

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

Bluetech Industry Co., Ltd

2F/1st Building, Shunchengji Industrial Park, Longhua New District, Shenzhen, China

Test Model: ZCL-GW-LE-ISA

Report Type:	Electrical and Photometric tests for Horticultural Lighting
Test Engineer:	Hexy He <i>Hexy He</i>
Report Number:	R2DG180920050-10
Test Date:	2018-09-21
Report Date:	2018-09-25
Reviewed By:	Blake Zhang / EE Engineer <i>Blake Zhang</i>
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China. Tel: +86-755-33320018 Fax: +86-755-33320008
Test Facility:	Test facility was located at No.69, Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.(Shenzhen). 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. Product Description

General Information:

One sample was received on 2018-09-20 and used for testing.

Model Tested:	ZCL-GW-LE-ISA
Manufacturer:	BLUETECH INDUSTRY CO., LTD.
Brand Name:	SAMSUNG QUANTUM BOARD (custom)
Product Designation:	HORTICULTURAL LED LIGHT SOURCE
Burning Time Before Test:	0hour(For New Products)
Rated Current:	1100mA CC
Rated Power:	50 W

2. Standards Used

- IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI/ASABE S640 JUL2017 Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms) (This method is not in NVLAP accreditation scope)

3. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
1.5m temperature integrating sphere	SENSING	SPR-600	S09008	2018-06-28	2019-06-28
High-precision rapid spectral analysis system	EVERFINE	HAAS-2000	M112048CA1361125	2018-06-28	2019-06-28
Digital power meter	YOKOGAWA	WT310	13398	2017-12-14	2018-12-14
Programmable Precision DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	2018-03-26	2019-03-26
thermometer	SENSING	NA	NA	2018-03-26	2019-03-26
Standard Light Source	EVERFINE	D204	G100283CA8351158	2018-01-08	2019-01-08
Precision frequency power supply	ALL Power	APW-105N	970613	2018-03-19	2019-03-19
AC POWER SUPPLY	EVERFINE	VPS1030 PWM	1012017	2018-03-19	2019-03-19
Digital CC&CV DC Power Supply	EVERFINE	WY12010	1009009	2018-03-26	2019-03-26
Digital power meter	YOKOGAWA	WT-210	91j926132	2018-03-26	2019-03-26
full-field speed goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	2018-03-18	2019-03-18
Wireless Remote Sensor	N/A	433MHz	N/A	2018-03-17	2019-03-17
Standard Light Source	EVERFINE	D908	1012003	2018-01-05	2019-01-05

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, Spectroradiometer, and integrating sphere. The integrating sphere system is calibrated by standard spectrum 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 $U=25\text{K}$ ($K=2$), 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 $U=0.17\%$ of rdg, Power $U=0.48\%$ ($K=2$), 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 vertical angle (γ) test intervals were set no more than 1 degree while data for 5 degree intervals is reported. The horizontal angle (C plane) test intervals were set no more than 22.5 degree.

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

5. Test Result

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

Test orientation: **Downward**

Voltage (V)	44.82
Frequency (Hz)	N/A
Current (A)	1.100
Power (W)	49.31
Power Factor	1.000
Luminous Flux (lm)	8296
Efficacy (lm/W)	168.38
CCT	2973

