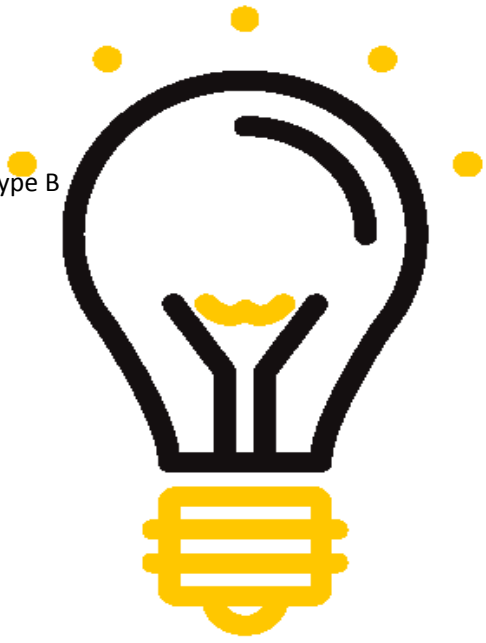
Shanghai Nanhua Electronics Co., Ltd.

TEST REPORT



SCOPE OF WORK
ICAO, Annex 14, Volume 1, dated July 2016 testing of the LP202A Type B Medium-Intensity Obstacle Light

REPORT NUMBER
103253028CRT-001

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13

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Project No. G103253028

Test Report For
Shanghai Nanhua Electronics Co., Ltd.

Standard(s)

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

Product
LP202A Type B Medium-Intensity Obstacle Light

Brittnie Polhamus
Project Engineer

Christopher W. Metcalf
Engineering Supervisor

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SECTION 1
SUMMARY

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

Test Purpose: Evaluation to ICAO

Dates Tested: October 31, 2017

Authorization: The test was authorized by signed quote number Qu-00824394.

STANDARD	CLAUSE	TEST DESCRIPTION	CONCLUSION
ICAO	Table 6-3	Photometry Medium-Intensity Type B	Complies
ICAO	Appendix 1	Chromaticity Red	Complies

SECTION 2
SAMPLE DESCRIPTION

TYPE	Medium-Intensity Type B Obstacle Light
OPTIONS	None
LIGHT SOURCE	(36) CREE XPEBRO-L1-0000-00D01 LED
LENS	Clear Plastic PC 2180T
SIZE (APPROX.)	21.5cm diameter, 28cm height
ELECTRICAL INPUT	100-240Vac
CABLE	None Supplied
MAX. CABLE LENGTH	N/A
CASTING MATERIAL	ADC12
MOUNTING	Straight Thread, 25mm I/D Fitting

SAMPLE NUMBER	DATE RECEIVED	MODEL NO.	DESCRIPTION	CONDITION
CRT1710021457-001	2-Oct	LP202A	Medium-Intensity Type B Obstacle Light	Production

SECTION 3

PHOTOGRAPHS

SECTION 4

TEST RESULTS

PRODUCT	Type B Medium-Intensity Obstacle Light	**ENGINEER**	Brittnie Polhamus
MODEL	LP202A	**TESTED BY**	Matthew Benninger/Clay CF WD
STANDARD	ICAO, Annex 14, Volume 1, dated July 2016	**REVIEWER**	Christopher W. Metcalf
SAMPLE	CRT1710021457-001	**DATE TESTED**	10/31/17

