

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

P.Q.L., Inc.

2285 Ward Avenue o Simi Valley, CA 93065

Test Model: 83677

Report Type:	Electrical and Photometric tests including: Luminous Flux, Color, Luminous Intensity Distribution
Test Engineer:	Daniel Duan <i>Daniel Duan</i>
Report Number:	R2KS151229054-10
Test Date:	2016-01-05 to 2016-01-06
Report Date:	2016-01-11
Reviewed By:	Jeanne Han/Safety Manager <i>Jeanne Han</i>
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Test Facility:	Test facility was located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.
Accreditation:	The NVLAP Lab Code is 200707-0.

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1. Product Description

General Information:

One sample was received on 2015-12-29 and used for testing.

Model Tested: 83677
 Manufacturer: P.Q.L., Inc.
 Brand Name: P.Q.L., Inc.
 Product Designation: Linear Retrofit Kit
 Burning Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120 V AC 60Hz
 Rated Power: 40 W
 Nominal CCT: 5000 K
 Nominal Lumen Output: 4500 lm(For Linear Retrofit Kit)

2. Standards Used

- IESNA LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits – Related Power Quality Requirements for Lighting

3. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integrating Sphere	SENSING	SPR-600	S09008	25~50℃	2015-03-25	2016-03-24
Spectral photometer	SENSING	SPR3000	90902027	350nm~800nm	2015-03-25	2016-03-24
Power Meter	YOKOGAWA	WT-210	91j926132	15/30/60/150/300/600 V	2015-03-05	2016-03-04
AC Power Supply	ALL Power	APW-105N	970663	220V±10% 50HZ	2015-03-05	2016-03-04
Standard Light Source	EVERFINE	D204	01331191	24V/100W	2015-08-27	2016-08-26
Thermal Meter	SENSING	N/A	N/A	25、50℃	2015-03-05	2016-03-04
DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	2015-03-05	2016-03-04
AC Power Supply	EVERFINE	VPS1030 PWM	1012017	0-150V, 0-300V	2015-03-05	2016-03-04
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2015-03-05	2016-03-04
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2015-03-05	2016-03-04
Goniophotometer	EVERFINE	GO-R5000	YG108492N101 20001	1600mm,3000 W/10A	2015-04-21	2016-04-20
Wireless Remote Sensor	N/A	433MHz	N/A	0℃~50℃;-20℃~60℃	2015-03-23	2016-03-22
Standard Light Source	EVERFINE	D908	1012003	N/A	2015-09-08	2016-09-07

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

4. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with IES LM-79-08. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$ during measurement. And relative humidity is less than 65%.

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.

4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the light output (luminous flux) measurements is $U=2.1\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=32\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=2.1$ ($K=2$), at the 95% confidence level.

The uncertainty of power meter AC current $U=0.19\%$ of rdg, AC Voltage $U=0.15\%$ of rdg, Power $U=0.20\%$ ($K=2$), at the 95% confidence level.

Goniophotometer System

The goniophotometer system is calibrated by standard light source before measurement.

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 uncertainty of the luminous intensity is $U=2.82\%$ ($K=2$), at the 95% confidence level.

5. Test Result

[Integrating Sphere System]

Total operating time for integrating sphere test: **1.0 hour**

Test orientation: **Downward**

Electrical Measurement

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.01	60	0.3711	44.15	0.991

Photometric Measurement

Luminous Flux (lm)	Radiant Flux (W)	Efficacy (lm/W)	CCT (K)	Duv
4267.399	13.031	96.657	4960	0.00447

