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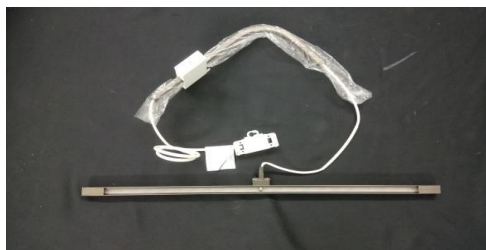
PHOTOMETRIC
TEST REPORT

Report Number	GNC-19589
Customer	Astro Lighting Limited
Contact	Ross Dickson
Product Type	LED Picture light
Test Purpose	Generation of Photometric Data
Sales Order Ref	Q-LUX17-21659
Works Order Number	WO-10236
Test Item Reference	TI-13778
LAB Test Method Reference	TES-102000
Test Standards	LM-79-08; (BS) EN 13032-4:2015; CIE S025:2015
Lab Location Reference	LUX-TSI
Tested by	Mike Sewell
Date of Test	29/06/2017
Reviewed by	Menno Schakel
Number of products tested	1

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Date: 29/06/2017



7897 - Mondrian 600 LED

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Nomenclature

Lamp Orientation described below relates to the position in which a lamp is designed to operate for maximum performance and safety, these include:

BD - Base Down (bulb is vertically positioned with the metal base at the bottom, glass up)

BU - Base Up (bulb is vertically positioned with the metal base at the top, glass hanging down)

HBD - Horizontal +15° to Base Down

H45 - Horizontal to -45° only

VBU - Vertical Base Up ±15°

VBD - Vertical Base Down ±15°

HBU - Base Up +/- 90° (bulb can be operated in a base up or horizontal position)

HOR - Horizontal Burn (bulb is positioned with the metal base parallel to the ground)

H75 - Horizontal +/- 75° (bulb should not be operated within 15° of vertical)

U - Universal Burn (burn can be operated in any position)

Test Conditions

Measurements were made with an ambient temperature of 25°C +/- 1°C. Measurements were taken only after sufficient time for thermal stabilisation has been allowed. Thermal stabilisation according to LM-79-08 was achieved before measurements are measured and reported.

Calibrations

The far field Type C Goniophotometer is calibrated using an intensity lamp calibrated by a NVLAP accredited calibration laboratory.

Test Equipment

UL LSI Custom Far-Field Type C Moving Mirror Goniophotometer measures intensity as a function of angle. On-axis spectral measurements taken using spectrometer, for which these measurements and outputs are not accredited.

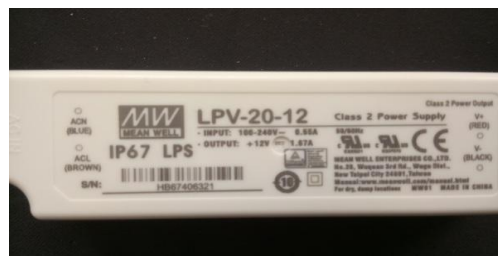
Data Formats

IES (15 deg azimuth and 2.5 deg inclination) and LDT (15 deg C planes and 2.5 deg gamma angles)

Spectral Data file from which the calculation of chromaticity and CRI etc. have been performed and the derived results from the LightMtrX software are provided as a text file format.

All photometric data for LED products will be provided in ABSOLUTE photometric format and all non-LED data will be in relative photometric format with lamp lumens measured separately, where possible, for LOR estimation.

Product Name	Mondrian 600 Frame Mounted LED
Part/Serial Number	1374015
Type of Product	LED Picture light
Base Type	Not Applicable - Luminaire
Driver Type	External AC transformer
Test Time	30 mins
Operating Orientation	Base Up
Test Orientation	Base Up
Ambient Temperature	25.7°C
Manufacturer	Astro Lighting Limited
Date of Manufacture	Not Available
Thermal Management	Passive
Dimmable	No
Pre-Burning Time	0 hours
Stabilisation Time	45 mins
Humidity	54.8% RH
Averaging Applied	NONE



Driver Details		
Manufacturer	MeanWell	
Model	LPV-20-12	
Part/Serial #	HB67406321	
Rated Voltage	100-240V	
Output	Current	1.570 A
	Voltage	12.000 V