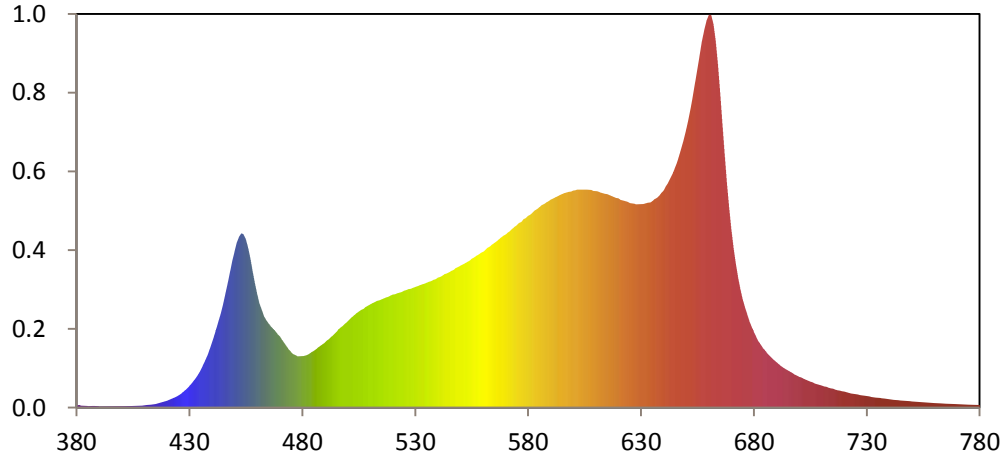
Color Rendering Index

Ra			
94.7			
R1	R2	R3	R4
96	98	97	93
R5	R6	R7	R8
96	95	93	90
R9	R10	R11	R12
82	96	94	86
R13	R14	R15	
97	99	96	

Radiant Flux (W)	Range	Test Result
Photosynthetic Photon Flux (PPF), (μmol/s)	400-700nm	141.248
	400-500nm	16.744
	500-600nm	50.314
	600-700nm	75.229
Far Red Photon Flux (PF _{FR}), (μmol/s)	700-800nm*	3.921
Photosynthetic PhotonEfficacy (PPE), (μmol/J)	400-700nm	2.864

Note: Measured spectral range is 380nm-780nm. Only 700-780nm is calculated for PF_{FR}.

