

# Photometric Test Report

## Relevant Standards

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

## Prepared For

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## Project Number

**DLF2211104**

## Report Number

**DLF2211104-37a**

## 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	-		1368
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	$\geq 375$		518
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	-		84.4
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		16.2
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%		8.53%
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	3045 $\pm$ 175	2950
		4 step	3045 $\pm$ 100	
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	$\geq 0$		72
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	$\geq 89$		99
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		26.0

## 2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/11/23	KNOOKFA32 / 16W / 3000K	AK1
2	Goniophotometer Test	2022/11/23	KNOOKFA32 / 16W / 3000K	AK1
3	THD and PF Test	2022/11/23	KNOOKFA32 / 16W / 3000K	AK1

### Remark(If any)

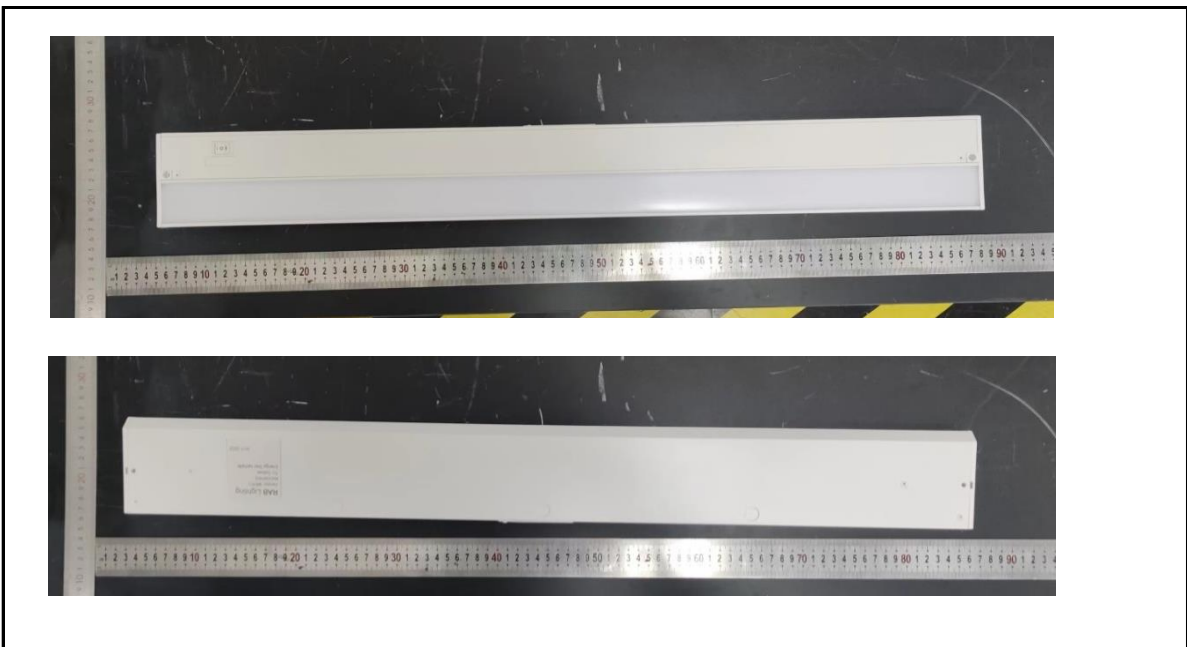
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## 3.0 Production Description

**Luminaire Description:** KNOOKFA32 / 16W / 3000K

**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 / 3000K	Sample ID.	AK1
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	0.136	16.2	0.995

