

# Photometric Test Report

## Relevant Standards

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

## Prepared For

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## Project Number

**DLF2211104**

## Report Number

**DLF2211104-40a**

## 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	-		1585
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	$\geq 375$		600
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	-		96.6
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		16.4
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%		8.37%
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	5029 $\pm$ 355	4868
		4 step	5029 $\pm$ 220	
Minimum CRI (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	$\geq 80$		95
Minimum R9 (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	$\geq 0$		74
Minimum Rf (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	$\geq 70$		91
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%		-4%
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		26.5

## 2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/11/23	KNOOKFA32 / 16W / 5000K	AN1
2	Goniophotometer Test	2022/11/23	KNOOKFA32 / 16W / 5000K	AN1
3	THD and PF Test	2022/11/23	KNOOKFA32 / 16W / 5000K	AN1

### Remark(If any)

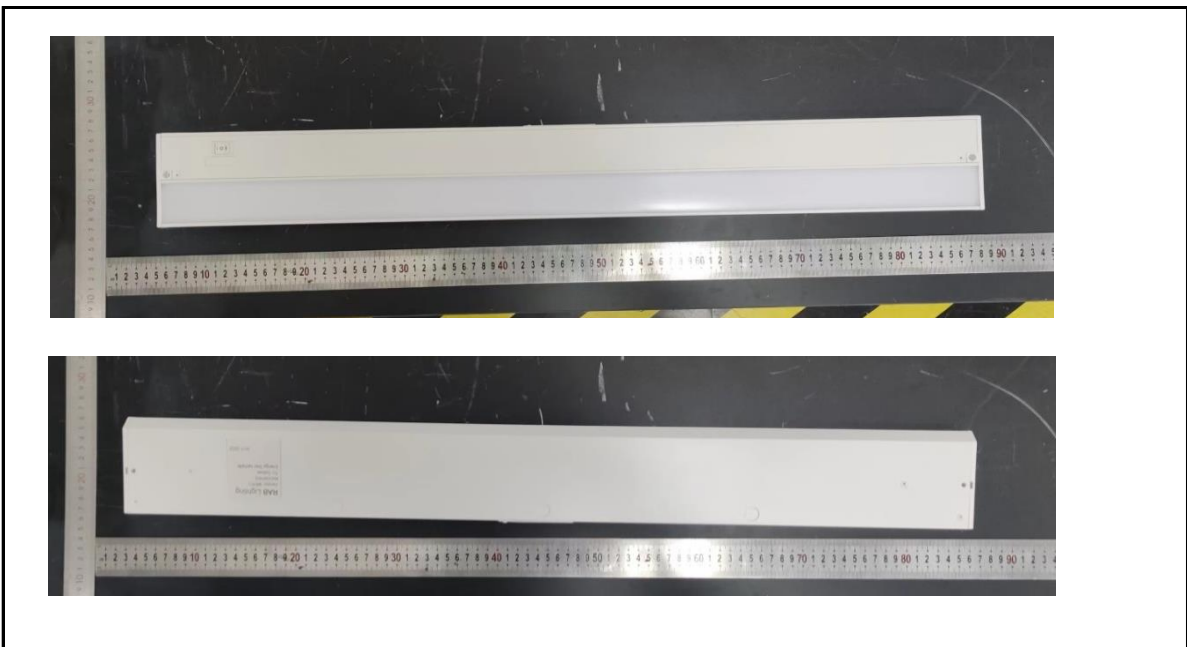
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## 3.0 Production Description

**Luminaire Description:** KNOOKFA32 / 16W / 5000K

**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 / 5000K	Sample ID.	AN1
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
120.00	60	0.137	16.4	0.995