Relative Spectral Power Distribution



F I N A L

Spectral Quantum Distribution

nm	μmol/s/nm	nm	μmol/s/nm	nm	μmol/s/nm	nm	μmol/s/nm	nm	μmol/s/nm
380	0.003999	461	0.289951	542	0.428477	623	0.771290	704	0.114051
381	0.006762	462	0.270497	543	0.434487	624	0.770441	705	0.110795
382	0.005109	463	0.253937	544	0.438152	625	0.766974	706	0.107588
383	0.004114	464	0.242965	545	0.442466	626	0.766631	707	0.103131
384	0.003968	465	0.235132	546	0.447568	627	0.766807	708	0.100258
385	0.004226	466	0.227418	547	0.451726	628	0.765930	709	0.097200
386	0.003330	467	0.221230	548	0.458552	629	0.766099	710	0.094607
387	0.003804	468	0.214858	549	0.462143	630	0.767316	711	0.090520
388	0.004109	469	0.207632	550	0.468042	631	0.770644	712	0.089040
389	0.003120	470	0.201160	551	0.473499	632	0.772922	713	0.085827
390	0.003182	471	0.191706	552	0.477588	633	0.776791	714	0.083381
391	0.002668	472	0.183748	553	0.483539	634	0.779078	715	0.081346
392	0.003532	473	0.174766	554	0.488581	635	0.786146	716	0.077749
393	0.002509	474	0.165943	555	0.495030	636	0.794296	717	0.075640
394	0.002751	475	0.158709	556	0.500105	637	0.800869	718	0.073705
395	0.002468	476	0.153393	557	0.506592	638	0.810127	719	0.071464
396	0.002545	477	0.150167	558	0.512166	639	0.821545	720	0.069396
397	0.002703	478	0.147405	559	0.518224	640	0.834601	721	0.066780
398	0.002632	479	0.147313	560	0.523833	641	0.850909	722	0.065062
399	0.002863	480	0.147460	561	0.529927	642	0.865653	723	0.062131
400	0.003129	481	0.149898	562	0.537918	643	0.884739	724	0.060946
401	0.003610	482	0.152385	563	0.543111	644	0.903880	725	0.059606
402	0.003528	483	0.156214	564	0.551148	645	0.926851	726	0.057922
403	0.003299	484	0.160826	565	0.557320	646	0.950429	727	0.055747
404	0.003546	485	0.165537	566	0.563984	647	0.980024	728	0.054016
405	0.004252	486	0.170104	567	0.571143	648	1.012415	729	0.052299
406	0.004361	487	0.176275	568	0.578797	649	1.044359	730	0.050674
407	0.004515	488	0.181125	569	0.586000	650	1.082373	731	0.049668
408	0.004478	489	0.186360	570	0.592271	651	1.123221	732	0.047747
409	0.005371	490	0.191616	571	0.599992	652	1.168549	733	0.045741
410	0.006005	491	0.198122	572	0.606303	653	1.218923	734	0.044662
411	0.006593	492	0.203831	573	0.615027	654	1.272727	735	0.043912
412	0.006954	493	0.210056	574	0.622338	655	1.326689	736	0.042508
413	0.007975	494	0.216759	575	0.628709	656	1.383004	737	0.040748
414	0.008545	495	0.223653	576	0.637507	657	1.440033	738	0.039927
415	0.009509	496	0.231403	577	0.642472	658	1.490079	739	0.038869
416	0.010488	497	0.238724	578	0.652766	659	1.529804	740	0.037685
417	0.012709	498	0.245366	579	0.657768	660	1.552539	741	0.036670
418	0.014228	499	0.252491	580	0.666176	661	1.554891	742	0.035653
419	0.015807	500	0.258514	581	0.672667	662	1.524040	743	0.034285
420	0.017411	501	0.265606	582	0.680150	663	1.459835	744	0.033597
421	0.019740	502	0.272683	583	0.688629	664	1.369896	745	0.032222
422	0.022609	503	0.278818	584	0.696156	665	1.258556	746	0.031305
423	0.024650	504	0.285524	585	0.702728	666	1.136296	747	0.030798
424	0.027309	505	0.291198	586	0.710297	667	1.017567	748	0.029526
425	0.030852	506	0.296555	587	0.715925	668	0.904061	749	0.029121
426	0.035209	507	0.300277	588	0.723043	669	0.804751	750	0.028012
427	0.040049	508	0.306008	589	0.728704	670	0.718021	751	0.027547
428	0.044902	509	0.311418	590	0.735367	671	0.644491	752	0.026773
429	0.050206	510	0.315014	591	0.740072	672	0.582536	753	0.025330
430	0.056542	511	0.320203	592	0.745778	673	0.526975	754	0.024859
431	0.063159	512	0.323483	593	0.751499	674	0.481895	755	0.024078
432	0.070889	513	0.327888	594	0.756242	675	0.442661	756	0.023471
433	0.078727	514	0.330977	595	0.761494	676	0.406303	757	0.022806
434	0.088196	515	0.334505	596	0.766760	677	0.377872	758	0.022665
435	0.098290	516	0.337829	597	0.770042	678	0.350375	759	0.021585
436	0.110726	517	0.341855	598	0.773832	679	0.328585	760	0.020762
437	0.123400	518	0.344378	599	0.776127	680	0.308207	761	0.020452
438	0.138731	519	0.348513	600	0.780432	681	0.289931	762	0.019485
439	0.153617	520	0.352706	601	0.782738	682	0.272171	763	0.019428
440	0.170959	521	0.354299	602	0.787563	683	0.258524	764	0.018457
441	0.189965	522	0.358033	603	0.787359	684	0.245066	765	0.018328
442	0.209461	523	0.361080	604	0.789674	685	0.235060	766	0.017327
443	0.230673	524	0.363742	605	0.791488	686	0.223246	767	0.017279
444	0.254205	525	0.367596	606	0.792289	687	0.213578	768	0.017077
445	0.279255	526	0.370450	607	0.791567	688	0.205147	769	0.016489
446	0.307248	527	0.374767	608	0.792871	689	0.195942	770	0.015622
447	0.335439	528	0.375831	609	0.789593	690	0.188209	771	0.015539
448	0.365475	529	0.379992	610	0.792420	691	0.180857	772	0.015082
449	0.395229	530	0.383280	611	0.791676	692	0.173078	773	0.014636
450	0.421313	531	0.386844	612	0.789390	693	0.167477	774	0.014435
451	0.446755	532	0.390330	613	0.788118	694	0.160873	775	0.013935
452	0.462859	533	0.393782	614	0.786837	695	0.155179	776	0.013369
453	0.473729	534	0.396708	615	0.787091	696	0.150399	777	0.013133
454	0.470980	535	0.400850	616	0.784251	697	0.144730	778	0.013196
455	0.459085	536	0.404422	617	0.782945	698	0.139278	779	0.013239
456	0.437985	537	0.407870	618	0.780598	699	0.134686	780	0.013282
457	0.410294	538	0.412632	619	0.778756	700	0.129846		
458	0.375509	539	0.415471	620	0.777423	701	0.126985		
459	0.344060	540	0.421343	621	0.774005	702	0.122002		
460	0.315085	541	0.423797	622	0.772651	703	0.118473		

