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Report No. 103379350CRT-002

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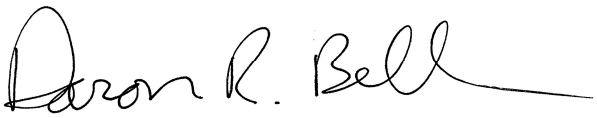
China

Standards

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

Test Purpose	ICAO Photometry and Chromaticity Performance Testing
Test Dates	February 28th 2018 through March 12th 2018
Revision Note	Client address updated



Daron R. Bell
Project Engineer
Lighting

Christopher W. Metcalf
Engineering Supervisor
Lighting

Test Plan and Datasheets			
Client	Shanghai Nanhua Electronics Co., Ltd.	Engineer	Daron R. Bell
Report #	103379350CRT-002	Reviewer	Christopher W. Metcalf
Product	Medium Intensity Type B	Model(s)	LT864
Standard	ICAO Annex 14, dated July 2013		

Spec	Test name	Clause	Pass Fail NA
ICAO	Photometry Low Intensity Type A	Table 6-1	NA
ICAO	Chromaticity ICAO App. 1 2.2.1	2.1.1	NA
ICAO	Photometry Medium Intensity Type B	Table 6-3R	Pass
ICAO	Chromaticity ICAO App. 1 2.2.1	2.1.1	Pass

Sample Information				
Date Rec.	**Intertek ID**	**Description**	**Condition**	**Model No.**
2/14/18	CRT1802141509-001	LT864 Medium Intensity Type B	Production	1000117-001

Further Sample Description	
Type:	Medium Intensity Type B
Class:	NA
Mode:	NA
Style:	NA
Options:	Solar Panel
Light Source:	18 x CREE Model XPEBRD
Filter:	Polycarbonate
Diameter:	6.75"
Electrical Input:	12.0 VDC 3 A (Supplied by client)
Casting Material:	Aluminium
Yield Device:	NA
Mounting:	NA

Picture(s)

LT864 Front

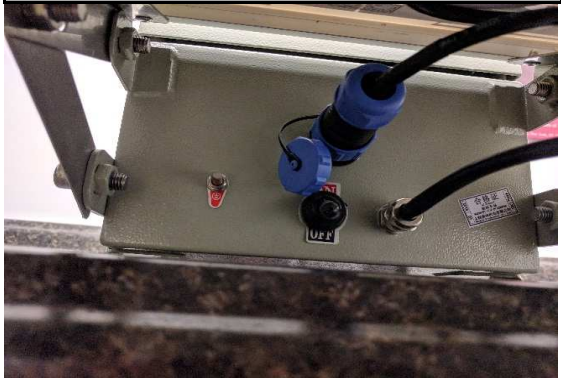
LT864 Back

LT864 Side

LT864 Label

LT864 Top

LT864 Solar Panel Connection



Photometry Medium Intensity Type B (Red)

Energize the light by the system power supply and control unit and test for compliance with the photometric requirements in Table 6-3. Vary the input voltage to the light ± 10% from nominal voltage and measure the effective intensity at the input extremes. 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

ICAO Medium-Intensity, Type B (Red Night)

Table 6-3 Minimum Requirements

Mode	Parameter	Requirement	Measured		Result
Red Night	Flash Rate (FPM)	20-60 FPM	20	FPM	Pass
	Min. Avg. Intensity	2,000 cd at 0°	2204	cd	Pass
	Min. Peak Intensity	1,500 cd at 0°	1903	cd	Pass
	Min. Peak Intensity	750 cd at -1°	1007	cd	Pass
	Beam Spread	≥3° at each vertical slice (min 750cd)	3.5	degrees	Pass

Table 6-3 Recommendations

Mode	Parameter	Requirement	Measured		Result
Red Night	Max. Intensity	2,500 cd at 0°	2718	cd	Fail
	Max. Intensity	1,125 cd at -1°	1896	cd	Fail
	Max. Intensity	75 cd at -10°	13	cd	Pass