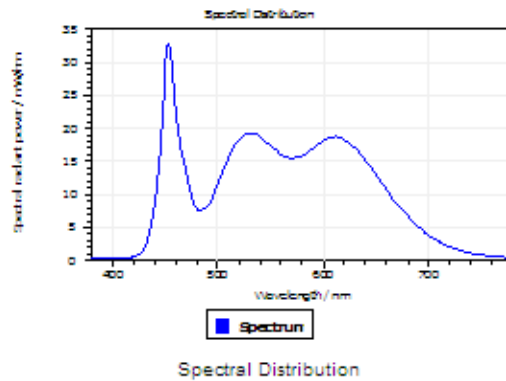
#### Test Result

CCT (K)	CRI	R9	Duv
4868	95	74	0.0028

Rf	Rg	IES Rcs,h1
91	100	-4%

## 4.1 Integrating Sphere Test

### Results

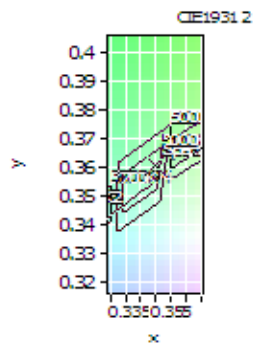


#### Spectral values

DominantWavelength 571.84 nm  
Purity 0.132  
PeakWavelength 453.32 nm  
Radiant Power 4.024 W  
Width50%:

#### Color Coordinates

Correlated Color Temperat 4868 K  
x: 0.3496 u: 0.2109 u': 0.2109  
y: 0.3609 v: 0.3265 v': 0.4898  
CRI01 96.8 CRI09 73.5  
CRI02 95.5 CRI10 86.4  
CRI03 91.4 CRI11 94.4  
CRI04 97.2 CRI12 60.9  
CRI05 94.2 CRI13 97.1  
CRI06 92.2 CRI14 94.5  
CRI07 97.5 CRI15 93.4  
CRI08 91.3 CRI16 85.7  
ResultsCRI 94.5