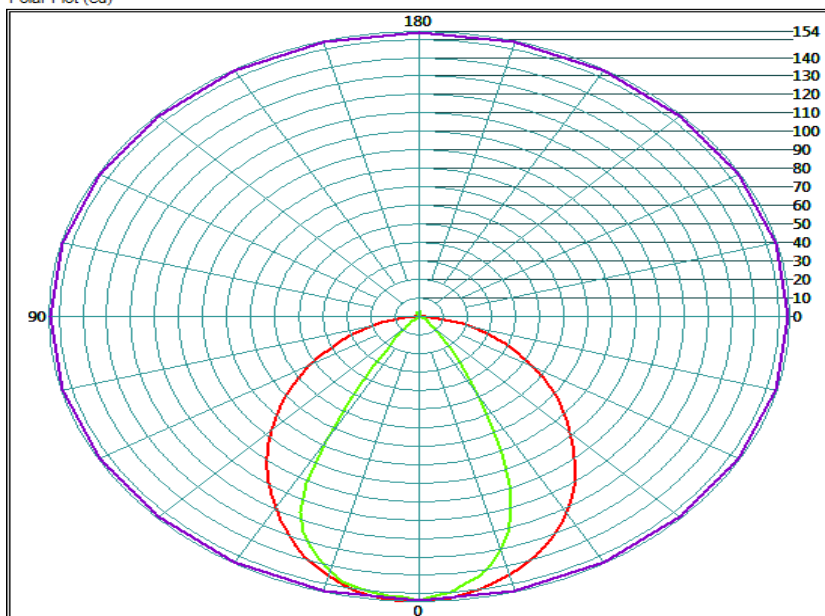
Photometric Measurements	
Luminous Flux	219 lm
Luminous Efficacy	20 lm/W

Dimension	Sample	Luminous Opening
Diameter/Width	15 mm	12 mm
Length	600 mm	525 mm
Height/Depth	15 mm	0 mm

Electrical Measurements	
Frequency	50 Hz
Voltage	230.290 V
Current	0.129 A
Power	10.8 W
Power Factor	0.362
Apparent Power	29.8 VA

Goniophotometric Measurements		
Beam Angle	Horizontal	56°
	Vertical	100°
On-axis Intensity		154 cd
Peak Intensity		154 cd
Peak Direction	Horizontal	0°
	Vertical	3°

Polar Plot (cd)



0.00	Red
180.00	Red
90.00	Green
270.00	Green
0.00	Purple

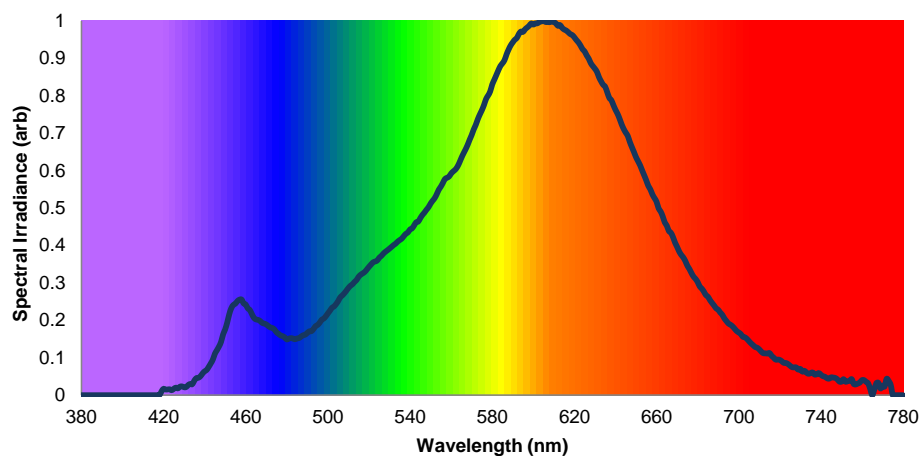
Mounting Height (m)	Beam Cone Width (m)	Orthogonal Beam Cone Width (m)	Projected Illuminance (lux)
0.5	1.18	0.53	614.4
1	2.37	1.06	153.6
2	4.74	2.12	38.4
3	7.11	3.18	17.1
4	9.48	4.24	9.6
5	11.85	5.30	6.1
6	14.22	6.36	4.3
8	18.96	8.49	2.4
10	23.70	10.61	1.5
20	47.39	21.21	0.4

Appendices

On-axis Spectral Measurement

The following data was determined from an on-axis spectral measurement using a SP1000 spectrometer at a distance of 500mm, for which these measurements and outputs are not accredited.