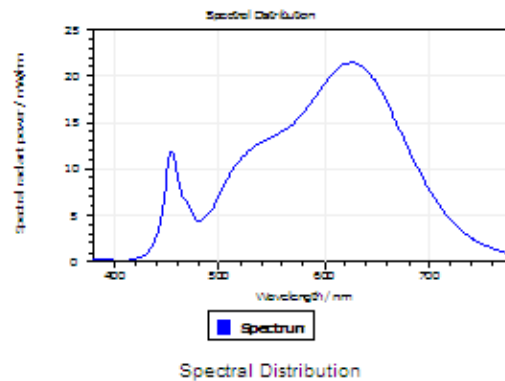
#### Test Result

CCT (K)	CRI	R9	Duv
2950	95	72	0.00037

Rf	Rg	IES Rcs,h1
92	99	-3%

## 4.1 Integrating Sphere Test

### Results



### Spectral values

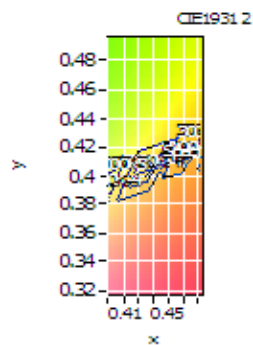
DominantWavelength 582.91 nm  
Purity 0.544  
PeakWavelength 625.39 nm  
Radiant Power 3.724 W  
Width50%:

L

### Color Coordinates

Correlated Color Temperat 2950 K  
x: 0.4411 u: 0.2522 u': 0.2522  
y: 0.4084 v: 0.3486 v': 0.5229

CRI01	96.2	CRI09	72.0
CRI02	97.3	CRI10	92.0
CRI03	96.7	CRI11	97.1
CRI04	96.3	CRI12	78.5
CRI05	95.2	CRI13	96.7
CRI06	96.2	CRI14	97.1
CRI07	94.9	CRI15	92.8
CRI08	88.0	CRI16	91.1
ResultsCRI	95.1		