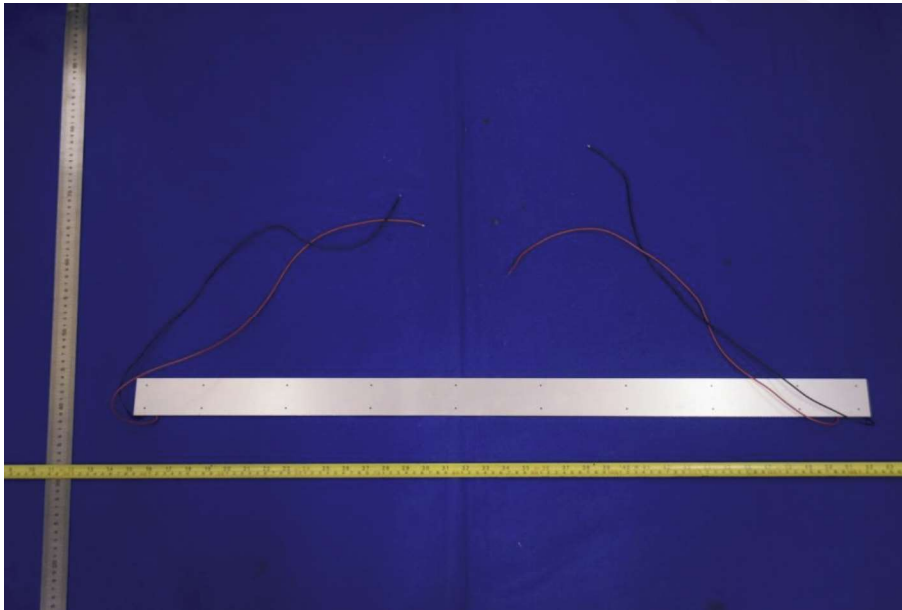
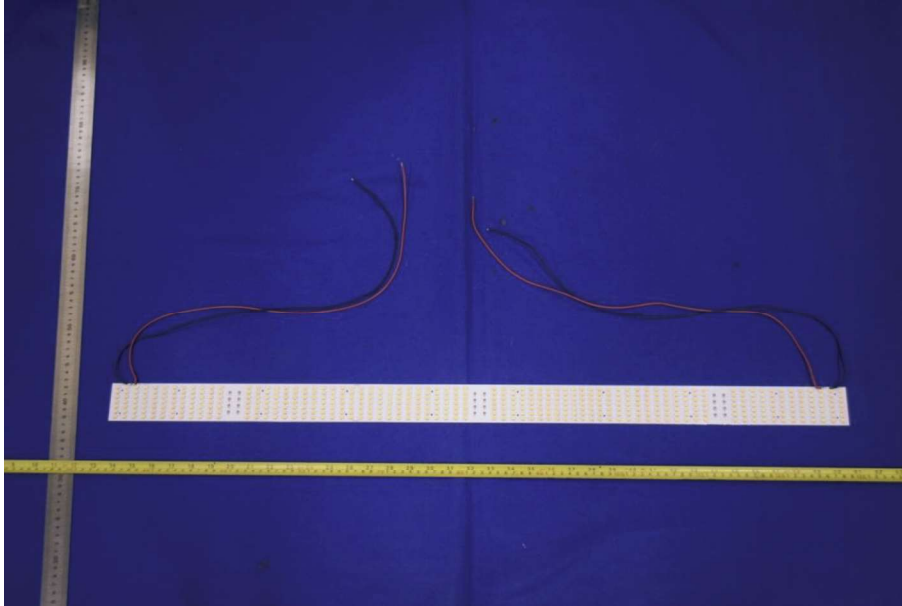
Photosynthetic Photon Intensity Distribution (PPID) ($\mu\text{mol/s/sr}$) Data

