Intertek Testing Services NA
3933 US Rt 11
Cortland, NY 13045
Tel: 607-753-6711

Test Verification of Conformity

In the basis of the tests undertaken, the sample(s) of the below product have been found to comply with the requirements of the referenced specifications at the time the tests were carried out.

Applicant Name & Address:	Shanghai Nanhua Electronics Company Building 9, No.1755, Wenbei Rd JIADING DISTRICT, SHHP 201802
Product Description:	Medium Intensity Obstruction Light Type B (Red)
Ratings & Principle Characteristics:	110-240VAC CREE LED: XPEBRO-L1-030-Q2-C-0160 (2 rows of 30) Red LED's
	
Models:	LM100
Brand Name:	NANHUA
Relevant Standards	International Civil Aviation Organization (ICAO), Aerodromes, Annex 14, Volume 1, Sixth Edition, dated July 2013
Standard Limitation(s)	Photometry (Table 6-3) & Chromaticity Appendix 1 (Section 2.1.1) (Not including recommendations)
Verification Issuing Office:	Intertek Cortland – Lighting 3933 US Rt. 11 Cortland, NY 13045
Date of Tests:	February 24, 2015 through March 13, 2015
Test Report Number(s):	101856446CRT-001

This verification is part of the full test report(s) and should be read in conjunction with them.

Signature:

Name: Jeremy N. Downs, P.E.
Position: Staff Engineer
Date: March 25, 2015

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Issue Date:March 17, 2015
Project No. G101856446

Quote No.:500556721

Contact: Stella
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Report No: 101856446CRT-001

Shanghai Nanhua Electronics Company

Building 9, No.1755, Wenbei Rd

JIADING DISTRICT
SHHP
201802

Standards

International Civil Aviation Organization (ICAO), Aerodromes, Annex 14, Volume 1, Sixth Edition, dated July 2013

Test Purpose	Medium Intensity Obstruction Light Type B - Verification of Conformity
Test Dates	February 24, 2015 through March 13, 2015

Peter Leshkiv
Engineering Supervisor
Lighting

Jeremy N. Downs, P.E.
Staff Engineer
Lighting

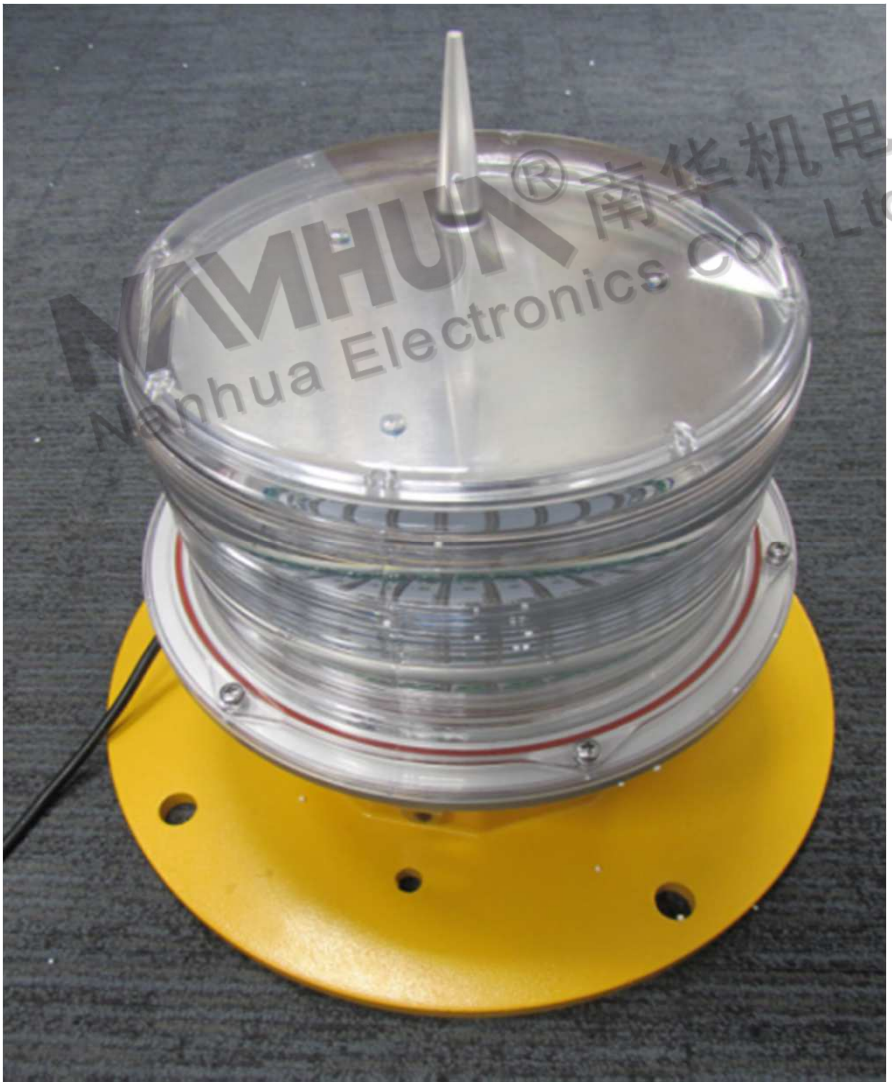
Test Plan and Datasheets			
Client	Shanghai Nanhua Electronics Company	Engineer	Peter Leshkiv
Report #	101856446CRT-001	Reviewer	Jeremy N. Downs, P.E.
Product	Medium Intensity Obstruction Light Type B	Model(s)	LM100
Standard	ICAO Annex 14, dated July 2013		