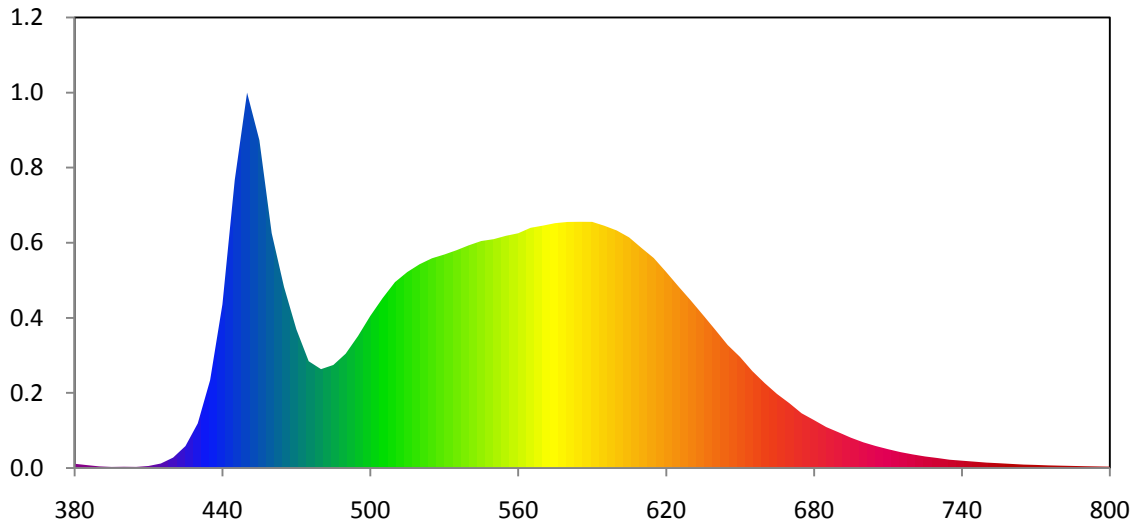
Chromaticity Coordinate

x	y	u	v	u'	v'
0.3472	0.3623	0.2087	0.3267	0.2087	0.4901

Color Rendering Index

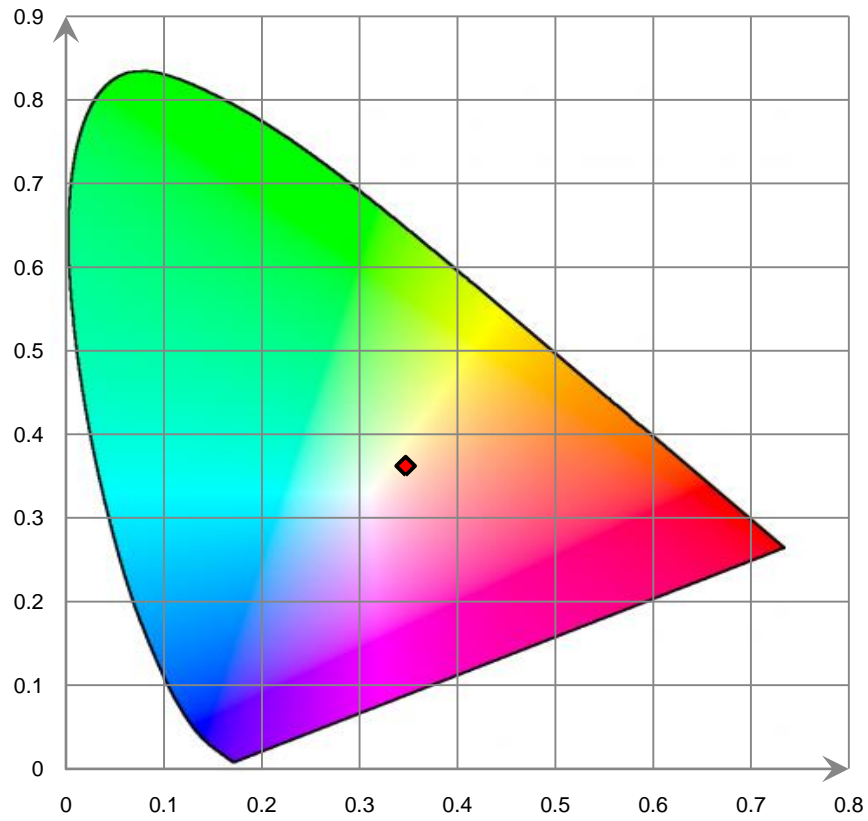
Ra			
82.1			
R1	R2	R3	R4
80	88	94	81
R5	R6	R7	R8
80	83	87	65
R9	R10	R11	R12
2	71	80	55
R13	R14	R15	
83	96	73	

