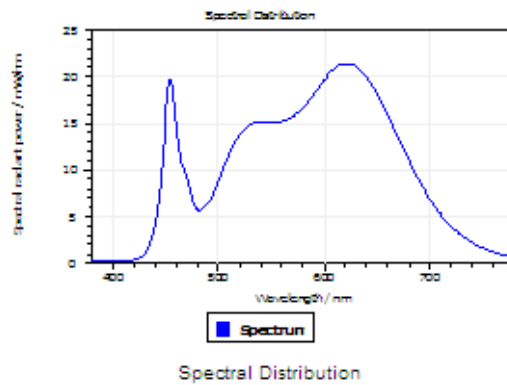
#### Test Result

CCT (K)	CRI	R9	Duv
3435	97	81	0.0013

Rf	Rg	IES Rcs,h1
92	100	-3%

## 4.1 Integrating Sphere Test

### Results



### Spectral values

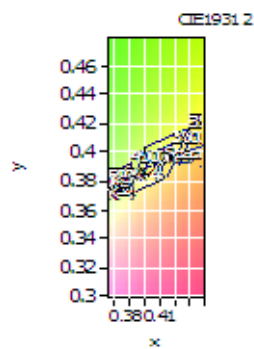
DominantWavelength 581.67 nm  
Purity 0.391  
PeakWavelength 620.81 nm  
Radiant Power 3.995 W  
Width50%

### Color Coordinates

Correlated Color Temperat 3435 K  
x: 0.4076 u: 0.2380 u': 0.2380  
y: 0.3890 v: 0.3408 v': 0.5109

CRI01	98.5	CRI09	80.8
CRI02	98.2	CRI10	93.4
CRI03	95.0	CRI11	96.3
CRI04	98.6	CRI12	73.8
CRI05	97.2	CRI13	99.3
CRI06	95.7	CRI14	96.1
CRI07	96.5	CRI15	96.5
CRI08	92.4	CRI16	92.3

ResultsCRI 96.5



PlanckDistance 1.3E-003

### 4.1 Integrating Sphere Test

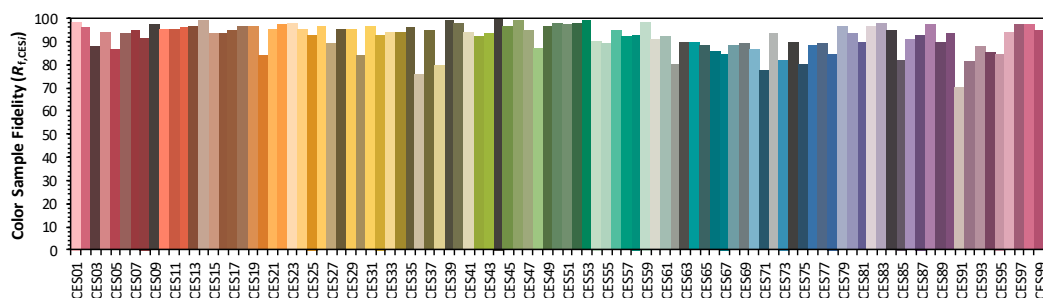
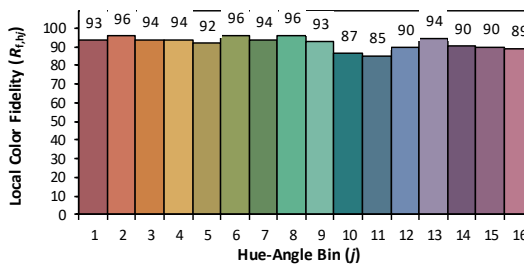
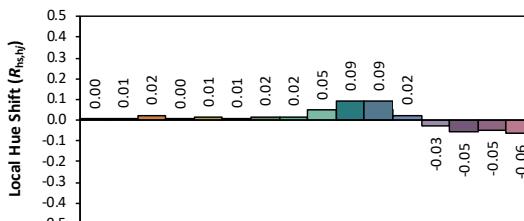
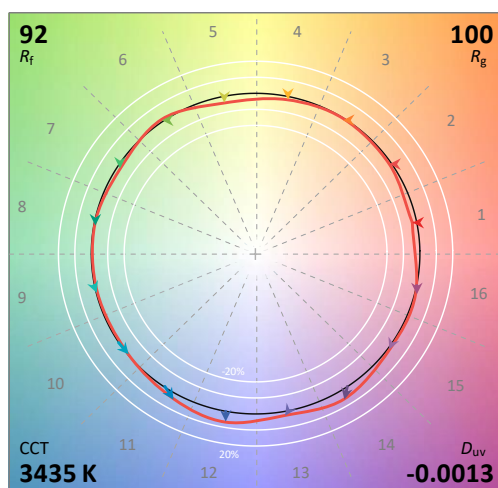
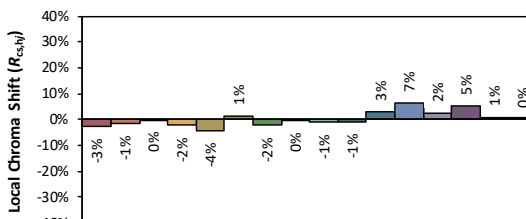
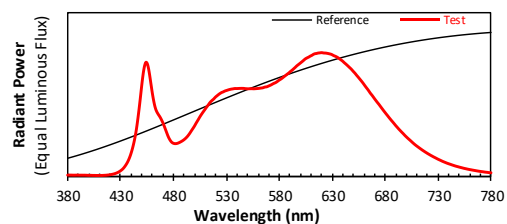
## IES TM-30-18 Color Rendition Report

