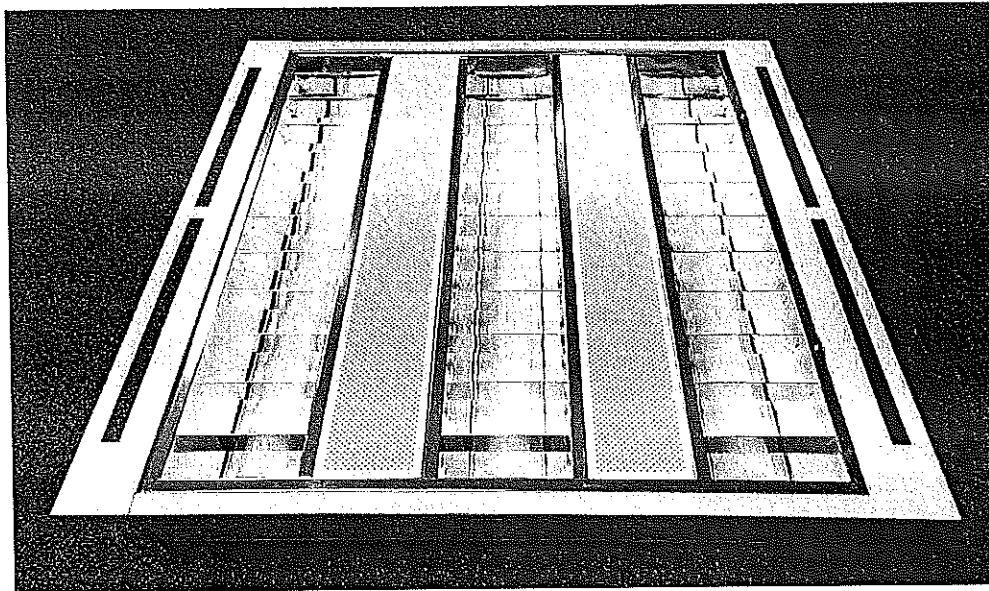


# Report of Test LL17351-E

PCO Lite Electrical 600 x 600 (nom.) mm Recessed Troffer. Product ID: LEDTINO VDU 312/9T-P2/AS.  
Folded/welded metal body with white finish, extent ~ 595 x 585 x 66 mm deep. Three of 12 cell semi  
-specular louvres with 25 mm closed-top crossblades form luminous opening of 460 x 530 mm.  
Curved semi cylindrical opal diffusers enclosing a LED strip. Three nos of LED strip centred 185 mm apart  
and ~ 60 mm above L/O. Osram OT FIT 35/220-240/700 CS L, 220-240V 0/50/60Hz electronic controller.  
Tested at 240 V 50 Hz.



### Performance Summary

Luminous flux	2235 lm
Luminaire Power	29.8 W
Luminous Efficacy	75.0 lm/W
SHR Nominal	0.75
SHR Maximum	0.94

PREPARED FOR : PCO Lite Electrical SDN. BHD., Kampar Perak. Malaysia.

丙電器(馬)有限公司  
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47100 Puchong, Selangor.





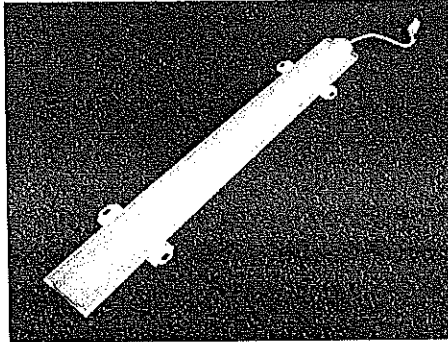
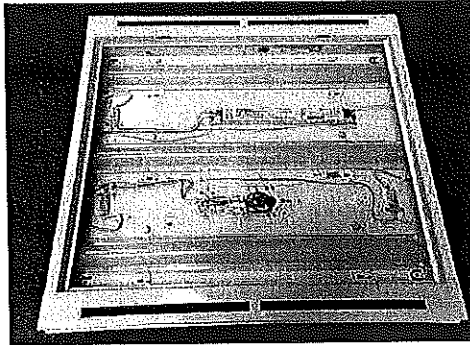
**LightLab**  
INTERNATIONAL



Accredited for compliance with ISO/IEC 17025.  
The results of the tests, calibrations and / or measurements included in this document are traceable to Australian / national standards.  
Accreditation No. 2258.