Relative Spectral Power Distribution

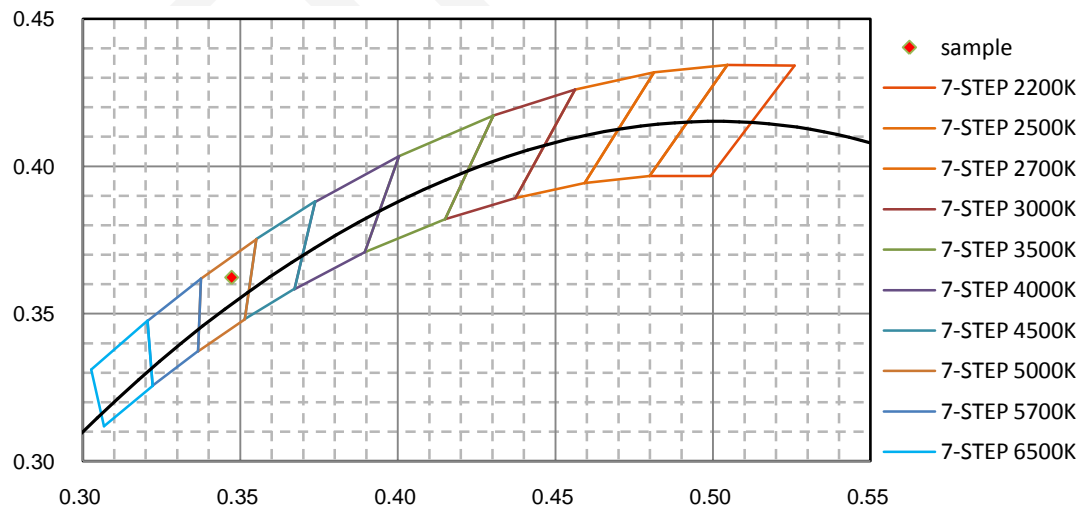


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	2.755E-03	465	1.128E-01	550	1.426E-01	635	9.535E-02	720	8.584E-03
385	1.913E-03	470	8.643E-02	555	1.447E-01	640	8.610E-02	725	7.304E-03
390	1.129E-03	475	6.657E-02	560	1.462E-01	645	7.666E-02	730	6.339E-03
395	7.830E-04	480	6.164E-02	565	1.496E-01	650	6.926E-02	735	5.258E-03
400	8.913E-04	485	6.424E-02	570	1.510E-01	655	6.042E-02	740	4.667E-03
405	7.956E-04	490	7.125E-02	575	1.525E-01	660	5.297E-02	745	4.065E-03
410	1.356E-03	495	8.223E-02	580	1.533E-01	665	4.620E-02	750	3.469E-03
415	2.893E-03	500	9.478E-02	585	1.534E-01	670	4.047E-02	755	3.081E-03
420	6.586E-03	505	1.059E-01	590	1.533E-01	675	3.417E-02	760	2.658E-03
425	1.375E-02	510	1.158E-01	595	1.509E-01	680	2.994E-02	765	2.241E-03
430	2.790E-02	515	1.221E-01	600	1.480E-01	685	2.557E-02	770	2.024E-03
435	5.478E-02	520	1.270E-01	605	1.437E-01	690	2.231E-02	775	1.741E-03
440	1.020E-01	525	1.307E-01	610	1.372E-01	695	1.895E-02	780	1.554E-03
445	1.794E-01	530	1.330E-01	615	1.308E-01	700	1.611E-02		
450	2.338E-01	535	1.357E-01	620	1.222E-01	705	1.381E-02		
455	2.042E-01	540	1.388E-01	625	1.132E-01	710	1.183E-02		
460	1.463E-01	545	1.414E-01	630	1.045E-01	715	1.002E-02		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **1.0 hour**

Test orientation: **Downward**

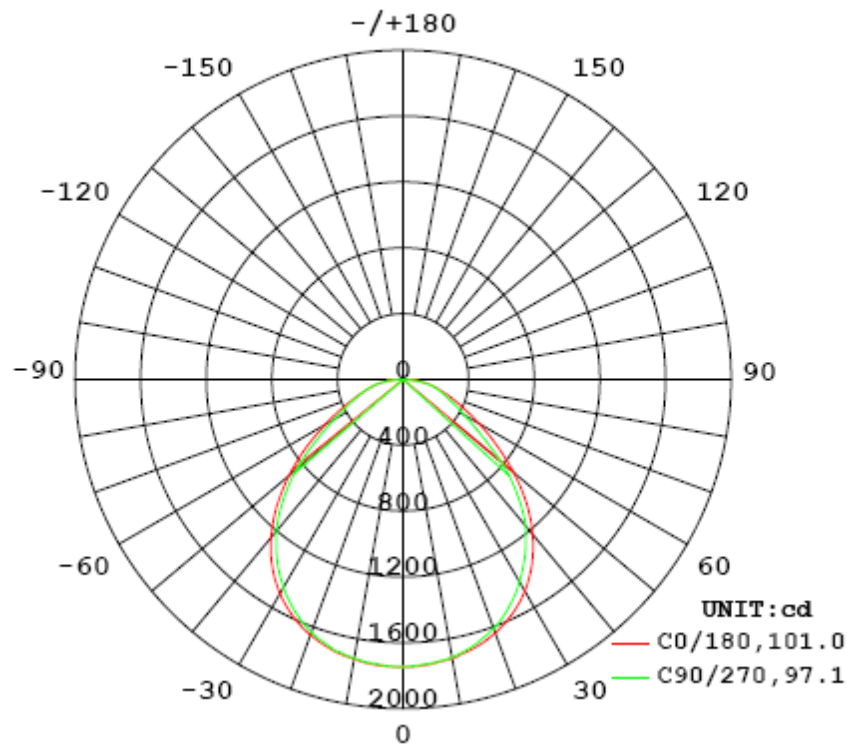
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120	60	0.373	43.75	0.9774