PlanckDistance 3.7E-004

## 4.1 Integrating Sphere Test

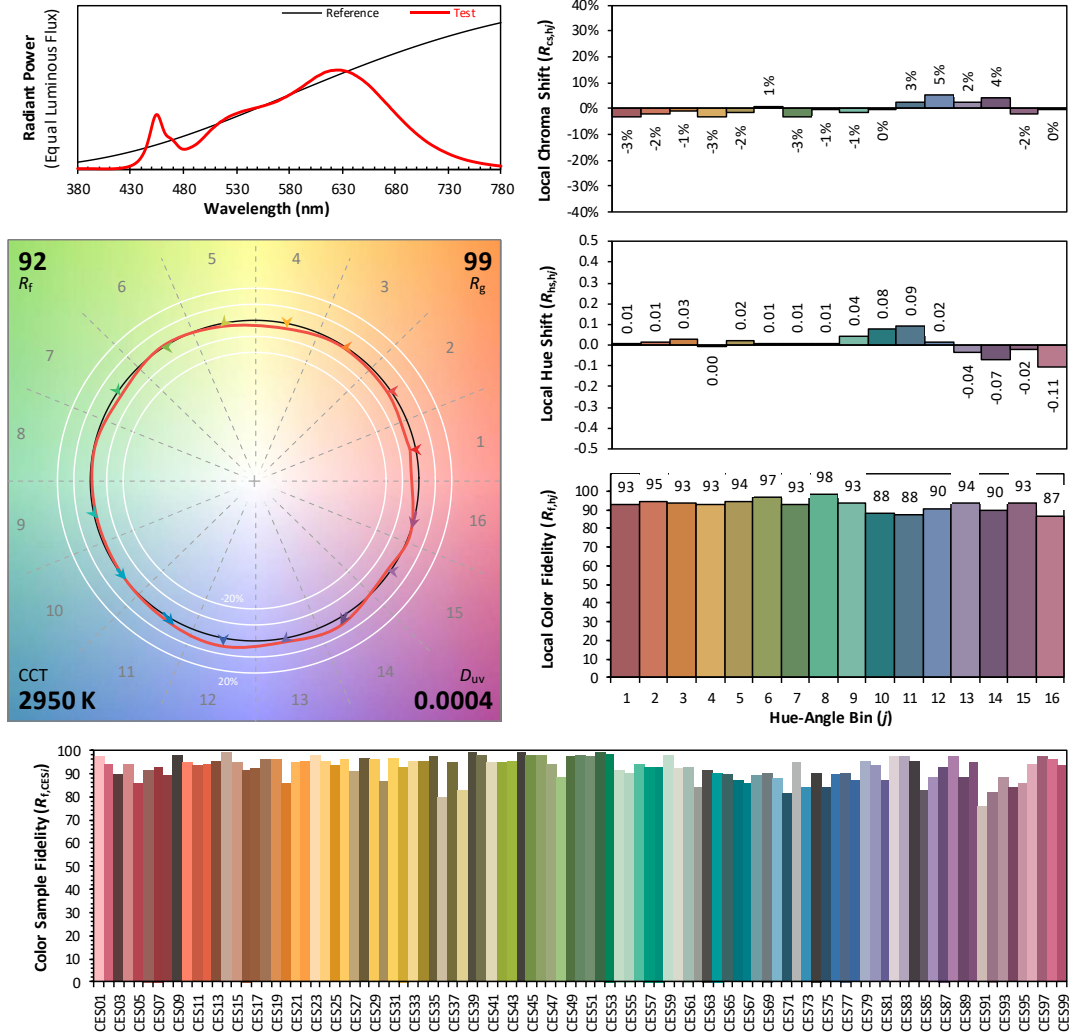
### IES TM-30-18 Color Rendition Report

Source: DLF2211104-37a

Manufacturer: RAB Lighting Inc.

Date: 2022/11/23

Model: KNOOKFA32 / 16W / 3000K



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

$x$  0.4411  
 $y$  0.4064  
 $u'$  0.2522  
 $v'$  0.5229

CIE 13.3-1995  
(CRI)

$R_a$  95  
 $R_g$  74

## 4.0 LM-79 Measurement and Test Results

### 4.2 Goniophotometer Test

Model No.	KNOOKFA32 / 16W / 3000K	Sample ID.	AK1
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	120.01	60	0.136	16.2	0.995

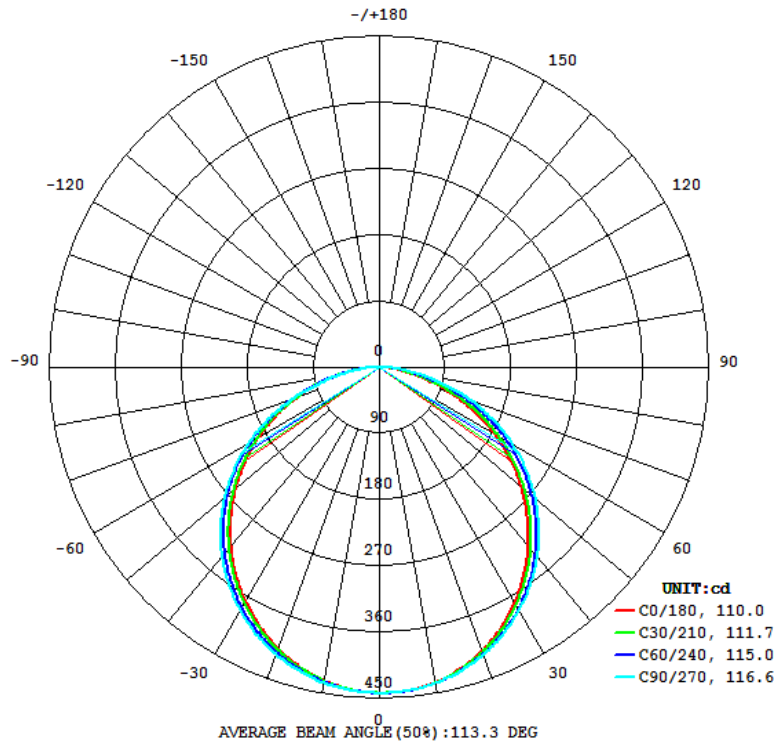
#### Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
1368	159.4	162.2	110.0	116.6	84.4