Spectral Irradiance versus Wavelength

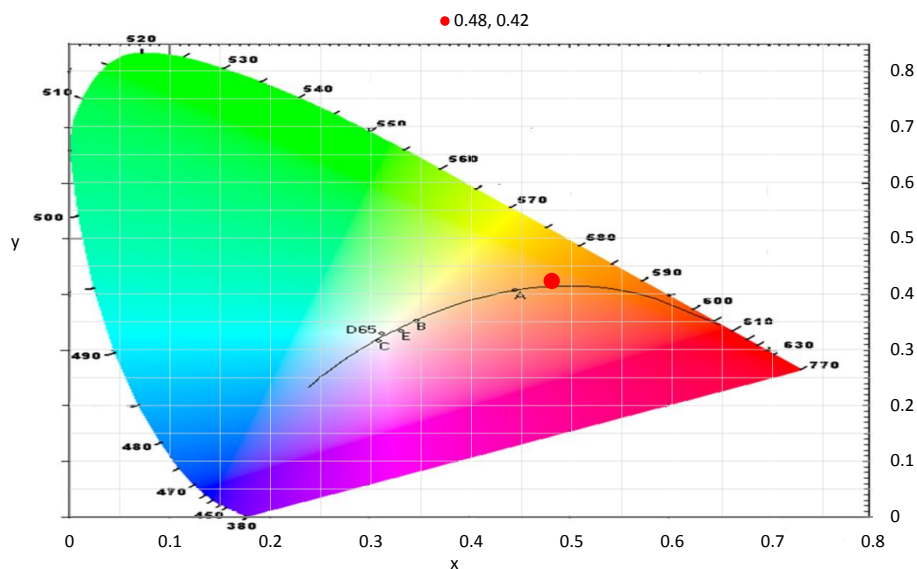


Colour Rendering Index Detail			
R1	77	R8	52
R2	90	R9	-2
R3	95	R10	78
R4	75	R11	74
R5	77	R12	70
R6	89	R13	80
R7	80	R14	98

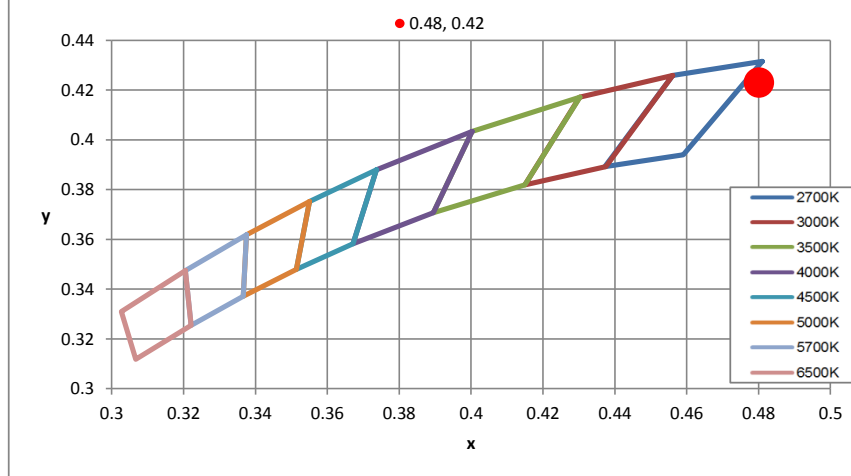
Colorimetric Details	
CCT	2528K
CRI (Ra)	80

Chromaticity Coordinates		
CIE 1931	x	0.4801
	y	0.4230
CIE 1960	u	0.2699
	v	0.3567
CIE 1976	u'	0.2699
	v'	0.5350
Duv		0.0027