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
4269.43	97.59	1748	1.26	1.21

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	101.0	99.0	97.1	99.5	99.2
Field Angle (10% I _{max}):	156.5	151.8	156.9	152.0	154.3

Luminous Intensity (cd) Distribution Data

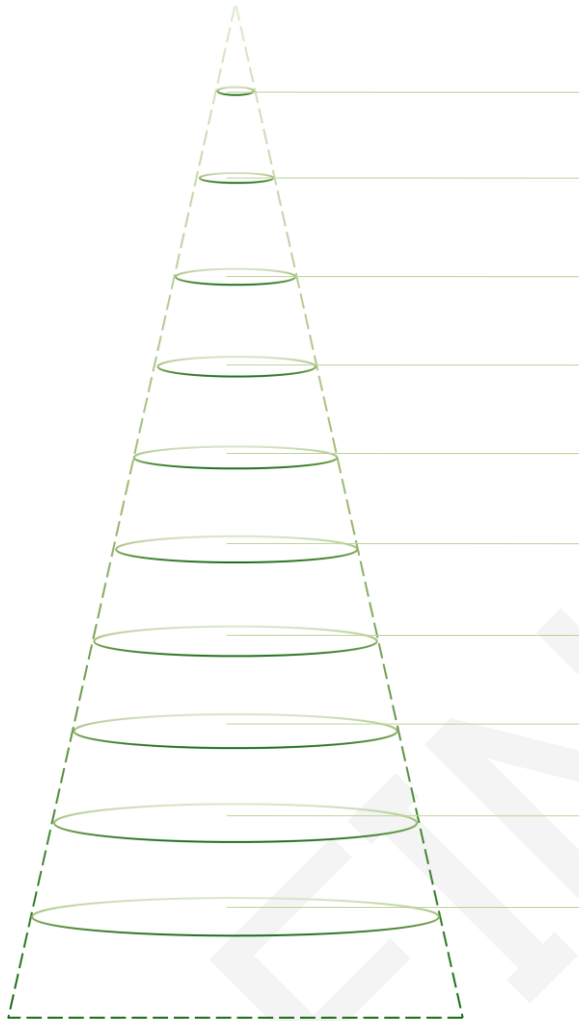
C \ y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1747	1747	1747	1747	1747	1747	1747	1747
5.0°	1743	1742	1741	1739	1737	1739	1739	1740
10.0°	1724	1725	1724	1723	1720	1721	1722	1722
15.0°	1697	1696	1695	1690	1689	1688	1690	1690
20.0°	1651	1653	1646	1641	1635	1636	1642	1644
25.0°	1588	1591	1583	1568	1558	1565	1575	1580
30.0°	1503	1506	1493	1471	1460	1466	1484	1496
35.0°	1391	1394	1377	1355	1340	1344	1370	1385
40.0°	1254	1258	1239	1220	1204	1205	1224	1243
45.0°	1091	1094	1076	1055	1035	1036	1057	1077
50.0°	908	909	889	860	846	857	876	893
55.0°	723	719	700	659	648	673	699	710
60.0°	551	540	511	485	484	502	529	539
65.0°	406	384	360	363	371	378	382	395
70.0°	298	276	253	279	287	291	276	293
75.0°	219	204	187	219	225	223	199	219
80.0°	154	146	142	160	162	156	143	151
85.0°	82	82	81	83	77	77	75	79
90.0°	9	8	4	2	2	2	2	3
95.0°	0	0	0	0	0	0	0	0
100.0°	0	1	0	0	0	0	0	0
105.0°	0	1	1	0	0	1	1	1
110.0°	0	1	1	1	0	1	1	1
115.0°	0	1	1	1	1	1	0	1
120.0°	1	1	1	1	1	1	1	1
125.0°	1	1	1	1	1	1	1	1
130.0°	1	1	1	1	1	1	1	1
135.0°	1	1	1	1	1	1	1	1
140.0°	1	1	1	1	1	1	1	1
145.0°	1	1	1	1	1	1	1	1
150.0°	1	1	1	1	1	1	1	1
155.0°	1	1	1	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	1	1

Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1747	1747	1747	1747	1747	1747	1747	1747
5.0°	1740	1738	1737	1734	1733	1735	1739	1739
10.0°	1720	1717	1715	1715	1713	1716	1719	1721
15.0°	1687	1683	1680	1674	1673	1677	1683	1689
20.0°	1640	1635	1624	1615	1612	1618	1631	1639
25.0°	1573	1565	1547	1531	1525	1539	1558	1576
30.0°	1484	1474	1446	1423	1419	1436	1462	1484
35.0°	1369	1351	1320	1298	1296	1315	1343	1369
40.0°	1227	1206	1176	1154	1162	1177	1203	1228
45.0°	1064	1038	1005	982	983	1008	1038	1068
50.0°	878	854	827	801	781	813	853	885
55.0°	694	669	648	595	573	597	668	697
60.0°	533	500	470	442	430	436	475	523
65.0°	400	365	337	339	333	328	331	372
70.0°	298	269	243	264	264	255	233	267
75.0°	218	195	180	203	208	199	174	198
80.0°	151	133	127	139	143	142	128	137
85.0°	74	65	56	54	52	59	65	71
90.0°	0	0	0	0	0	0	0	0
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	0	0	1	0	0	0	0	0
110.0°	0	0	1	1	0	0	0	0
115.0°	0	0	1	1	1	0	0	0
120.0°	1	1	1	1	1	1	0	0
125.0°	1	1	1	1	1	1	1	0
130.0°	1	1	1	1	1	1	1	1
135.0°	1	1	1	1	1	1	1	1
140.0°	1	1	1	1	1	1	1	1
145.0°	1	1	1	1	1	1	1	1
150.0°	1	1	1	1	1	1	1	1
155.0°	1	1	1	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	1	1

Average Area Illumination Figure

Angle:99.2°. Flux out:3006.0lm



Height (m)	Diameter (cm)	E _{avg} (lx)	E _{max} (lx)
0.5	117.50	2695.0	6994.0
1.0	235.00	673.7	1749.0
1.5	352.50	299.4	777.2
2.0	470.00	168.4	437.2
2.5	587.50	107.8	279.8
3.0	705.00	74.9	194.3
3.5	822.50	55.0	142.7
4.0	940.00	42.1	109.3
4.5	1057.50	33.3	86.4
5.0	1175.00	27.0	69.9

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	41.6	0.98
5-10	123.7	2.89
10-15	202.1	4.74
15-20	273.8	6.41
20-25	335.7	7.86
25-30	384.0	8.99
30-35	415.5	9.74
35-40	427.6	10.01
40-45	418.0	9.79
45-50	384.3	9.00
50-55	331.0	7.75
55-60	267.4	6.27
60-65	207.6	4.86
65-70	159.8	3.74
70-75	123.6	2.90
75-80	93.5	2.19
80-85	59.6	1.40
85-90	16.5	0.38
90-95	0.3	0.01
95-100	0.2	0.00
100-105	0.2	0.01
105-110	0.3	0.00
110-115	0.3	0.01
115-120	0.3	0.01
120-125	0.3	0.00
125-130	0.3	0.01
130-135	0.3	0.01
135-140	0.3	0.00
140-145	0.3	0.01
145-150	0.3	0.01
150-155	0.3	0.00
155-160	0.2	0.01
160-165	0.2	0.00
165-170	0.1	0.01
170-175	0.1	0.00
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	41.6	0.98
0-10	165.3	3.87
0-15	367.4	8.61
0-20	641.2	15.02
0-25	976.8	22.88
0-30	1360.9	31.87
0-35	1776.3	41.61
0-40	2203.9	51.62
0-45	2621.9	61.41
0-50	3006.1	70.41
0-55	3337.2	78.16
0-60	3604.5	84.43
0-65	3812.2	89.29
0-70	3972.0	93.03
0-75	4095.6	95.93
0-80	4189.1	98.12
0-85	4248.7	99.52
0-90	4265.2	99.90
0-95	4265.5	99.91
0-100	4265.7	99.91
0-105	4266.0	99.92
0-110	4266.2	99.92
0-115	4266.5	99.93
0-120	4266.7	99.94
0-125	4267.0	99.94
0-130	4267.3	99.95
0-135	4267.5	99.96
0-140	4267.8	99.96
0-145	4268.1	99.97
0-150	4268.4	99.98
0-155	4268.7	99.98
0-160	4269.0	99.99
0-165	4269.2	99.99
0-170	4269.3	100.00
0-175	4269.4	100.00
0-180	4269.4	100.00

6. Product Photo



*****END OF REPORT*****