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Test report of
IES LM-79-08
Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Applicant:

IKIO LED LIGHTING

Address:

8470 Allison Pointe Blvd, Suite 128 Indianapolis, IN 46250

For Product:

Outdoor Pole/Arm-Mounted Area and Roadway Luminaires

Model No.:

IK-RFL1-L140-475-DY-40 / IK-RFL1-L140-475-DY-57
IK-RFL1-L140-475-DY-40 / IK-RFL1-L140-475-DY-57

Test laboratory: Shenzhen Belling Efficiency Testing Lab Co.,Ltd, 1Floor, No.1 Building, Meibaohe Industrial Park, Dalang Street, Longhua District, Shenzhen, Guangdong Prov.518101 China.

Zac.kuang

Jasonzhou

Complied by: Zac Kuang **Review by: Jason zhou**

Project Engineer **Technical Manager**

Note: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or use in part without prior written consent from Shenzhen Belling Efficiency Testing Lab Co.,Ltd. This report must not be used by the customer to claim product certification, approval, or endorsement By NVLAP, NIST, or any agency of the U.S. Government.

1 General

1.1 Product Information

Manufacturer	IKIO LED LIGHTING
Manufacturer Address	8470 Allison Pointe Blvd, Suite 128 Indianapolis, IN 46250
Brand Name	IKIO
Luminaire Type	Outdoor Pole/Arm-Mounted Area and Roadway Luminaires
Model Number	IK-RFL1-L140-475-DY-40 / IK-RFL1-L140-475-DY-57 IK-RFL1-L140-475-DY-40 / IK-RFL1-L140-475-DY-57
Rated Inputs	AC 200-480V 50/60Hz
Rated Power	475 W
Nominal CCT	4000K / 5700K
Date of Receipt Samples	2019-05-13
Date of test	2019-05-13 to 2019-05-23
Burning Time Before Test	0hour(For New Products)

1.2 Standards or methods

- ANSI C78.377-2015:Specifications for the Chromaticity of Solid State Lighting Products
- ANSI C82.77-10:2014:Harmonic Emission Limits - Related Power Quality Requirements for Lighting Equipment - Solid State
- CIE Publication No.13.3-1995:Method of Measuring and Specifying Color Rendering of Light Sources
- IESNA LM-79-08 Approved Method: Electric & Photometric Measurement of Solid-state Lighting Products

1.3 Equipment list

Device	Manufacture	Model No.	Serial No.	Calibration due date
Goniophotometric System	SENSING	GMS-3000	N.A	2020-04-07
AC Power Source	ALL POWER	APW-110N	992257	2020-04-08
Total Luminous Flux Standard Lamp	SENSING	110V/200W	S1520062	2020-04-15
Total Spectral Radiant Flux Standard Lamp	SENSING	12V/20W	LSD12201731	2020-04-15
Digital Power Meter	YOKOGAWA	WT310	C2QM02030V	2020-04-08
Integral Sphere	SENSING	SPR-600M	N.A	2020-04-07
Digital Power Meter	YOKOGAWA	WT210	91L929742	2020-04-08
Optical Color and Electrical Measurement System	SENSING	SPR-3000	S1101108	2020-04-07
Environment Measurer	KTJ	HTC-1	N/A	2019-06-23
Environment Measurer	KTJ	TA218B	N/A	2019-06-23
Electronic clock	CHUANGRONG	QUARTZ	823	2019-07-19
Digital Anemometer	TECMAN	TD8901	026141	2019-09-11

Statement of Traceability: Shenzhen Belling Efficiency Testing Lab Co.,Ltd attests that all calibration has been performed using suitable standards traceable to national primary standards and International System of Unit (SI).