					Minimum Cable Length					
Voltage Variation	Voltage	Position	Measured	Factor	Min. Avg. Int. 2,000cd @ 0°			Min. Peak Int. 1,500cd @ 0°		
Input Voltage	12.0	0, 0	9960	NA	2204	cd	Result	1903	cd	Result
Input Voltage +10%	13.2	0, 0	9970	100%	2207	cd	Pass	1905	cd	Pass
Input Voltage -10%	10.8	0, 0	9940	100%	2200	cd	Pass	1899	cd	Pass

Flash Duration (sec):	0.664	Calibration Factor:	3.61x10-12	Input:	12.0 VDC
Flash Period (sec.):	3.02	Neutral Density Filter:	NA		

Calculated Effective Intensity Data (candela)

Vertical Position	Horizontal Position (deg.)											
	0	30	60	90	120	150	180	210	240	270	300	330
3U	778	991	692	789	880	1116	549	444	74	491	143	630
2U	1924	1549	1951	1630	1998	1641	2032	1361	1301	1125	1553	1373
1.5U	2472	1759	2398	1829	2477	1875	2530	1644	1928	1563	1919	1694
1U	2653	2081	2544	2035	2597	2262	2769	1898	2507	1891	2141	2058
0	2236	1944	2169	1903	2134	2007	2333	2113	2718	2157	2516	2222
1D	1208	1225	1238	1007	1301	1310	1250	1678	1896	1787	1558	1373
1.5D	870	718	826	796	810	715	755	961	1405	1236	1255	870
2D	430	470	521	650	427	296	486	808	1014	859	764	690
3D	104	89	261	350	115	61	55	262	128	245	200	227
10D	11	12	12	11	13	11	11	6	9	9	10	11

Complies: ☑ YES ☐ NO

Tested By:	Matthew Benninger	Signature or initials:	MB	Comp. Date	2/28/18
Reviewed By:	cwm	Signature or initials:	cwm		
Test Equipment Used:	1,2,3,4	Sample:	CRT1802141509-001		
Amb (ºC):	22 RH% 30%				

Chromaticity ICAO + CAR

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 - ICAO Red

Sample	Color	Input	Measured	Location	x	y	z	(P/F)
CRT1802141509-001	Red	12Vdc	12.000Vdc	(0,1.5)	0.677	0.323	0.000	P
				(0,0)	0.676	0.323	0.000	P
				(0,-1)	0.664	0.323	0.013	P

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

Boundary	Line Equation	Calc.
Purple Boundary	y ≥ 0.980 - x	0.303
Yellow Boundary	y ≤ 0.335	0.323

Complies: ☑ YES ☐ NO

Tested By:	Craig Small		Signature or initials:	Comp. Date	3/12/18
Reviewed By:	cwm		Signature or initials:		
Test Equipment Used:	6,7,8,9,10,11				
Amb (ºC):	24.5	RH% 18.5			

Equipment list

#	Intertek ID No.	Description	Manufacturer	Calibration Due
1	O109	Goniometer	Optronik	04-Oct-2018
2	O114	5M Photometer	Optronik	22-Oct-2018
3	O113	Power Supply	Optronik	13-Apr-2018
4	T1555	Hygro-Thermometer	Extech	16-May-2018
5	M292	OL750S	Gooch & Housego	26-Sep-2018
6	E288	OL-750 Spectroradiometer	Optronic Labratories	20-Mar-2018
7	M282	Hygrometer	Testo	08-Apr-2018
8	E536	Digital Power Meter	Yokogowa	19-Jan-2019
9	N721	Steel Ruler	Products Engineering Corp	12-Jul-2019
10	N1335	Tape Measure	Stanley	16-May-2019
11	E499	Digital Level	Smart Tool	22-Jun-2018
12				
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20				

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