CIE 1931 Colour Chart



CIE 1931 x, y Chromaticity Diagram - Nominal CCT Quadrangles



Spectral Power Distribution

λ (nm)	Arb units	λ (nm)	Arb units	λ (nm)	Arb units	λ (nm)	Arb units
380	0.00E+00	430	2.12E-02	480	1.49E-01	530	3.92E-01
381	0.00E+00	431	2.16E-02	481	1.51E-01	531	3.96E-01
382	0.00E+00	432	2.71E-02	482	1.53E-01	532	4.01E-01
383	0.00E+00	433	3.00E-02	483	1.51E-01	533	4.05E-01
384	0.00E+00	434	2.92E-02	484	1.49E-01	534	4.11E-01
385	0.00E+00	435	3.90E-02	485	1.52E-01	535	4.15E-01
386	0.00E+00	436	4.56E-02	486	1.53E-01	536	4.19E-01
387	0.00E+00	437	4.66E-02	487	1.57E-01	537	4.25E-01
388	0.00E+00	438	5.07E-02	488	1.60E-01	538	4.31E-01
389	0.00E+00	439	5.80E-02	489	1.62E-01	539	4.35E-01
390	0.00E+00	440	6.37E-02	490	1.66E-01	540	4.43E-01
391	0.00E+00	441	6.75E-02	491	1.71E-01	541	4.46E-01
392	0.00E+00	442	7.56E-02	492	1.71E-01	542	4.54E-01
393	0.00E+00	443	8.48E-02	493	1.77E-01	543	4.62E-01
394	0.00E+00	444	9.49E-02	494	1.84E-01	544	4.64E-01
395	0.00E+00	445	1.11E-01	495	1.88E-01	545	4.73E-01
396	0.00E+00	446	1.20E-01	496	1.94E-01	546	4.81E-01
397	0.00E+00	447	1.30E-01	497	2.02E-01	547	4.88E-01
398	0.00E+00	448	1.42E-01	498	2.05E-01	548	4.96E-01
399	0.00E+00	449	1.62E-01	499	2.11E-01	549	5.02E-01
400	0.00E+00	450	1.76E-01	500	2.19E-01	550	5.12E-01
401	0.00E+00	451	1.94E-01	501	2.26E-01	551	5.20E-01
402	0.00E+00	452	2.16E-01	502	2.34E-01	552	5.27E-01
403	0.00E+00	453	2.33E-01	503	2.37E-01	553	5.37E-01
404	0.00E+00	454	2.41E-01	504	2.44E-01	554	5.49E-01
405	0.00E+00	455	2.45E-01	505	2.51E-01	555	5.57E-01
406	0.00E+00	456	2.52E-01	506	2.61E-01	556	5.67E-01
407	0.00E+00	457	2.55E-01	507	2.66E-01	557	5.78E-01
408	0.00E+00	458	2.56E-01	508	2.72E-01	558	5.81E-01
409	0.00E+00	459	2.45E-01	509	2.79E-01	559	5.84E-01
410	0.00E+00	460	2.42E-01	510	2.87E-01	560	5.92E-01
411	0.00E+00	461	2.32E-01	511	2.92E-01	561	5.98E-01
412	0.00E+00	462	2.28E-01	512	2.97E-01	562	6.03E-01
413	0.00E+00	463	2.17E-01	513	3.03E-01	563	6.10E-01
414	0.00E+00	464	2.07E-01	514	3.08E-01	564	6.21E-01
415	0.00E+00	465	2.02E-01	515	3.17E-01	565	6.34E-01
416	0.00E+00	466	2.01E-01	516	3.22E-01	566	6.46E-01
417	0.00E+00	467	1.98E-01	517	3.26E-01	567	6.57E-01
418	0.00E+00	468	1.93E-01	518	3.30E-01	568	6.69E-01
419	9.98E-03	469	1.91E-01	519	3.36E-01	569	6.83E-01
420	1.71E-02	470	1.89E-01	520	3.43E-01	570	6.95E-01
421	1.52E-02	471	1.85E-01	521	3.49E-01	571	7.10E-01
422	1.53E-02	472	1.81E-01	522	3.55E-01	572	7.22E-01
423	1.58E-02	473	1.80E-01	523	3.57E-01	573	7.38E-01
424	1.32E-02	474	1.75E-01	524	3.60E-01	574	7.50E-01
425	1.71E-02	475	1.68E-01	525	3.67E-01	575	7.62E-01
426	2.02E-02	476	1.64E-01	526	3.72E-01	576	7.75E-01
427	1.81E-02	477	1.60E-01	527	3.78E-01	577	7.91E-01
428	2.27E-02	478	1.58E-01	528	3.83E-01	578	8.01E-01
429	2.35E-02	479	1.54E-01	529	3.87E-01	579	8.12E-01
						580	8.30E-01