2 Test conducted and method

2.1 Ambient Condition

The ambient temperature in which measurements are being taken was maintained at 25°C ±1°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 Integrating Sphere System

The system includes AC power source, digital power meter, DC power supply, spectrophotometer, and integrating sphere. The integrating sphere system is calibrated by standard light source before measurement. The system and standard light source has been calibrated regularly and traceable to the National Primary Standards. 4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

Integrating Sphere Uncertainty: The uncertainty of the light output (luminous flux) measurements is U=1.8% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=20K (K=2), at the 95% confidence level. The uncertainty of the CRI is U=1.8(K=2), at the 95% confidence level. The uncertainty of power meter AC current U=0.18% of rdg, AC Voltage U=0.16% of rdg, Power U=0.20% (K=2), at the 95% confidence level.

2.5 Goniophotometer System

The goniophotometer system is calibrated by standard light source before measurement. The standard light source has been calibrated regularly and traceable to the National Primary Standards.

Type C goniophotometer was used for measuring total luminous flux, luminous intensity distribution, and color spatial uniformity. The product was operated in its intended orientation in application and was recorded in this report. The method according to IESNA LM-79-08 following chapter.

Goniophotometer Uncertainty :The uncertainty of the luminous intensity is U=1.6% (K=2), at the 95% confidence level.

3 Test Result Summary

3.1 Integrating Sphere System (Total operating time for integrating sphere test: 1.0 hour)

3.1.1 Electrical data

Model Number	Input Voltage(V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
IK-RFL1-L140-475-DY-40	277.12	60	1.724	472.58	0.989
IK-RFL1-L140-475-DY-57	276.96	60	1.737	475.83	0.989

3.1.2 Photometric data

Model Number	Luminous Flux (lm)	Efficacy (lm/W)	CCT (K)	CRI	R9
IK-RFL1-L140-475-DY-40	64837.98	137.2	3970	71.2	-40
IK-RFL1-L140-475-DY-57	69233.27	145.5	5510	71.7	-30

3.1.3 Chromaticity Coordinate

Model Number	Duv	x	y	u'	v'
IK-RFL1-L140-475-DY-40	+0.00029	0.4417	0.4064	0.2526	0.5230
IK-RFL1-L140-475-DY-57	+0.00119	0.3323	0.3432	0.2059	0.4786

3.2 Goniophotometer System (Total operating time for luminous intensity distribution: 1.0 hour)

3.2.1 Electrical data

Model Number	Input Voltage(V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
IK-RFL1-L140-475-DY-40	277.22	60	1.755	481.040	0.9887

3.2.2 Photometric data

Luminous Flux (lm)	Efficacy (lm/W)	Zonal Lumen in 0-90°(%lm)	Zonal Lumen in 80-90°(%lm)
66329.85	137.89	99.80	0.68

3.3 Additional Test

Model Number	Test Item	Test Voltage (V)	Frequency(Hz)	Test Result
IK-RFL1-L140-475-DY-40	Power Factor	480	60	0.944
	THD	480	60	8.8%