PlanckDistance 2.8E-003

## 4.1 Integrating Sphere Test

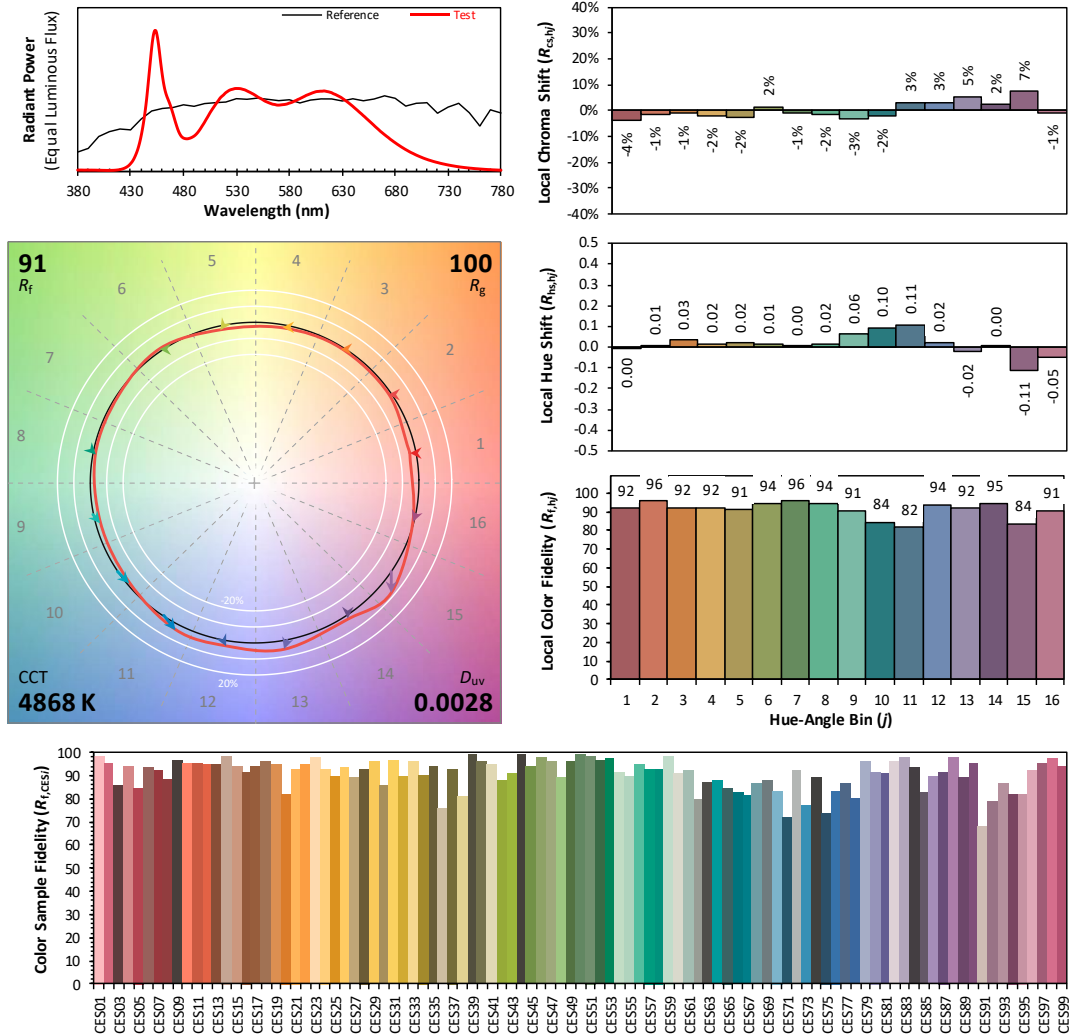
### IES TM-30-18 Color Rendition Report

Source: DLF2211104-40a

Manufacturer: RAB Lighting Inc.

Date: 2022/11/23

Model: KNOOKFA32 / 16W / 5000K



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

$x$  0.3496  
 $y$  0.3609  
 $u'$  0.2109  
 $v'$  0.4898

CIE 13.3-1995  
(CRI)

$R_a$  95  
 $R_g$  76

## 4.0 LM-79 Measurement and Test Results

### 4.2 Goniophotometer Test

Model No.	KNOOKFA32 / 16W / 5000K	Sample ID.	AN1
Operate 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 parameters were measured using a type C goniophotometer and software.

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 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 samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at  $0.5^{\circ}$  vertical intervals and  $10^{\circ}$  horizontal intervals.

#### Test Conditions

Condition	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
WORST CASE	120.00	60	0.137	16.4	0.995

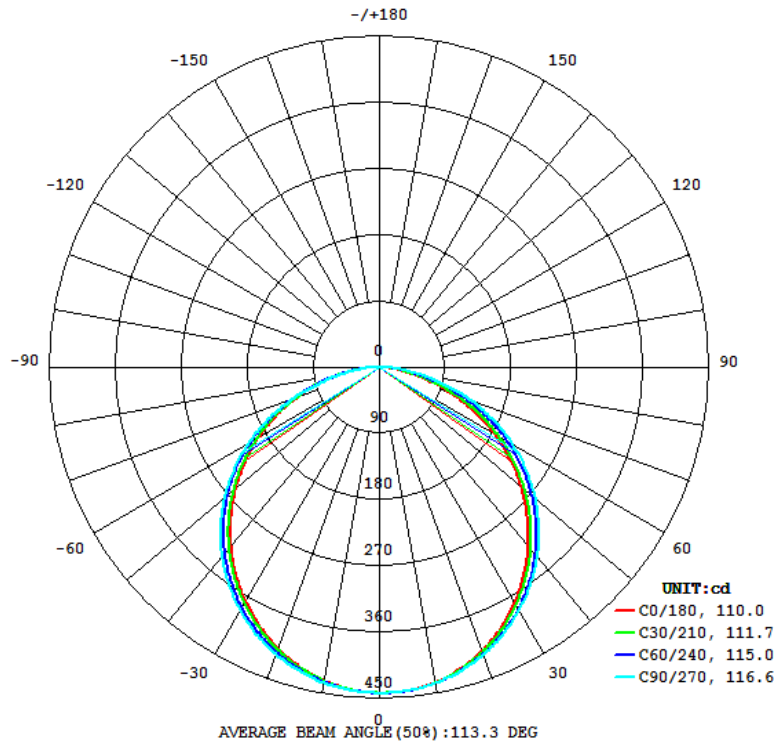
#### Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
1585	159.4	162.2	110.0	116.6	96.6