**Source:** DLF2211104-38a

**Manufacturer:** RAB Lighting Inc.

Date: 2022/11/23

**Model:** KNOOKFA32 / 16W / 3500K



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

 $x = 0.4076$  $y$  0.3890

$u'$	0.2380
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$V'$       0.5109

CIE 13.3-1995  
(CRI)

 $R_a$  97 $R_9$  81

## 4.0 LM-79 Measurement and Test Results

### 4.2 Goniophotometer Test

Model No.	KNOOKFA32 / 16W / 3500K	Sample ID.	AL1
Opreate time (Min.)	90	Stabilization time (Min.)	45
Temperature (°C)	25.3	Humidity (%RH)	54.0

#### Test Method

The samples were tested according to the IES LM-79-2008.

Photometric paramters were measured using a type C goniophotometer and software.

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 voltage of an AC power supply (RMS voltage) or DC power supply (instantaneous voltage) applied to the device under test shall be regulated to within ±0.2 percent under load.

The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 0.5° vertical intervals and 10° horizontal intervals.

#### Test Conditions

Condition	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
WORST CASE	120.01	60	0.132	15.8	0.995

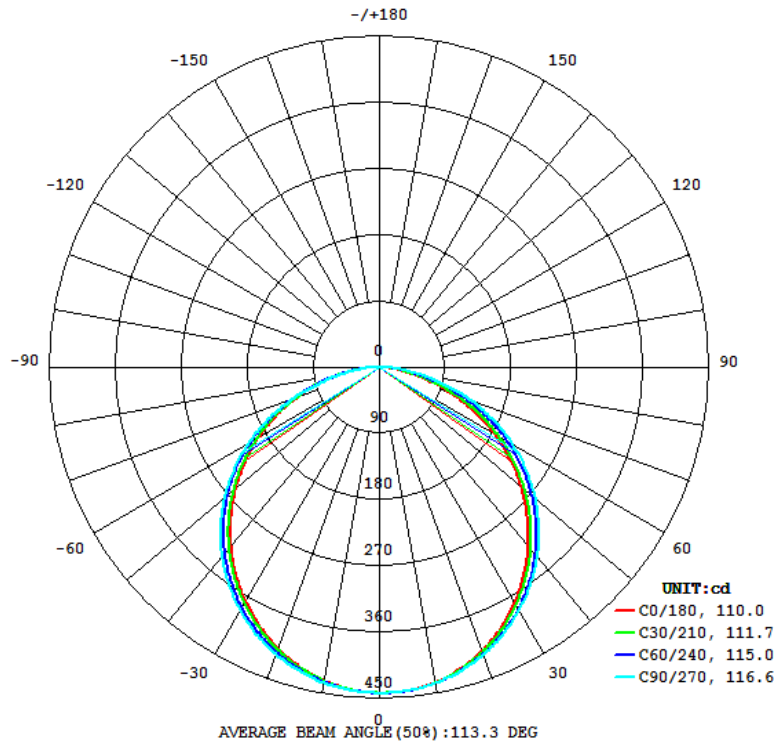
#### Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
1496	159.4	162.2	110.0	116.6	94.7