γ \ C	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	46.799	46.799	46.799	46.799	46.799	46.799	46.799	46.799
5.0°	46.684	46.691	46.687	46.674	46.663	46.642	46.629	46.611
10.0°	46.265	46.281	46.254	46.196	46.158	46.138	46.147	46.130
15.0°	45.542	45.555	45.479	45.353	45.263	45.253	45.327	45.355
20.0°	44.503	44.505	44.354	44.141	44.024	44.017	44.168	44.279
25.0°	43.147	43.131	42.883	42.593	42.423	42.443	42.693	42.911
30.0°	41.454	41.425	41.060	40.696	40.496	40.531	40.849	41.217
35.0°	39.389	39.341	38.868	38.460	38.217	38.291	38.671	39.172
40.0°	36.924	36.863	36.326	35.827	35.530	35.662	36.148	36.712
45.0°	34.021	33.944	33.367	32.777	32.407	32.645	33.175	33.812
50.0°	30.719	30.629	30.003	29.259	28.791	29.146	29.823	30.538
55.0°	27.076	26.970	26.303	25.525	25.213	25.418	26.198	26.908
60.0°	23.203	23.031	22.400	21.768	21.442	21.655	22.316	23.071
65.0°	19.091	18.922	18.321	17.765	17.471	17.678	18.296	18.946
70.0°	14.645	14.518	14.020	13.519	13.314	13.497	14.023	14.503
75.0°	9.933	9.910	9.659	9.208	9.123	9.236	9.631	10.122
80.0°	5.484	5.526	5.367	5.234	5.152	5.232	5.409	5.694
85.0°	1.781	1.927	1.991	1.950	1.904	1.961	2.025	2.065
90.0°	0.060	0.148	0.123	0.151	0.114	0.159	0.143	0.110
95.0°	0.013	0.013	0.022	0.030	0.029	0.031	0.023	0.014
100.0°	0.016	0.016	0.016	0.016	0.018	0.017	0.016	0.016
105.0°	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
110.0°	0.019	0.019	0.019	0.019	0.020	0.020	0.019	0.019
115.0°	0.020	0.021	0.021	0.021	0.021	0.021	0.021	0.021
120.0°	0.022	0.023	0.023	0.024	0.024	0.024	0.023	0.023
125.0°	0.026	0.027	0.027	0.028	0.028	0.028	0.027	0.027
130.0°	0.032	0.032	0.033	0.034	0.034	0.034	0.033	0.032
135.0°	0.039	0.039	0.040	0.041	0.042	0.041	0.040	0.039
140.0°	0.048	0.049	0.050	0.051	0.051	0.051	0.050	0.049
145.0°	0.060	0.060	0.061	0.063	0.063	0.063	0.062	0.060
150.0°	0.069	0.070	0.071	0.073	0.073	0.073	0.071	0.069
155.0°	0.076	0.077	0.079	0.081	0.081	0.081	0.079	0.077
160.0°	0.081	0.082	0.084	0.086	0.086	0.085	0.083	0.081
165.0°	0.081	0.082	0.084	0.086	0.086	0.085	0.083	0.081
170.0°	0.079	0.079	0.080	0.083	0.082	0.081	0.080	0.079
175.0°	0.073	0.073	0.075	0.076	0.075	0.075	0.074	0.073
180.0°	0.067	0.066	0.067	0.068	0.069	0.068	0.067	0.067