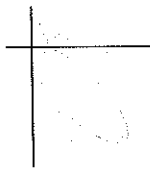
**Test Report No. LL17351-E**

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**Test Report No. LL17351-E**

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Tested at 240 V 50 Hz.

**LM-79 Performance Data**

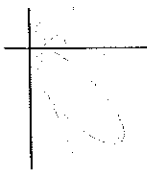
<b>Spectral</b>	CIE 1931 (x, y) <sup>(1)</sup>	(0.424, 0.398)
	CIE 1976 (u', v') <sup>(1)</sup>	(0.245, 0.517)
	Correlated Colour Temperature (CCT) <sup>(1)</sup>	3170 K
	Colour Spatial Uniformity <sup>(2)</sup>	0.0023
	Colour Rendering Index (Ra) <sup>(1)</sup>	82
	Special CRI 9 (R <sub>g</sub> ) <sup>(1),(3)</sup>	16
	Distance from Planckian Locus (Duv) <sup>(1),(3)</sup>	-0.0007
	Scotopic/Photopic Ratio <sup>(1),(3)</sup>	1.37

<b>Electrical</b>	Voltage	240 V	
	Frequency	50 Hz	
	Current	0.133 A	
	Power	29.8 W	
	Power Factor	0.93	
	1.16 Total Harmonics Distortion (%)	Current THD	3.42 %

Performance data in accordance with IESNA LM-79-08. Spectral calculations are for a CIE 2° observer

- (1) Value is computed from the weighted average of the spatial measurements
- (2) Value is the maximum deviation of the spatial u' and v' measurements from the weighted average
- (3) Quantity is in addition to the scope of IESNA LM-79-08

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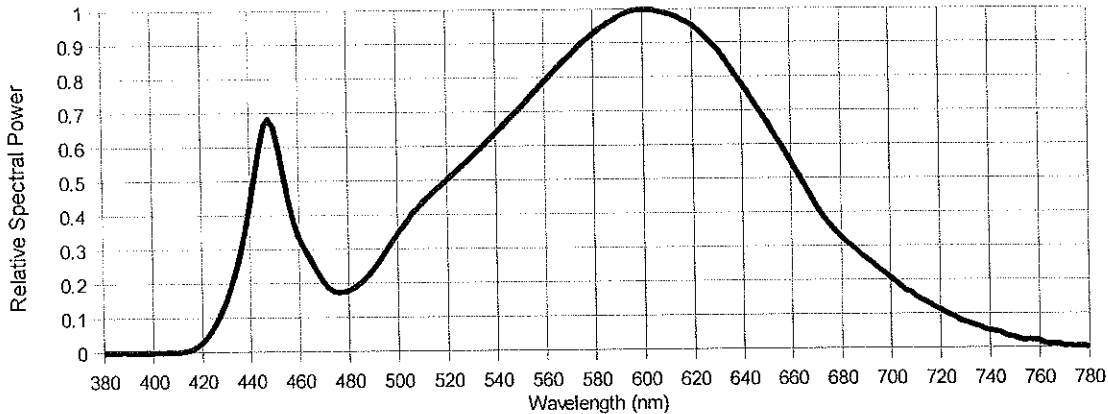
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Tested at 240 V 50 Hz.

**LM-79 Performance Data**

**Summary Relative Spectral Irradiance Distribution (wavelength – nm, irradiance – relative to peak = 1)**

380	0.00E+00	480	1.80E-01	580	9.30E-01	680	3.29E-01
385	4.28E-05	485	2.04E-01	585	9.56E-01	685	2.97E-01
390	0.00E+00	490	2.41E-01	590	9.79E-01	690	2.66E-01
395	4.39E-05	495	2.93E-01	595	9.95E-01	695	2.37E-01
400	6.18E-05	500	3.45E-01	600	1.00E+00	700	2.09E-01
405	1.64E-04	505	3.95E-01	605	9.97E-01	705	1.78E-01
410	8.30E-04	510	4.35E-01	610	9.89E-01	710	1.54E-01
415	7.50E-03	515	4.71E-01	615	9.74E-01	715	1.34E-01
420	2.90E-02	520	5.03E-01	620	9.54E-01	720	1.14E-01
425	7.46E-02	525	5.36E-01	625	9.21E-01	725	9.53E-02
430	1.48E-01	530	5.68E-01	630	8.84E-01	730	7.78E-02
435	2.61E-01	535	6.03E-01	635	8.32E-01	735	6.57E-02
440	4.28E-01	540	6.39E-01	640	7.80E-01	740	5.24E-02
445	6.31E-01	545	6.77E-01	645	7.23E-01	745	4.38E-02
450	6.58E-01	550	7.13E-01	650	6.70E-01	750	3.24E-02
455	4.80E-01	555	7.52E-01	655	6.09E-01	755	2.41E-02
460	3.38E-01	560	7.91E-01	660	5.50E-01	760	2.20E-02
465	2.69E-01	565	8.28E-01	665	4.85E-01	765	1.16E-02
470	2.06E-01	570	8.63E-01	670	4.21E-01	770	4.97E-03
475	1.76E-01	575	9.00E-01	675	3.69E-01	775	4.70E-03
						780	1.18E-03