Zonal Lumen Requirement (0°-60°)	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
78.78%	26.3	2.64	567

## 4.2 Goniophotometer Test

### Light Distrubtion Curve



### UGR Table - Corrected

#### UGR Table - Corrected

Reflectances											
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	21.9	23.6	22.3	23.9	24.2	21.4	23.0	21.7	23.3	23.7
	3H	23.8	25.3	24.2	25.6	26.0	23.2	24.7	23.6	25.0	25.4
	4H	24.5	25.9	24.9	26.3	26.7	23.9	25.3	24.3	25.7	26.1
	6H	25.0	26.3	25.4	26.7	27.1	24.4	25.7	24.9	26.1	26.5
	8H	25.2	26.4	25.6	26.8	27.2	24.6	25.8	25.0	26.2	26.6
	12H	25.3	26.5	25.7	26.9	27.3	24.7	25.9	25.1	26.3	26.7
4H	2H	22.5	23.9	22.9	24.3	24.6	22.1	23.5	22.5	23.8	24.2
	3H	24.6	25.8	25.0	26.2	26.6	24.2	25.3	24.6	25.7	26.1
	4H	25.5	26.5	25.9	27.0	27.4	25.0	26.1	25.4	26.5	26.9
	6H	26.1	27.0	26.6	27.5	27.9	25.6	26.6	26.1	27.0	27.5
	8H	26.3	27.2	26.8	27.6	28.1	25.8	26.7	26.3	27.1	27.6
	12H	26.5	27.2	26.9	27.7	28.2	26.0	26.8	26.4	27.2	27.7
8H	4H	25.7	26.6	26.2	27.1	27.5	25.4	26.2	25.8	26.7	27.1
	6H	26.5	27.2	27.0	27.7	28.2	26.1	26.8	26.6	27.3	27.8
	8H	26.8	27.4	27.3	27.9	28.4	26.4	27.0	26.9	27.5	28.0
	12H	27.0	27.6	27.5	28.0	28.6	26.6	27.2	27.1	27.6	28.2
12H	4H	25.8	26.5	26.2	27.0	27.5	25.4	26.2	25.9	26.7	27.1
	6H	26.5	27.2	27.1	27.7	28.2	26.2	26.9	26.7	27.3	27.8
	8H	26.9	27.4	27.4	27.9	28.5	26.5	27.1	27.0	27.6	28.1