Test Name:
Photometry of Medium-Intensity Type B Obstacle Light

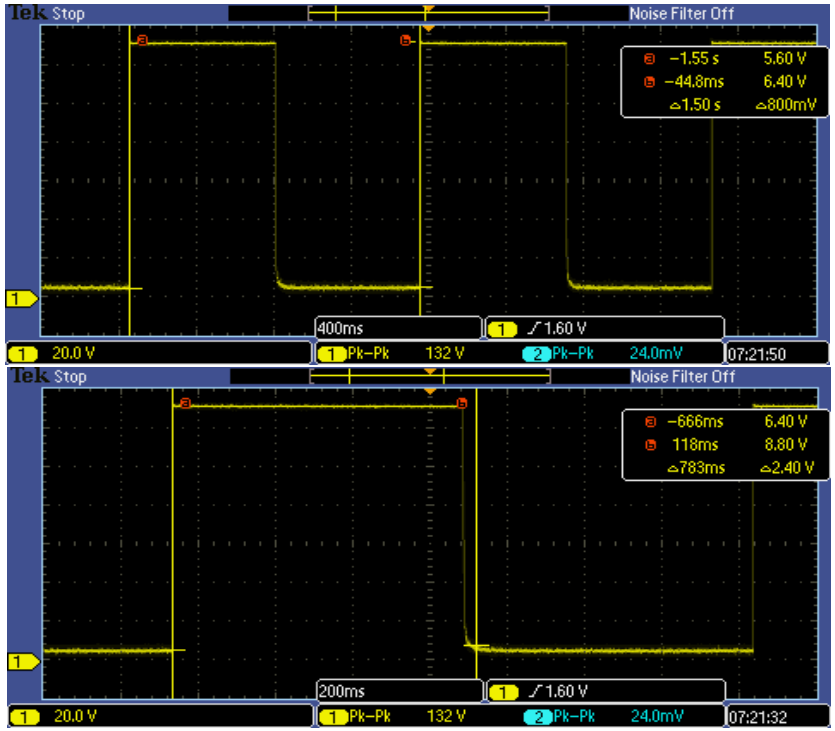
Standard Reference:
Table 6-1 and 6-3

Test Summary:
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.

Test Parameters:
The test distance is 25 meters.
The horizontal beam spread is 360 degrees.

Test Results:

OSCILLISCOPE IMAGES



VOLTAGE VARIATION

VOLTAGE VARIATION	VOLTAGE Vac	MEASURED VALUE cd·s	FACTOR	CALC. VALUE cd	REQ. MIN cd	RESULT	CALC. VALUE cd	REQ. MIN cd	RESULT
Input	120.3	10690	N/A	1902	1500	P	1874	750	P
+ 10%	260.2	10710	1.00187	1905.9	1500	P	1877	750	P
- 10%	90.3	10700	1.00094	1904.12	1500	P	1876	750	P

PHOTOMETRIC MEASUREMENT

PAUSE	POSITION	MEASURED VALUE	PERCENT CHANGE
minutes		cd	%
0	H|V	10930	
1	H|V	N/A	
2	H|V	N/A	
3	H|V	N/A	
4	H|V	N/A	
5	H|V	10750	
6	H|V	N/A	
7	H|V	N/A	
8	H|V	N/A	
9	H|V	N/A	
10	H|V	10720	
11	H|V	N/A	
12	H|V	N/A	
13	H|V	N/A	
14	H|V	N/A	
15	H|V	10710	2.01%
16	H|V	N/A	N/A
17	H|V	N/A	N/A
18	H|V	N/A	N/A
19	H|V	N/A	N/A
20	H|V	10690	0.56%

PARAMETER	MEASURED VALUE	UNIT
Input	120.2	Vac
Cable Length	N/A	feet
Flash Duration	0.783	seconds
Flash Period	1.5	seconds
Calibration Factor	3.62x10-12	
Neutral Density Filter	NA	

CALCULATED EFFECTIVE INTENSITY

units of candela

		HORIZONTAL ANGLES in deg.											
		0.0	30	60	90	120	150	180	210	240	270	300	330
VERTICAL ANGLES in deg.	3.0U	1634	1622	1683	1516	1662	1677	1821	1839	1784	1713	1784	1634
	2.0U	2024	1860	1908	1721	2035	1880	2024	2035	1986	1906	1961	1827
	1.5U	2122	1955	2004	2153	1986	1953	2098	2098	2061	1978	2049	1906
	1.0U	2362	2028	2083	1849	2045	2002	2138	2146	2110	2022	2114	1963
	0.0	2175	2098	2163	1902	2256	2024	2155	2153	2149	2057	2336	2004
	1.0D	2161	2079	2142	1874	2071	2104	2075	2073	2092	1996	2334	1972
	1.5D	2128	2039	2197	1837	2020	2067	2173	2010	2085	1941	2197	1927
	2.0D	2075	2035	2061	1788	1955	1841	2077	1933	2031	1870	2187	1866
	3.0D	1915	1762	1900	1636	1774	1660	1833	1736	1959	1689	2000	1699
	10D	431	439	509	429	437	407	415	396	212	423	448	411