Spec	Test name	Clause	Pass Fail NA
ICAO	Photometry Medium Intensity Type B (Red)	Table 6-3R	Pass
ICAO	Chromaticity ICAO	2.1.1	Pass

Sample Information				
Date Rec.	**Intertek ID**	**Description**	**Condition**	**Model No.**
1/26/2015	CRT1501261451-001	Medium Intensity Obstacle Light	Production	LM100
3/5/2015	CRT1503051518-001	Replacement Board	Production	LM100

Further Sample Description	
Type:	Medium Intensity Obstruction Light Type B
Light Source:	CREE LED:XPEBRO-L1-030-Q2-C-012 (Rows of 30 LED's-60 LED's total)
Filter:	Clear
Size:	Height: 11 inches, Width: 9 inches
Electrical Input:	110-240VAC
Casting Material:	Aluminum
Mounting:	8 Hole Base Plate
Catalog Number:	LM100

Picture(s)



Photometry: Medium Intensity Obstacle Light (Red Night)

Energize the light by the system power supply and control unit until stabilized and test for compliance with the photometric requirements in ICAO Annex 14, Para. 6.2.1.2 Table 6-1/ 6-3. Make the effective intensity measurements using an integrating photometer whose calibration is traceable to an NIST steady state source. The test distance is 25 meters. The horizontal beam spread is 360 degrees.

Results: Medium Intensity Type B Obstacle Light (Red Night)

Sample Number:	CRT1501261451-001	Note: Sample with 1 flash mode capability.

Medium Intensity Type B (Red Night) 30 FPM

Mode	Parameter	Requirements	Measured		Result
Red Night	Flash Rate (FPM)	20-60FPM	29	FPM	Pass
	Min. Intensity	1,500 cd at 0°	2427	cd	Pass
	Min. Average Intens	2000 cd at 0°	2734	cd	Pass
	Min. Intensity	750cd at -1°	1723	cd	Pass
	Beam Spread	≥3° at each vertical slice (min 750cd)	5	degrees	Pass
	Recommendations (not required for compliance)		Measured		Result
	Max Intensity	2500 cd at 0°	2973	cd	N/A
	Max Intensity	1125 cd at -1°	2136	cd	N/A
	Max Intensity	75 cd at -10°	110	cd	N/A

Voltage Range	Voltage	Position	Measured	Factor
Min Voltage	110	0,0	17000	NA
Max Voltage	240	0,0	17250	101%

Cable Length:	5ft	Calibration Factor:	3.57X10-12	Input:	120VAC	Vac
Flash Duration (sec):	1.05	Neutral Density Filter:	NA			
Flash Period (sec.):	2.09					

Calculated Effective Intensity Data (candela)

Vertical Position	Horizontal Position (deg.)											
	0	30	60	90	120	150	180	210	240	270	300	330
3U	1131	1088	1096	1128	1142	1195	1115	1128	1118	1203	1176	1227
2U	2330	2160	2245	2251	2285	2334	2317	2389	2302	2272	2280	2323
1.5U	2685	2573	2603	2686	2726	2723	2709	2656	2618	2501	2530	2611
1U	3131	2995	3102	3022	3150	3118	3125	3141	3134	2979	2925	3082
0	2754	2686	2850	2858	2898	2973	2915	2834	2656	2427	2430	2528
1D	1880	1949	2064	2106	2130	2136	2107	2014	1858	1774	1725	1723
1.5D	1211	1314	1442	1555	1531	1544	1427	1333	1179	1125	1096	1058
2D	816	898	1053	1046	1056	1091	1008	922	826	824	771	757
3D	582	586	640	597	629	635	614	613	598	610	574	547
10D	103	92	107	105	108	110	96	93	92	87	86	88