Maximum UGR = 28.6



## 4.2 Goniophotometer Test

### ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	49.35	0 - 10	49.35	3.30%
10-20	141.34	0 - 20	190.69	12.75%
20-30	214.36	0 - 30	405.05	27.07%
30-40	259.01	0 - 40	664.06	44.39%
40-50	269.71	0 - 50	933.77	62.42%
50-60	244.77	0 - 60	1178.54	78.78%
60-70	186.65	0 - 70	1365.19	91.25%
70-80	104.39	0 - 80	1469.58	98.23%
80-90	24.62	0 - 90	1494.20	99.88%
90-100	0.26	0 - 100	1494.46	99.89%
100-110	0.17	0 - 110	1494.63	99.91%
110-120	0.20	0 - 120	1494.83	99.92%
120-130	0.25	0 - 130	1495.08	99.94%
130-140	0.28	0 - 140	1495.36	99.95%
140-150	0.27	0 - 150	1495.63	99.97%
150-160	0.22	0 - 160	1495.85	99.99%
160-170	0.14	0 - 170	1495.99	100.00%
170-180	0.05	0 - 180	1496.04	100.00%

## 4.2 Goniophotometer Test

### COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

#### Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30			10			0
R/W	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	109	104	100	96	106	102	98	94	97	94	91	93	91	88	90	88	86	84
2	99	90	84	78	96	89	82	77	85	80	75	82	77	73	79	75	72	70
3	90	79	71	65	87	78	70	64	75	68	63	72	66	62	69	65	61	58
4	82	70	61	55	80	69	61	54	66	59	53	64	58	53	62	56	52	50
5	76	63	54	47	74	62	53	47	59	52	46	57	51	46	56	50	45	43
6	70	56	47	41	68	55	47	41	54	46	40	52	45	40	50	44	40	38
7	65	51	42	36	63	50	42	36	49	41	36	47	40	35	46	40	35	33
8	60	47	38	32	59	46	38	32	45	37	32	43	37	32	42	36	31	29
9	56	43	34	29	55	42	34	29	41	34	29	40	33	28	39	33	28	26
10	53	39	31	26	51	39	31	26	38	31	26	37	30	26	36	30	26	24

## 4.0 LM-79 Measurement and Test Results

### 4.3 THD and PF Test

Model No.	KNOOKFA32 / 16W / 3500K	Sample ID.	AL1
Temperature (°C)	25.3	Humidity (%RH)	55.4

#### Test Method

The samples were tested according to the ANSI C82.77:2002.

The total harmonic distortion shall be measured to the 40th order.

The ambient temperature condition was maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ . The sample measurements were made using a digital power meter and power supply. The sample was operated at rated voltage and was stabilized before measurement. The total harmonic distortion were calculated.

#### Test Results

Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD
120.01	60	0.132	15.8	0.995	8.67%

## 5.0 Equipment Information

Test Equipment			
Equipment ID	Equipment Name	Last Calibration Date	Calibration Due Date
DLF107	Integrating Sphere System	2021/12/26	2022/12/25
DLF108	Auxiliary Lamp	2021/12/26	2022/12/25
DLF122	Measurement Standard Lamp Standard Lamp Type: 220 V, 0.4720 A, Tungsten, Omni-derectional	2021/12/26	2022/12/25
DLF116	AC Power Source	2021/12/26	2022/12/25
DLF113	Power Meter	2021/12/26	2022/12/25
DLF112	Temperature Recorder	2021/12/26	2022/12/25
DLF114	Temperature & Humidity Datalogger	2021/12/26	2022/12/25
DLF101	Goniophotometer	2021/12/26	2022/12/25
DLF125	Standard Lamp Standard Lamp Type: 76.58 V, 6.7875 A, Tungsten, Omni-derectional	2021/12/26	2022/12/25
DLF104	AC Power Source	2021/12/26	2022/12/25
DLF507	DC Power Source	2021/12/26	2022/12/25
DLF102	Power Meter	2021/12/26	2022/12/25
DLF111	Temperature & Humidity Datalogger	2021/12/26	2022/12/25
DLF119	Power Meter	2021/12/26	2022/12/25
DLF031	Temperature data logger	2021/12/26	2022/12/25
DLF022	Digital power meter	2021/12/26	2022/12/25
DLF003	Temperature & Humidity Datalogger	2021/12/26	2022/12/25

\*\*\*\*\* End of Test Report\*\*\*\*\*