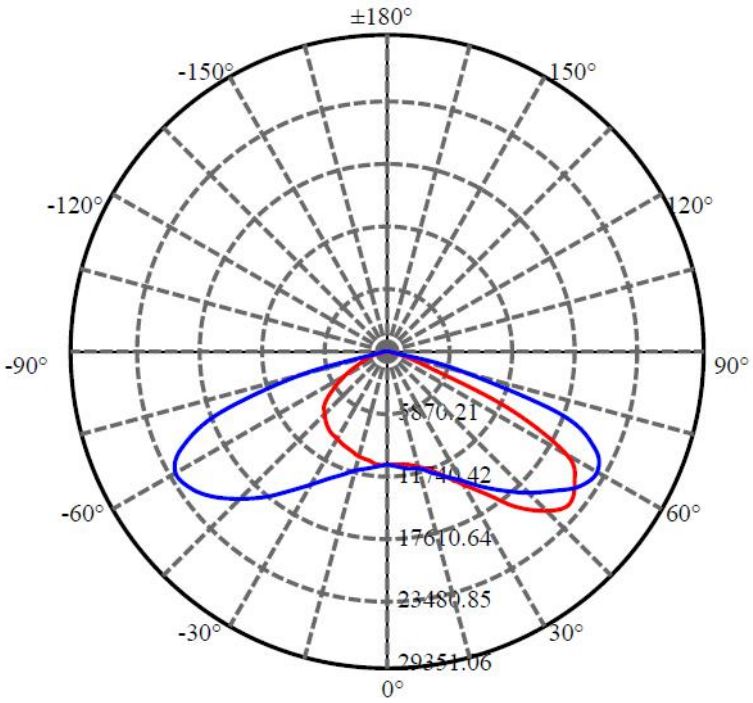
Zonal Flux Diagram

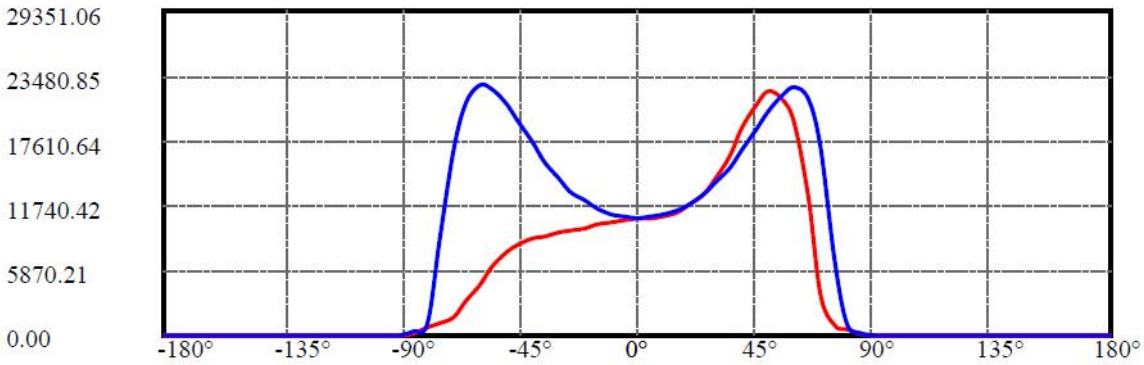
Zonal flux distribution table

γ(°)	Average I(cd)	Zonal F(lm)	Sum F(lm)	Eff Flux(%)	Eff Sum(%)
0.0	10528.600	0.000	0	0.00%	0.00%
5.0	10554.961	252.048	252.048	0.38%	0.38%
10.0	10656.999	758.819	1010.866	1.14%	1.52%
15.0	10888.363	1278.056	2288.923	1.93%	3.45%
20.0	11275.832	1826.641	4115.564	2.75%	6.20%
25.0	11843.772	2424.820	6540.384	3.66%	9.86%
30.0	12609.572	3094.591	9634.975	4.67%	14.53%
35.0	13665.497	3869.188	13504.162	5.83%	20.36%
40.0	14884.380	4763.331	18267.493	7.18%	27.54%
45.0	16090.444	5735.240	24002.733	8.65%	36.19%
50.0	17027.451	6691.955	30694.689	10.09%	46.28%
55.0	17345.498	7473.824	38168.512	11.27%	57.54%
60.0	16786.820	7889.589	46058.101	11.89%	69.44%
65.0	14614.941	7633.828	53691.929	11.51%	80.95%
70.0	10387.357	6330.743	60022.672	9.54%	90.49%
75.0	5141.441	4058.978	64081.65	6.12%	96.61%
80.0	1084.722	1665.948	65747.598	2.51%	99.12%
85.0	277.345	370.106	66117.704	0.56%	99.68%
90.0	15.915	80.297	66198.001	0.12%	99.80%
95.0	11.816	7.593	66205.594	0.01%	99.81%
100.0	12.793	6.687	66212.281	0.01%	99.82%
105.0	15.433	7.552	66219.833	0.01%	99.83%
110.0	18.745	8.934	66228.767	0.01%	99.85%
115.0	21.994	10.315	66239.082	0.02%	99.86%
120.0	24.862	11.391	66250.473	0.02%	99.88%
125.0	27.033	11.995	66262.468	0.02%	99.90%
130.0	28.099	11.987	66274.456	0.02%	99.92%
135.0	27.782	11.291	66285.747	0.02%	99.93%
140.0	26.652	10.079	66295.826	0.02%	99.95%
145.0	25.192	8.650	66304.476	0.01%	99.96%
150.0	23.974	7.240	66311.716	0.01%	99.97%
155.0	22.680	5.904	66317.62	0.01%	99.98%
160.0	21.233	4.606	66322.226	0.01%	99.99%
165.0	20.180	3.413	66325.639	0.01%	99.99%
170.0	19.532	2.356	66327.994	0.00%	100.00%
175.0	19.240	1.387	66329.381	0.00%	100.00%
180.0	19.673	0.465	66329.846	0.00%	100.00%