Spectral Power Distribution

λ (nm)	Arb units	λ (nm)	Arb units	λ (nm)	Arb units	λ (nm)	Arb units
581	8.43E-01	631	8.64E-01	681	2.91E-01	731	6.28E-02
582	8.55E-01	632	8.50E-01	682	2.85E-01	732	6.53E-02
583	8.68E-01	633	8.39E-01	683	2.77E-01	733	6.02E-02
584	8.80E-01	634	8.30E-01	684	2.68E-01	734	5.70E-02
585	8.87E-01	635	8.24E-01	685	2.63E-01	735	5.92E-02
586	8.95E-01	636	8.09E-01	686	2.54E-01	736	6.08E-02
587	9.11E-01	637	7.95E-01	687	2.47E-01	737	5.50E-02
588	9.24E-01	638	7.88E-01	688	2.40E-01	738	5.61E-02
589	9.35E-01	639	7.75E-01	689	2.32E-01	739	5.92E-02
590	9.43E-01	640	7.63E-01	690	2.28E-01	740	5.46E-02
591	9.50E-01	641	7.52E-01	691	2.21E-01	741	5.08E-02
592	9.55E-01	642	7.39E-01	692	2.15E-01	742	4.92E-02
593	9.66E-01	643	7.24E-01	693	2.05E-01	743	4.53E-02
594	9.72E-01	644	7.12E-01	694	1.98E-01	744	4.41E-02
595	9.71E-01	645	7.02E-01	695	1.92E-01	745	4.78E-02
596	9.78E-01	646	6.93E-01	696	1.88E-01	746	4.70E-02
597	9.83E-01	647	6.77E-01	697	1.84E-01	747	4.61E-02
598	9.87E-01	648	6.63E-01	698	1.78E-01	748	4.24E-02
599	9.93E-01	649	6.50E-01	699	1.72E-01	749	3.64E-02
600	9.90E-01	650	6.36E-01	700	1.68E-01	750	3.61E-02
601	9.94E-01	651	6.25E-01	701	1.63E-01	751	4.28E-02
602	9.94E-01	652	6.14E-01	702	1.56E-01	752	3.59E-02
603	9.97E-01	653	6.01E-01	703	1.55E-01	753	3.73E-02
604	9.99E-01	654	5.87E-01	704	1.50E-01	754	3.85E-02
605	1.00E+00	655	5.74E-01	705	1.44E-01	755	4.29E-02
606	9.97E-01	656	5.59E-01	706	1.39E-01	756	2.99E-02
607	9.97E-01	657	5.50E-01	707	1.34E-01	757	2.88E-02
608	9.97E-01	658	5.36E-01	708	1.29E-01	758	3.12E-02
609	9.98E-01	659	5.27E-01	709	1.27E-01	759	3.39E-02
610	9.97E-01	660	5.17E-01	710	1.22E-01	760	4.03E-02
611	9.94E-01	661	4.99E-01	711	1.16E-01	761	4.02E-02
612	9.87E-01	662	4.91E-01	712	1.12E-01	762	3.57E-02
613	9.89E-01	663	4.78E-01	713	1.12E-01	763	3.17E-02
614	9.82E-01	664	4.62E-01	714	1.11E-01	764	1.68E-02
615	9.77E-01	665	4.53E-01	715	1.13E-01	765	0.00E+00
616	9.75E-01	666	4.39E-01	716	1.05E-01	766	1.51E-02
617	9.70E-01	667	4.34E-01	717	1.00E-01	767	3.19E-02
618	9.65E-01	668	4.23E-01	718	9.49E-02	768	3.29E-02
619	9.62E-01	669	4.08E-01	719	9.52E-02	769	1.79E-02
620	9.56E-01	670	3.97E-01	720	9.42E-02	770	2.56E-02
621	9.49E-01	671	3.84E-01	721	9.06E-02	771	2.30E-02
622	9.43E-01	672	3.75E-01	722	8.62E-02	772	4.37E-02
623	9.34E-01	673	3.68E-01	723	8.61E-02	773	3.79E-02
624	9.25E-01	674	3.59E-01	724	8.32E-02	774	2.73E-02
625	9.19E-01	675	3.46E-01	725	7.87E-02	775	0.00E+00
626	9.08E-01	676	3.37E-01	726	7.49E-02	776	0.00E+00
627	8.99E-01	677	3.26E-01	727	7.43E-02	777	0.00E+00
628	8.87E-01	678	3.17E-01	728	7.43E-02	778	0.00E+00
629	8.79E-01	679	3.11E-01	729	6.81E-02	779	0.00E+00
630	8.72E-01	680	3.02E-01	730	7.03E-02	780	0.00E+00

Measurement Uncertainty

The following is the reported expanded uncertainty of the UL 6440T Type C Mirror Goniophotometer.

Parameter	Uncertainty
Total Luminous Flux (%)	± 4.9
Luminous Intensity (%)	± 4.9
Temperature (°C)	± 1.0
Voltage DC TY720 (%)	± 0.02
Current DC TY720 (%)	± 0.10
Voltage AC WT210 (%)	± 0.0585
Current AC WT210 (%)	± 0.0251
Power AC WT210 (%)	± 0.2261
Frequency (50/60 Hz) WT210 (%)	± 0.0040
Power Factor WT210 (%)	± 0.0601

The reported expanded uncertainty is based on the combined standard uncertainty multiplied by a coverage factor of $k = 2$. This value of k gives a coverage probability of approximately 95%, assuming a normal distribution. This determination of the measurement uncertainty has been done in accordance with international requirements including UKAS, BIPM Guide to the Expression of Uncertainty in Measurement and CIE 198:2011 and CIE S 025/E:2015.

Electrical measurement equipment used for the determination of results for this report, are compliant and meet the performance requirements of the measurement standards used.

----- END OF REPORT -----