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Report No. 102485468CRT-001

Shanghai Nanhua Electronics Co Ltd.

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China

Standards

International Civil Aviation Organization (ICAO), Aerodromes, Annex 14, Volume 1, Seventh Edition, dated July 2016

Test Purpose:	ICAO Compliance
Type/Model:	Low-intensity, Type E / LS810
Test Dates:	March 1st 2018 through March 8th 2018

Rudolph Sporman
Associate Engineer
Lighting

Christopher W. Metcalf
Engineering Supervisor
Lighting

Test Plan and Datasheets			
Client	Shanghai Nanhua Electronics Co Ltd.	Engineer	Rudolph Sporman
Report #	102485468CRT-001	Reviewer	Christopher W. Metcalf
Product	Low-intensity, Type E	Model(s)	LS810
Standard	ICAO Annex 14, dated July 2016		

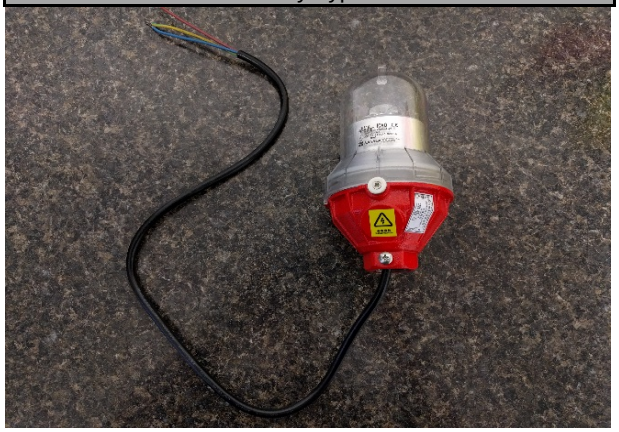
Spec	Test name	Clause	Pass Fail NA
ICAO	Photometry Low Intensity Type E	Table 6-1	Pass
ICAO	Chromaticity ICAO App. 1 2.2.1	2.3.1	Pass

Sample Information				
Date Rec.	**Intertek ID**	**Description**	**Condition**	**Model No.**
1/10/18	CRT1801101310-001	Low-intensity, Type E	Production	LS810

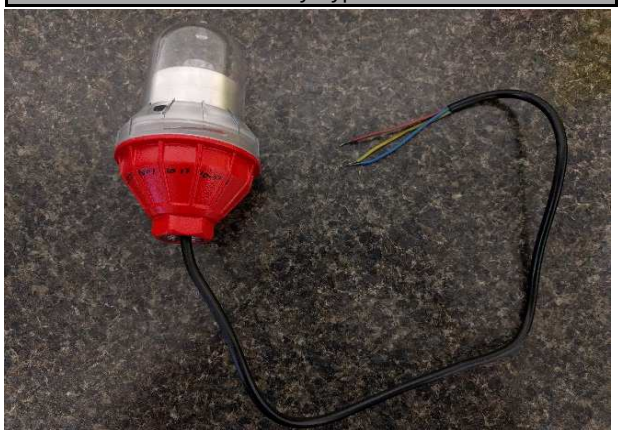
Further Sample Description	
Type:	Low-intensity, Type E
Light Source:	LED - Cree (1), model: XPEBRD-L1-0000-00701/702/801/802/cree, 4W
Filter:	NA
Diameter:	3.5"
Electrical Input:	48VDC/ 100-240 VAC 50/60Hz
Casting Material:	Aluminium
Yield Device:	NA
Mounting:	1" NPS

Picture(s)