Luminous Intensity Distribution Diagram

Light Distribution Curve [Unit:cd]





C0/C180:

C90/C270:

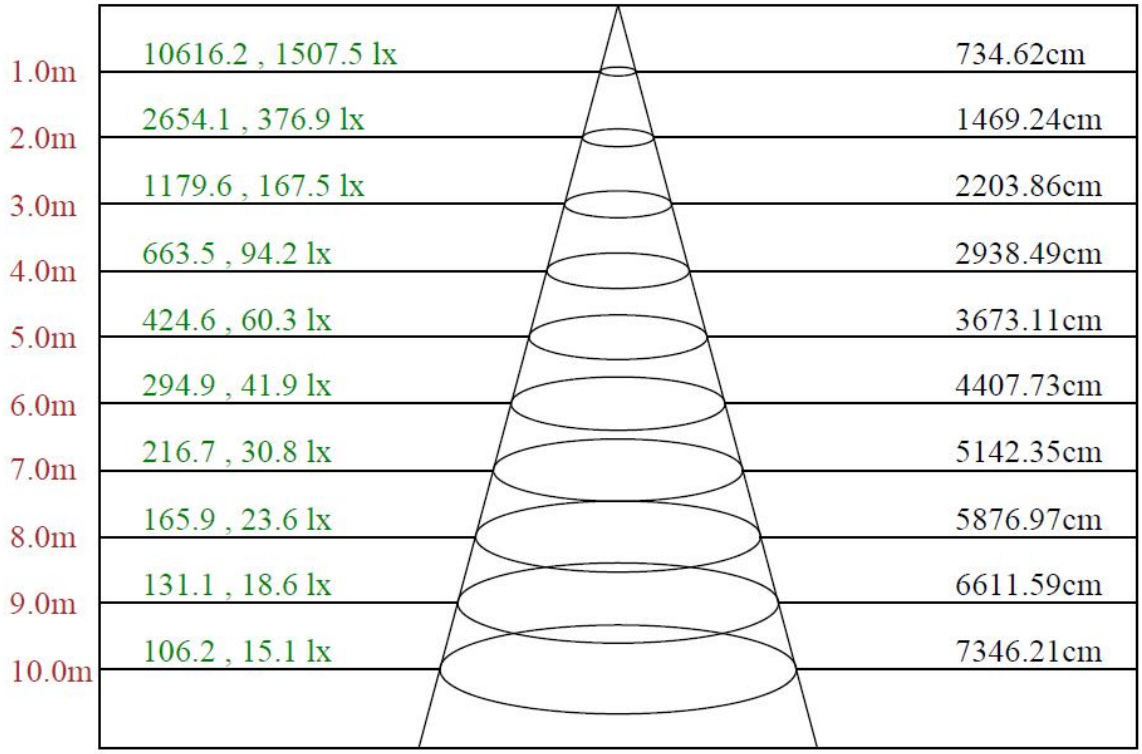
Field angle(10%Imax):C0/180Left:74.8 Right:74.8