Sample Number:	CRT1503051518-001

Medium Intensity Type B (Red Night) 40 FPM					
Mode	Parameter	**Requirements**	Measured		Result
Red Night	Flash Rate (FPM)	20-60FPM	39	FPM	Pass
	Min. Intensity	1,500 cd at 0°	2438	cd	Pass
	Min. Average Intens	2000 cd at 0°	2736	cd	Pass
	Min. Intensity	750cd at -1°	1685	cd	Pass
	Beam Spread	≥3° at each vertical slice (min 750cd)	4.5		Pass
	Recommendations (not required for compliance)		Measured		Result
	Max Intensity	2500 cd at 0°	2994	cd	N/A
	Max Intensity	1125 cd at -1°	2259	cd	N/A
	Max Intensity	75 cd at -10°	102	cd	N/A

Voltage Range	Voltage	Position	Measured	Factor
Min Voltage	110	0,0	12600	NA
Max Voltage	240	0,0	12430	99%

Cable Length:	5ft	Calibration Factor:	3.57X10-12	Input:	120 Vac
Flash Duration (sec):	0.758	Neutral Density Filter:	na		
Flash Period (sec.):	1.52				

Calculated Effective Intensity Data (candela)

Vertical Position	Horizontal Position (deg.)											
	0	30	60	90	120	150	180	210	240	270	300	330
3U	1113	1063	1050	1035	973	1054	1000	1061	1019	1134	1132	1200
2U	2282	2138	2157	2094	2129	2138	2163	2200	2192	2244	2221	2271
1.5U	2616	2451	2480	2520	2545	2505	2733	2543	2505	2610	2466	2735
1U	3050	2960	2956	2906	2937	2927	2956	2931	2960	2860	3027	3015
0	2706	2681	2839	2994	2885	2841	2948	2887	2678	2486	2438	2447
1D	1816	1971	2134	2136	2209	2217	2259	2146	1946	1760	1731	1685
1.5D	1177	1288	1451	1645	1620	1658	1587	1618	1336	1144	1098	1031
2D	787	906	1042	1102	1146	1177	1109	992	820	816	756	741
3D	553	587	633	595	633	637	645	622	601	580	557	528
10D	95	102	94	97	91	92	93	94	98	102	97	97

Sample Number:	CRT1503051518-001

Medium Intensity Type B (Red Night) 60 FPM (Abbreviated)					
Mode	Parameter	**Requirements**	Measured		Result
Red Night	Flash Rate (FPM)	20-60FPM	59	FPM	Pass
	Min. Intensity	1,500 cd at 0°	2142	cd	Pass
	Min. Average Intens	2000 cd at 0°	2499	cd	Pass
	Min. Intensity	750cd at -1°	1601	cd	Pass
	Beam Spread	≥3° at each vertical slice (min 750cd)	4.5	degrees	Pass
	Recommendations (not required for compliance)		Measured		Result
	Max Intensity	2500 cd at 0°	2771	cd	N/A
	Max Intensity	1125 cd at -1°	2023	cd	N/A
	Max Intensity	75 cd at -10°	111	cd	N/A

Voltage Range	Voltage	Position	Measured	Factor
Min Voltage	110	0,0	8410	NA
Max Voltage	240	0,0	8450	100%

Cable Length:	5ft	Calibration Factor:	3.57X10-12	Input:	120 Vac
Flash Duration (sec):	0.506	Neutral Density Filter:	na		
Flash Period (sec.):	1.02				

Calculated Effective Intensity Data (candela)

Vertical Position	Horizontal Position (deg.)											
	0	30	60	90	120	150	180	210	240	270	300	330
3U	1020			969			992			1037		
2U	2068			1921			1946			2031		
1.5U	2385			2309			2289			2218		
1U	2771			2649			2657			2589		
0	2408	2425	2567	2708	2626	2771	2606	2618	2425	2476	2218	2142
1D	1640			1938			2023			1601		
1.5D	1062			1204			1419			1040		
2D	717			992			989			745		
3D	509			544			578			531		
10D	94			111			90			97		