PARAMETER	MINIMUM REQUIREMENT	MEASURED VALUE	UNIT	RESULT
Flash Rate	20-60 FPM	40.0	FPM	P
Minimum Average Intensity	2,000 cd at 0°	2123	cd	P
Minimum Peak Intensity	1,500 cd at 0°	1902	cd	P
Minimum Peak Intensity	750 cd at -1°	1874	cd	P
Beam Spread	≥3° at each vertical slice (min 750cd)	6	degrees	P

PARAMETER	RECOMMENDATION	MEASURED VALUE	UNIT	RESULT
Maximum Average Intensity	2,500 cd at 0°	2123	cd	P
Maximum Peak Intensity	1,125 cd at -1°	2334	cd	F
Minimum Peak Intensity	75 cd at -10°	509	cd	F

Complies: ☑ YES ☐ NO

Environmental Conditions:

Temperature (°C)	21
Relative Humidity (%)	39

Equipment Used:

1 2 3 4

See the last page for equipment details.

SECTION 4

TEST RESULTS

PRODUCT	Type B Medium-Intensity Obstacle Light	**ENGINEER**	Brittnie Polhamus
MODEL	LP202A	**TESTED BY**	Craig Small
STANDARD	ICAO, Annex 14, Volume 1, dated July 2016	**REVIEWER**	Christopher W. Metcalf
SAMPLE	CRT1710021457-001	**DATE TESTED**	10/31/17

Test Name:
Chromaticity

Standard Reference:
Appendix 1

Test Summary:
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 stability at rated input at the main beam center.

Test Evaluation:
Red: The aviation red must be per ICAO Annex 14, Volume 1, Appendix 1, Colours for Aeronautical Ground Lights, at operating temperature within the following chromaticity boundaries.

Test Results:

TYPE	COLOR	INPUT	POSITION H,V	x	y	z	COLOR TEMP (K)	REQUIREMENT		CALC.	RESULT
Medium-Intensity	Red	120Vac	0,0	0.678	0.321	0.000	N/A	Purple Boundary:	y ≥ 0.980 - x	0.302	P
							N/A	Yellow Boundary:	y ≤ 0.335	0.321	P

Environmental Conditions:

Temperature (°C)	25
Relative Humidity (%)	27

Equipment Used:

6 7 8 9 10

See the last page for equipment details.

SECTION 5
EQUIPMENT LIST

#	EQUIPMENT DESCRIPTION	ASSET NUMBER	CALIBRATION DATE	CALIBRATION DUE DATE	MAKE	MODEL
1	Gonimeter	O109	10/4/2017	10/4/2018	Optroniks	sms 10
2	Hygro-Thermometer	T1555	5/16/2017	5/16/2018	Extech	445715
3	Multimeter	M135	4/4/2017	4/4/2018	Fluke	87
4	Spectroradiometer	L061	10/22/2017	10/22/2018	International Light	IL1700
5	Oscilloscope	E466	7/27/2017	7/27/2018	Tektroniks	DPO 2012
6	Spectroradiometer	E288	10/14/2017	11/14/2017	Optronic Labratories	OL750
7	Digital Power Meter	E440	9/18/2017	9/18/2018	Yokogawa	WT1600
8	Steel Ruler	N721	7/12/2016	7/12/2019	Products Engineering Corp	N/A
9	Digital level	L155	7/3/2018	1/13/2018	Mitutoyo	Pro360
10	ThermoHygrometer	M282	4/8/2018	4/8/2018	Testo	608-H1

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