:C90/270Left:80.0 Right:80.0

Beam Angle(50%Imax):C0/180Left:57.8 Right:69.1

:C90/270Left:77.2 Right:76.3

Lux distance Curve



Max , Ave Beam angle of C292.5 plane 149.54

Luminous Intensity Distribution Data

C/γ(°)	0.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0
0.0	10528.60	10549.50	10718.04	11124.17	11767.88	12791.31	14212.75	16204.79	18743.07
22.5	10528.60	10525.14	10657.13	11085.59	11713.05	12651.20	14021.87	15973.30	18286.19
45.0	10528.60	10486.55	10673.37	11089.65	11723.20	12624.80	13981.26	15723.54	17766.34
67.5	10528.60	10492.65	10657.13	11044.97	11706.96	12643.08	13794.44	15579.36	17746.04
90.0	10528.60	10697.74	10925.17	11298.80	11910.02	12764.92	13843.18	15187.45	16795.71
112.5	10528.60	10614.48	10780.99	11075.43	11475.47	12005.46	12567.94	13205.56	13745.71
135.0	10528.60	10551.53	10569.81	10596.21	10659.16	10703.83	10703.83	10604.33	10425.63
157.5	10528.60	10464.22	10326.13	10133.22	9972.81	9822.54	9570.74	9331.13	9042.78
180.0	10528.60	10419.54	10222.57	9970.78	9716.95	9536.22	9268.18	9018.41	8689.45
202.5	10528.60	10425.63	10248.97	10078.40	9901.73	9749.44	9524.04	9280.36	9008.26
225.0	10528.60	10462.19	10445.94	10429.70	10478.43	10484.52	10502.80	10427.67	10295.67
247.5	10528.60	10527.17	10722.11	11028.73	11414.55	11840.98	12360.82	12951.73	13392.38
270.0	10528.60	10738.35	10973.90	11426.73	12133.39	13018.74	14235.09	15713.38	17457.69
292.5	10528.60	10689.62	10945.47	11388.15	12050.13	13067.48	14434.09	16478.93	18913.65
315.0	10528.60	10626.67	10852.07	11256.16	11950.63	13002.50	14452.36	16550.00	18966.44
337.5	10528.60	10608.39	10793.18	11187.12	11838.95	12793.34	14279.76	16418.01	18875.07
360.0	10528.60	10549.50	10718.04	11124.17	11767.88	12791.31	14212.75	16204.79	18743.07

C/γ(°)	45.0	50.0	55.0	60.0	65.0	70.0	75.0	80.0	85.0
0.0	20838.68	22032.69	21338.21	19226.36	12399.40	3705.08	919.87	559.64	233.12
22.5	20670.14	22345.40	22461.15	20889.45	16164.18	6837.52	1006.58	539.94	213.83
45.0	20036.58	22383.99	24558.79	25462.41	23740.44	18684.19	8498.57	885.56	286.32
67.5	20111.72	22587.05	25078.63	27111.28	27848.40	25815.74	16718.54	2740.74	370.79
90.0	18507.52	20178.73	21732.16	22450.99	21283.39	17043.44	6681.16	1038.05	264.18
112.5	14247.27	14476.73	14222.90	13004.53	9879.40	5416.08	1909.19	1086.79	377.70
135.0	10137.29	9595.11	8462.02	6764.42	4469.81	2333.59	1040.09	534.46	181.94
157.5	8612.29	7824.41	6636.49	4894.21	3218.95	1736.59	1011.66	484.91	147.22
180.0	8279.26	7544.18	6185.69	4542.91	3174.27	1695.98	1029.93	656.70	159.81
202.5	8616.35	7856.90	6579.63	4898.27	3294.08	1817.82	1019.78	569.59	164.28
225.0	10023.57	9459.06	8289.42	6502.47	4376.40	2366.08	1029.93	563.09	225.81
247.5	13806.63	13895.97	13426.90	11956.73	9046.84	5107.43	1854.37	1015.72	389.68
270.0	19260.88	20887.41	22207.32	22599.23	21047.83	16734.79	8553.40	1006.78	442.47
292.5	21458.02	24181.09	26674.70	28642.37	29351.06	26753.89	17746.04	3564.56	395.77
315.0	21464.11	23994.27	26179.22	27399.63	26372.13	21665.14	12042.01	1528.25	340.74
337.5	21376.80	23196.24	23494.74	22243.87	18172.47	8484.36	1201.93	580.76	243.88
360.0	20838.68	22032.69	21338.21	19226.36	12399.40	3705.08	919.87	559.64	233.12