Photosynthetic Photon Intensity Distribution (PPID) ($\mu\text{mol/s/sr}$) Data (cont.)

γ \ C	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	46.799	46.799	46.799	46.799	46.799	46.799	46.799	46.799
5.0°	46.610	46.603	46.603	46.610	46.634	46.655	46.675	46.686
10.0°	46.134	46.113	46.106	46.095	46.126	46.171	46.226	46.268
15.0°	45.359	45.336	45.295	45.222	45.215	45.314	45.449	45.533
20.0°	44.289	44.257	44.153	43.978	43.950	44.077	44.301	44.474
25.0°	42.923	42.888	42.672	42.394	42.335	42.506	42.819	43.109
30.0°	41.244	41.213	40.841	40.468	40.391	40.591	40.974	41.385
35.0°	39.218	39.180	38.659	38.226	38.103	38.333	38.763	39.299
40.0°	36.826	36.740	36.130	35.591	35.406	35.670	36.190	36.807
45.0°	34.014	33.862	33.190	32.586	32.280	32.596	33.221	33.906
50.0°	30.843	30.584	29.838	29.135	28.660	29.041	29.829	30.577
55.0°	27.322	26.988	26.249	25.384	25.087	25.334	26.121	26.920
60.0°	23.528	23.167	22.408	21.678	21.395	21.613	22.247	22.977
65.0°	19.576	19.246	18.543	17.837	17.513	17.726	18.308	19.032
70.0°	15.105	14.808	14.247	13.623	13.310	13.470	13.969	14.609
75.0°	10.527	10.252	9.817	9.355	9.075	9.164	9.585	9.973
80.0°	6.105	5.925	5.605	5.322	5.124	5.149	5.294	5.564
85.0°	2.307	2.310	2.217	2.081	1.863	1.937	1.954	2.017
90.0°	0.215	0.277	0.282	0.277	0.218	0.243	0.216	0.094
95.0°	0.005	0.006	0.016	0.023	0.021	0.022	0.014	0.006
100.0°	0.007	0.007	0.007	0.009	0.010	0.008	0.007	0.007
105.0°	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
110.0°	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
115.0°	0.015	0.015	0.015	0.015	0.015	0.014	0.014	0.015
120.0°	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
125.0°	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021
130.0°	0.024	0.024	0.024	0.024	0.024	0.023	0.023	0.024
135.0°	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
140.0°	0.028	0.027	0.028	0.028	0.028	0.028	0.027	0.027
145.0°	0.030	0.029	0.030	0.030	0.030	0.030	0.030	0.030
150.0°	0.033	0.032	0.033	0.033	0.034	0.034	0.033	0.033
155.0°	0.038	0.037	0.037	0.038	0.039	0.039	0.038	0.038
160.0°	0.042	0.042	0.042	0.042	0.043	0.043	0.043	0.042
165.0°	0.046	0.046	0.045	0.046	0.047	0.047	0.047	0.046
170.0°	0.050	0.050	0.050	0.050	0.051	0.051	0.051	0.051
175.0°	0.058	0.057	0.057	0.057	0.058	0.058	0.059	0.059
180.0°	0.067	0.066	0.066	0.067	0.068	0.069	0.068	0.067

6. Product Photo



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