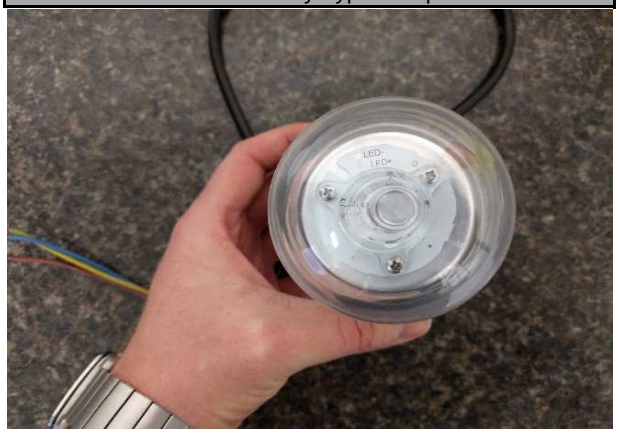
Low Intensity Type E Front



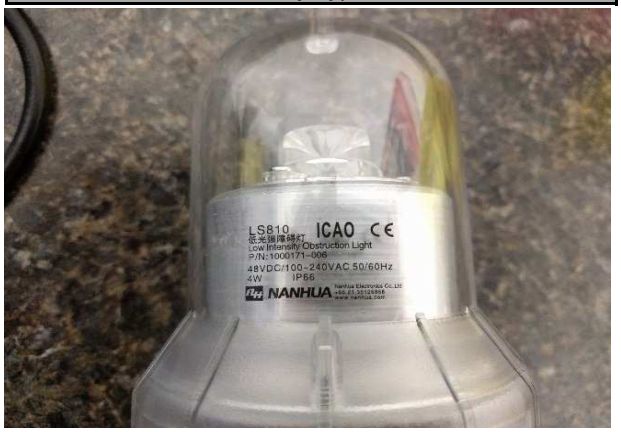
Low Intensity Type E Back



Low Intensity Type E Top



Low Intensity Type E Label



Photometry

Energize each light fixture and test for compliance with the photometric requirements. Operate the fixture until stabilized before taking measurements. Light was tested while flashing.

Results

Sample	Voltage Variation	Voltage	Freq.	Position	Measured	Factor	Result
CRT1801101310-001	Input Voltage*	240.2 VAC	60Hz	(0,5)	285	NA	Pass
	Label Maximum Voltage +10%	264.4 VAC	60Hz	(0,5)	283	99%	Pass
	Label Minimum Voltage -10%	90.2 VAC	60Hz	(0,5)	285	100%	Pass
	Nominal Voltage	240.2 VAC	50Hz	(0,5)	284	100%	Pass
	Label Maximum Voltage +10%	264.4 VAC	50Hz	(0,5)	282	99%	Pass
	Label Minimum Voltage -10%	90.2 VAC	50Hz	(0,5)	284	100%	Pass
	DC Nominal Voltage	48.2 VDC	NA	(0,5)	286	100%	Pass
	DC Voltage +10%	53.1 VDC	NA	(0,5)	288	101%	Pass
	DC Voltage -10%	43.2 VDC	NA	(0,5)	287	101%	Pass
* Distribution test voltage							
"Measured" is a relative flash energy measurement							

Flash Profile	
Flash Duration (sec):	0.502
Flash Rate (fpm):	60
Flash Period (sec.):	1.02