Report No.: 101856446CRT-001
Client: Shanghai Nanhua Electronics Company
Standard: ICAO Annex 14, dated July 2013

Product: Medium Intensity Obstruction Light Type B
Model(s): LM100

Sample Number:	CRT1503051518-001

Medium Intensity Type B (Red Night) 20 FPM (Abbreviated)

Mode	Parameter	Requirements	Measured		Result
Red Night	Flash Rate (FPM)	20-60FPM	20	FPM	Pass
	Min. Intensity	1,500 cd at 0°	2651	cd	Pass
	Min. Average Intens	2000 cd at 0°	2954	cd	Pass
	Min. Intensity	750cd at -1°	1901	cd	Pass
	Beam Spread	≥3° at each vertical slice (min 750cd)	5	degrees	Pass
	Recommendations (not required for compliance)		Measured		Result
	Max Intensity	2500 cd at 0°	3256	cd	N/A
	Max Intensity	1125 cd at -1°	2407	cd	N/A
	Max Intensity	75 cd at -10°	110	cd	N/A

Voltage Range	Voltage	Position	Measured	Factor
Min Voltage	110	0,0	24500	NA
Max Voltage	240	0,0	24310	99%

Cable Length:	5ft	Calibration Factor:	3.57x10-12	Input:	120 Vac
Flash Duration (sec):	1.52	Neutral Density Filter:	na		
Flash Period (sec.):	3.06				

Calculated Effective Intensity Data (candela)

Vertical Position	Horizontal Position (deg.)											
	0	30	60	90	120	150	180	210	240	270	300	330
3U	1228			1145			1100			1245		
2U	2500			2305			2349			2442		
1.5U	2872			2767			2767			2674		
1U	3093			3174			3198			3128		
0	2884	2919	3081	3105	3163	2895	3256	3116	2953	2767	2651	2663
1D	1959			2116			2407			1901		
1.5D	1252			1200			1291			1236		
2D	860			842			920			890		
3D	607			657			733			631		
10D	104			108			110			108		

Complies: ☑ YES ☐ NO

Tested By:	Matthew Benninger	Signature or initials:		Comp. Date	3/11/15
Reviewed By:	JND	Signature or initials:	JND		
Test Equipment Used:	1,2,3,4,5	Sample:	CRT1501261451-001		
Amb (ºC):	24	RH%	17		

Chromaticity ICAO

Test the fixture with the lamp, filter and optical system for color of light emitted. Chromaticity Coordinates are to be calculated from a spectral distribution measured in 2nm increments for LEDs, and 5nm increments for incandescent. Measure the color after stabilization at rated input at the main beam center and beam extremes.

Results

Sample	Color	Input	Location	x	y	z	(P/F)
CRT1501261451-001	Red	120V	(0,1.5)	0.684	0.316	0.000	P
			(0,0)	0.683	0.317	0.000	P
			(0,-1)	0.683	0.317	0.000	P

Results

The aviation red must be per ICAO Annex 14, Volume 1, Appendix 1, Colors for Aeronautical Ground Lights, at operating temperature within the following chromaticity boundaries

Boundary	Line Equation	Calc.
Purple Boundary	y ≥ 0.980 - x	0.296
Yellow Boundary	y ≤ 0.335	0.316

Complies: ☑ YES ☐ NO

Tested By:	Chris Klein			Signature or initials:	CJK	Comp. Date	2/26/15
Reviewed By:	JND			Signature or initials:	JND		
Test Equipment Used:	6,7,8,9						
Amb (ºC):	25.3	RH%	17				

Equipment list

#	Intertek ID No.	Description	Manufacturer	Calibration Due
1	O109	Goniometer	Optroniks	10-Oct-2015
2	O115	25M Photometer	Optroniks	29-Oct-2015
3	M135	Multimeter	Fluke	11-Feb-2016
4	T1360	Hygro-Thermometer	Extech	10-Dec-2015
5	L061	Il1700	Intertenational Light	29-Oct-2015
6	E288	OL-750 Spectroradiometer	Optronics	16-Mar-2015
7	T1366	Temp/RH Indicator	Extech	10-Dec-2015
8	N721	Setel Rule	---	24-Apr-2015
9	E499	Smart Tool/Level Meter	M-D Building Products	25-Feb-2015
10				

Note: For measurement uncertainty, refer to the calibration certificates for all the test equipment located in the equipment files