Zonal Lumen Requirement ( $0^{\circ}$ - $60^{\circ}$ )	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
78.78%	26.0	2.64	518

## 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	21.6	23.3	22.0	23.6	23.9	21.1	22.7	21.4	23.0	23.4
3H	23.5	25.0	23.9	25.3	25.7	22.9	24.4	23.3	24.7	25.1
4H	24.2	25.6	24.6	26.0	26.4	23.6	25.0	24.0	25.4	25.8
6H	24.7	26.0	25.1	26.4	26.8	24.1	25.5	24.6	25.8	26.2
8H	24.9	26.1	25.3	26.5	26.9	24.3	25.5	24.7	25.9	26.3
12H	25.0	26.2	25.4	26.6	27.0	24.4	25.6	24.8	26.0	26.4
4H	2H	22.2	23.6	22.6	24.0	24.3	21.8	23.2	22.2	23.5
3H	24.3	25.5	24.7	25.9	26.3	23.9	25.0	24.3	25.4	25.8
4H	25.2	26.2	25.6	26.7	27.1	24.7	25.8	25.1	26.2	26.6
6H	25.8	26.8	26.3	27.2	27.6	25.3	26.3	25.8	26.7	27.2
8H	26.0	26.9	26.5	27.3	27.8	25.5	26.4	26.0	26.9	27.3
12H	26.2	26.9	26.6	27.4	27.9	25.7	26.5	26.1	26.9	27.4
8H	4H	25.4	26.3	25.9	26.8	27.2	25.1	25.9	25.5	26.4
6H	26.2	26.9	26.7	27.4	27.9	25.8	26.5	26.3	27.0	27.5
8H	26.5	27.1	27.0	27.6	28.1	26.1	26.7	26.6	27.2	27.7
12H	26.7	27.3	27.2	27.7	28.3	26.3	26.9	26.8	27.3	27.9
12H	4H	25.5	26.2	25.9	26.7	27.2	25.1	25.9	25.6	26.4
6H	26.2	26.9	26.8	27.4	27.9	25.9	26.6	26.4	27.0	27.5
8H	26.6	27.1	27.1	27.6	28.2	26.2	26.8	26.7	27.3	27.8
Maximum UGR = 28.3										



## 4.2 Goniophotometer Test

### ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	45.11	0 - 10	45.11	3.30%
10-20	129.19	0 - 20	174.30	12.75%
20-30	195.94	0 - 30	370.24	27.07%
30-40	236.76	0 - 40	607.00	44.39%
40-50	246.53	0 - 50	853.53	62.42%
50-60	223.74	0 - 60	1077.27	78.78%
60-70	170.61	0 - 70	1247.88	91.25%
70-80	95.42	0 - 80	1343.30	98.23%
80-90	22.51	0 - 90	1365.81	99.88%
90-100	0.24	0 - 100	1366.05	99.89%
100-110	0.16	0 - 110	1366.21	99.91%
110-120	0.19	0 - 120	1366.40	99.92%
120-130	0.23	0 - 130	1366.63	99.94%
130-140	0.26	0 - 140	1366.89	99.96%
140-150	0.25	0 - 150	1367.14	99.97%
150-160	0.20	0 - 160	1367.34	99.99%
160-170	0.12	0 - 170	1367.46	100.00%
170-180	0.04	0 - 180	1367.50	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	91	84	78	96	89	82	77	85	80	75	82	77	73	79	75	72	70
3	90	79	71	65	88	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	30
9	56	43	35	29	55	42	34	29	41	34	29	40	33	29	39	33	28	27
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 / 3000K	Sample ID.	AK1
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	0.136	16.2	0.995	8.53%

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