C/γ(°)	90.0	95.0	100.0	105.0	110.0	115.0	120.0	125.0	130.0
0.0	20.31	7.92	5.48	6.09	7.11	8.73	10.56	12.18	13.81
22.5	14.82	6.09	4.87	6.30	7.92	9.95	12.39	14.21	16.04
45.0	12.39	9.14	7.72	8.73	11.78	15.03	18.07	20.51	22.13
67.5	17.26	14.62	14.42	16.65	20.71	25.18	28.23	29.85	30.46
90.0	15.03	14.82	15.84	17.67	20.51	23.56	26.40	28.63	29.85
112.5	13.40	16.04	20.10	24.77	28.43	33.10	36.55	38.79	37.97
135.0	10.36	14.42	20.31	27.01	32.69	36.55	39.39	41.02	40.41
157.5	6.50	9.14	14.62	21.53	28.02	32.69	35.33	37.16	37.57
180.0	5.08	6.50	9.75	14.82	20.71	25.99	29.65	32.08	33.91
202.5	6.09	7.51	10.56	14.62	19.29	22.95	27.21	30.46	33.10
225.0	11.58	12.39	15.43	18.89	22.74	26.40	30.05	34.11	36.15
247.5	17.46	17.87	20.31	23.76	27.82	32.08	36.35	38.99	38.58
270.0	22.13	15.23	16.65	19.09	21.93	24.37	27.01	28.84	29.24
292.5	26.40	14.01	12.59	12.18	13.81	15.84	17.87	19.49	21.12
315.0	28.63	12.79	9.54	8.53	8.94	10.56	12.39	14.01	15.64
337.5	27.21	10.56	6.50	6.30	7.51	8.94	10.36	12.18	13.61
360.0	20.31	7.92	5.48	6.09	7.11	8.73	10.56	12.18	13.81

C/γ(°)	135.0	140.0	145.0	150.0	155.0	160.0	165.0	170.0	175.0
0.0	15.03	16.25	17.06	17.67	18.07	18.48	18.48	18.68	18.89
22.5	17.67	18.68	19.29	19.70	19.90	19.90	19.49	19.49	19.49
45.0	23.15	23.35	23.35	22.74	22.13	21.32	20.51	20.10	19.70
67.5	29.85	28.84	26.80	25.59	24.16	22.54	21.32	20.31	19.90
90.0	29.24	27.62	25.38	24.16	22.74	20.92	19.70	18.89	18.68
112.5	35.13	31.88	28.84	26.80	24.57	21.93	20.31	19.09	18.68
135.0	37.77	33.91	30.66	28.23	25.38	22.74	21.12	19.90	19.29
157.5	35.94	33.51	30.66	28.23	25.79	23.35	21.32	20.31	19.49
180.0	33.91	32.49	30.26	27.82	25.59	23.35	21.73	20.31	19.70
202.5	33.91	32.49	30.05	27.82	25.38	23.15	21.73	20.71	19.90
225.0	35.13	32.69	29.85	27.82	25.59	23.15	21.32	20.71	19.90
247.5	35.94	32.90	30.26	27.62	25.59	23.15	21.32	20.51	20.10
270.0	28.23	26.80	24.77	23.76	22.34	20.71	19.90	19.09	19.09
292.5	21.73	21.53	20.92	20.51	19.90	19.29	18.68	18.28	18.48
315.0	17.06	17.67	18.07	18.07	18.28	18.07	17.87	18.07	18.07
337.5	14.82	15.84	16.85	17.06	17.46	17.67	18.07	18.07	18.48
360.0	15.03	16.25	17.06	17.67	18.07	18.48	18.48	18.68	18.89