Zonal Lumen Requirement ( $0^{\circ}$ - $60^{\circ}$ )	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
78.78%	26.5	2.64	600

## 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										
X=2H Y=2H	UGR Viewed Crosswise					UGR Viewed Endwise				
3H	22.1	23.8	22.5	24.1	24.4	21.6	23.2	21.9	23.5	23.9
4H	24.0	25.5	24.4	25.8	26.2	23.4	24.9	23.8	25.2	25.6
6H	24.7	26.1	25.1	26.5	26.9	24.1	25.5	24.5	25.9	26.3
8H	25.2	26.5	25.6	26.9	27.3	24.6	25.9	25.0	26.3	26.7
12H	25.4	26.6	25.8	27.0	27.4	24.8	26.0	25.2	26.4	26.8
4H	25.5	26.7	25.9	27.1	27.5	24.9	26.1	25.3	26.5	26.9
2H	22.7	24.1	23.1	24.5	24.8	22.3	23.7	22.7	24.0	24.4
3H	24.8	26.0	25.2	26.4	26.8	24.4	25.5	24.8	25.9	26.3
4H	25.7	26.7	26.1	27.2	27.6	25.2	26.3	25.6	26.7	27.1
6H	26.3	27.2	26.8	27.7	28.1	25.8	26.8	26.3	27.2	27.7
8H	26.5	27.4	27.0	27.8	28.3	26.0	26.9	26.5	27.3	27.8
12H	26.7	27.4	27.1	27.9	28.4	26.2	27.0	26.6	27.4	27.9
4H	25.9	26.8	26.4	27.3	27.7	25.6	26.4	26.0	26.9	27.3
6H	26.7	27.4	27.2	27.9	28.4	26.3	27.0	26.8	27.5	28.0
8H	27.0	27.6	27.5	28.1	28.6	26.6	27.2	27.1	27.7	28.2
12H	27.2	27.8	27.7	28.2	28.8	26.8	27.4	27.3	27.8	28.4
4H	26.0	26.7	26.4	27.2	27.7	25.6	26.4	26.1	26.9	27.3
6H	26.7	27.4	27.3	27.9	28.4	26.4	27.1	26.9	27.5	28.0
8H	27.0	27.6	27.6	28.1	28.7	26.7	27.3	27.2	27.8	28.3

Maximum UGR = 28.8



## 4.2 Goniophotometer Test

### ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	52.27	0 - 10	52.27	3.30%
10-20	149.72	0 - 20	201.99	12.75%
20-30	227.07	0 - 30	429.06	27.07%
30-40	274.38	0 - 40	703.44	44.39%
40-50	285.70	0 - 50	989.14	62.42%
50-60	259.29	0 - 60	1248.43	78.78%
60-70	197.72	0 - 70	1446.15	91.25%
70-80	110.58	0 - 80	1556.73	98.23%
80-90	26.08	0 - 90	1582.81	99.88%
90-100	0.27	0 - 100	1583.08	99.89%
100-110	0.18	0 - 110	1583.26	99.91%
110-120	0.22	0 - 120	1583.48	99.92%
120-130	0.27	0 - 130	1583.75	99.94%
130-140	0.30	0 - 140	1584.05	99.96%
140-150	0.29	0 - 150	1584.34	99.97%
150-160	0.23	0 - 160	1584.57	99.99%
160-170	0.14	0 - 170	1584.71	100.00%
170-180	0.05	0 - 180	1584.76	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
Rw	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	73	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 / 5000K	Sample ID.	AN1
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
120.00	60	0.137	16.4	0.995	8.37%

## 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\*\*\*\*\*