Effective Intensity (cd)												
Vertical Position (deg.)	Horizontal Position (deg.)											
	0	30	60	90	120	150	180	210	240	270	300	330
19.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	2.8	4.0	0.0
18.0	0.0	0.0	0.0	2.6	5.1	0.0	0.0	0.0	0.0	6.8	4.6	0.0
17.0	2.3	1.7	1.7	4.8	5.4	0.0	3.1	0.0	0.0	9.7	6.6	4.0
16.0	4.3	3.7	3.7	5.4	5.7	0.9	3.7	2.8	4.0	13.7	9.7	6.3
15.0	8.0	5.4	5.1	6.3	6.3	5.4	5.1	4.3	5.7	17.1	13.7	10.3
14.0	12.0	8.8	7.4	9.1	7.1	6.6	8.3	6.6	6.3	21.4	24.5	14.5
13.0	17.4	9.1	12.5	13.1	9.1	9.4	13.7	11.7	18.2	25.4	32.2	24.8
12.0	22.5	18.2	19.4	21.9	12.8	16.2	18.8	19.9	27.4	31.3	40.2	33.6
11.0	28.5	26.5	27.1	24.8	23.9	32.5	31.1	42.2	47.0	47.0	45.0	42.5
10.0	39.3	39.3	41.6	42.2	50.1	55.6	53.8	68.4	70.4	70.7	64.1	58.4
9.0	62.1	60.1	63.0	63.8	74.4	67.5	62.4	76.1	76.9	74.1	79.2	72.6
8.0	74.1	72.9	79.8	71.8	78.6	68.1	64.4	78.1	77.5	77.8	78.6	80.3
7.0	77.2	70.7	78.9	73.5	79.2	74.6	68.1	78.6	74.1	82.6	75.2	75.5
6.0	79.8	68.7	80.6	79.8	76.6	77.2	72.1	75.5	72.1	85.2	74.9	74.9
5.0	80.9	68.9	79.5	84.0	74.4	75.5	74.4	71.8	70.4	80.9	70.7	75.8
4.0	69.5	68.1	78.6	83.2	73.8	71.5	85.2	65.5	66.7	69.8	69.2	71.8
3.0	57.3	64.1	76.6	80.3	68.1	69.8	65.5	60.4	56.4	56.4	59.3	64.7
2.0	44.4	54.4	67.0	69.8	61.3	63.5	55.0	48.1	45.0	44.4	45.0	49.6
1.0	36.2	41.0	56.1	59.8	55.0	55.0	48.7	45.9	42.5	39.9	39.6	37.6
0.0	31.6	36.2	50.4	55.3	48.4	50.7	41.6	39.9	36.8	34.5	33.3	34.5
-1.0	26.2	30.2	45.9	45.9	42.2	43.3	33.9	33.3	30.5	30.2	25.9	27.4
-2.0	22.2	22.5	36.2	36.8	35.9	29.3	27.9	25.9	24.8	25.6	21.9	23.4
-3.0	18.2	19.1	29.9	30.8	25.4	26.8	20.5	17.9	20.2	21.4	18.2	19.7
-4.0	13.7	16.2	23.6	24.2	19.4	21.9	15.7	14.0	16.0	15.4	13.1	16.5
-5.0	8.3	9.1	17.4	19.1	14.5	13.4	8.5	6.8	11.1	12.8	8.0	11.4
-6.0	3.4	3.7	10.5	11.7	9.7	10.8	6.3	6.3	10.5	11.4	6.8	7.1
-7.0	0.0	2.3	8.3	9.7	8.5	10.3	4.6	4.3	9.7	10.8	4.8	6.6
-8.0	0.0	0.0	6.6	8.3	8.0	8.0	2.3	2.0	7.7	8.0	3.1	4.0
-9.0	0.0	0.0	4.8	5.7	6.3	4.3	0.0	0.0	5.7	5.7	0.0	2.6
-10.0	0.0	0.0	2.3	3.7	3.4	3.1	0.0	0.0	4.8	4.8	0.0	0.0

ICAO Low-intensity, Type E (flashing obstacle)												
Min 2°-10°	39.3	39.3	41.6	42.2	50.1	55.6	53.8	48.1	45.0	44.4	45.0	49.6
Upper (°)	13	12	12	12	11	12	12	12	13	15	14	13
Lower (°)	-3	-4	-5	-5	-4	-4	-3	-3	-3	-3	-3	-4
Spread (°)	16	16	17	17	15	16	15	15	16	18	17	17

Complies: ☑ YES ☐ NO

Tested By:	Matthew Benninger	Signature or initials:		Comp. Date	3/1/18
Reviewed By:	cwm	Signature or initials:			
Test Equipment Used:	1,2,3,4				
Amb (ºC):	24	RH%	30		

Chromaticity

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 unit has stabilized output at rated input at the main beam center and beam extremes.

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

Results

Sample	Color	Input	Location	x	y	z
CRT1802121346-001	Red	240.7 VAC	(0,10)	0.676	0.321	0.003
			(0,8)	0.680	0.320	0.000
			(0,6)	0.679	0.321	0.001

Boundary	Line Equation	Calc.
Purple Boundary	y ≥ 0.980 - x	0.304
Yellow Boundary	y ≤ 0.335	0.321

Complies: ☑ YES ☐ NO

Tested By:	Craig Small			Signature or initials:	Comp. Date	3/8/18
Reviewed By:	cwm			Signature or initials: cwm		
Test Equipment Used:	5,6,7,8,9,10					
Amb (ºC):	26.3	RH%	17			

Equipment list

#	Intertek ID No.	Description	Manufacturer	Calibration Due
1	O109	Goniometer	Optroniks	04-Oct-2018
2	M135	Multimeter	Fluke	04-Apr-2018
3	L061	IL1700	International Light	22-Oct-2018
4	E466	Oscilloscope	Tektroniks	27-Jul-2018
5	E288	OL-750 Spectroradiometer	Optronic Labratories	20-Mar-2018
6	M282	Hygrometer	Testo	08-Apr-2018
7	E536	Digital Power Meter	Yokogowa	19-Jan-2019
8	N721	Steel Ruler	Products Engineering Corp	12-Jul-2019
9	N1335	Tape Measure	Stanley	16-May-2019
10	E499	Digital Level	Smart Tool	22-Jun-2018

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