C/γ(°)	180.0
0.0	19.67
22.5	19.67
45.0	19.67
67.5	19.67
90.0	19.67
112.5	19.67
135.0	19.67
157.5	19.67
180.0	19.67
202.5	19.67
225.0	19.67
247.5	19.67
270.0	19.67
292.5	19.67
315.0	19.67
337.5	19.67
360.0	19.67

5 Performance Assessment

Model name	CCT(K)	Total Luminous(lm)	Power(W)	Luminous Efficacy(lm/W)
IK-RFL1-L140-475-DY-35	3000K	64837.98	472.58	137.2
HL-HP475WB35X3YYZSKS	3500K	65717.04 *1	474.21 *2	138.6 *3
IK-RFL1-L140-475-DY-40	4000K	66596.10 *1	474.21 *2	140.4 *3
IK-RFL1-L140-475-DY-45	4500K	67475.15 *1	474.21 *2	142.3 *3
IK-RFL1-L140-475-DY-50	5000K	68354.21 *1	474.21 *2	144.1 *3
IK-RFL1-L140-475-DY-57	5700K	69233.27	475.83	145.5

*1: This value is calculated and the calculation formula is as below:

65717.04=(69233.27-64837.98) /5+64837.98

66596.10=(69233.27-64837.98) /5+65717.04

67475.15=(69233.27-64837.98) /5+66596.10

68354.21=(69233.27-64837.98) /5+67475.15

*2: This value is calculated and the calculation formula is as below:

474.21=(472.58+475.83)/2

*3: This value is calculated and the calcuation formula is as below:

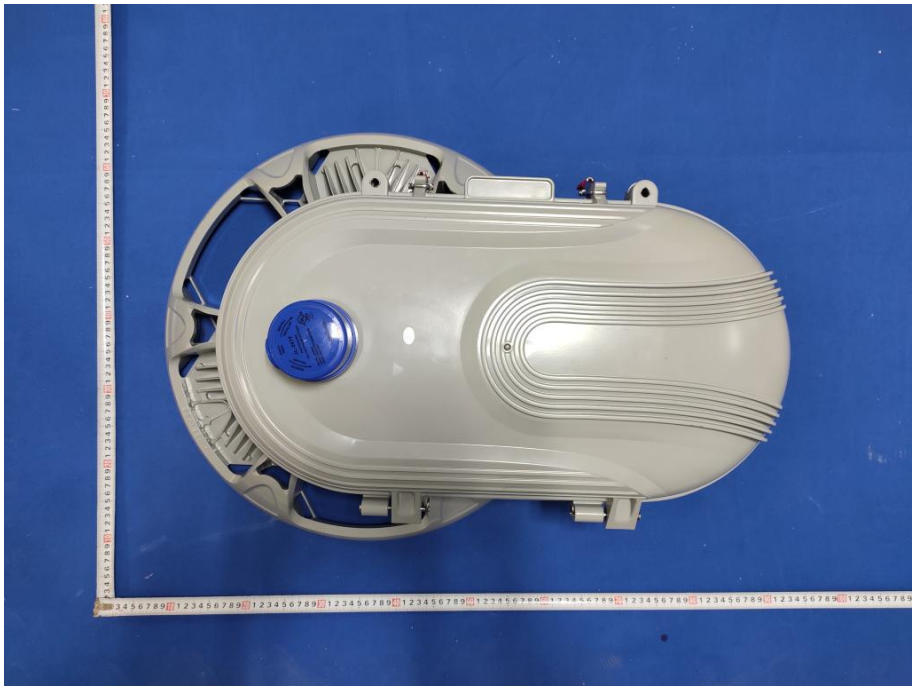
138.6=65717.04 /474.21

140.4=66596.10 /474.21

142.3=67475.15 /474.21

144.1=68354.21 /474.21

Photo Document



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