\* The spectral power distribution combines the weighted spectral power distributions of all spatial measurements.

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7100 Putrajaya, Selangor  
Tel: +603 8079 1388 Fax: 603 8079 1389

**Test Report No. LL17351-E**

PCO Lite Electrical 600 x 600 (nom.) mm Recessed Troffer. Product ID: LEDTINO VDU 312/9T-P2/AS.  
Folded/welded metal body with white finish, extent ~ 595 x 585 x 66 mm deep. Three of 12 cell semi  
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~ 60 mm above L/O. Osram OT FIT 35/220-240/700 CS L, 220-240V 0/50/60Hz electronic controller.  
Tested at 240 V 50 Hz.

**LM-79 Performance Data**

**Spatial measurements (lower hemisphere)**

Gamma angle (deg)	CIE 1976 (u',v') coordinates	
	C 0 plane	C 90 plane
0	(0.246, 0.517)	(0.246, 0.517)
10	(0.246, 0.517)	(0.245, 0.517)
20	(0.246, 0.518)	(0.245, 0.517)
30	(0.247, 0.519)	(0.245, 0.516)
40	(0.244, 0.516)	(0.244, 0.516)
50	I <= 10 %	(0.244, 0.516)
60	I <= 10 %	I <= 10 %
70	I <= 10 %	I <= 10 %
-	-	-
-	-	-

**Spatial measurements (upper hemisphere)**

Gamma angle (deg)	CIE 1976 (u',v') coordinates	
	C 0 plane	C 90 plane
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

**Test procedure**

All measurements were performed in an environmentally controlled laboratory employing suitable baffling to minimise stray light. The sample was mounted in its normal operating orientation on a rotating mirror goniophotometer and operated from a stabilised supply. The photometric output was monitored and measurements were performed once stability was achieved.

The goniophotometer was used to measure the spatial distribution of both luminous intensity and, in conjunction with a spectroradiometer and spectrally flat reflectance tile, spectral irradiance. The distribution locus comprises points in two or more C planes at no more than 10° gamma intervals. The CIE (x,y) coordinates and other derived metrics (CIE (u', v'), CCT and CRI) are calculated from the weighted sum (weighted for intensity and represented solid angle) of the measured spectral irradiances.

Sample Orientation	Ceiling mount	Stabilisation Time	19.75 hour
		Total Operation Time	20.75 hour

**Equipment and uncertainties**

C-gamma rotating mirror goniophotometer with a test distance of 8 m.

Luminous Intensity	± 4 %	Temperature	± 1 °C
Luminous Flux	± 4 %	Luminous Efficacy	± 4.5 %
C, Gamma Angles	± 0.25°		

PhotoResearch PR-670 spectroradiometer (380 - 780 nm., 2 nm. per pixel) measuring from a spectrally flat reflectance tile attached to goniophotometer arm at a distance from sample deemed >5 times the maximum observed luminous opening dimension.

CIE (x, y) coordinates	± 0.003	CCT	± 100 K
CIE (u', v') coordinates	± 0.002	CRI (Ra)	± 3
Δ (u', v') Colour difference	± 0.001	Scotopic / Photopic Ratio *	± 0.02
Relative Spectral Irradiance *	± 2 %	R9 *	± 3

Yokogawa WT210 power meter connected in circuit to the sample electrical supply

Voltage	± 0.5 %	Frequency *	± 0.1 Hz
Current	± 0.5 %	Power	± 0.5 %
Current THD *	± 3 %	Power Factor	± 0.02

Quantities marked with \* : NATA accreditation does not cover the performance of this service.

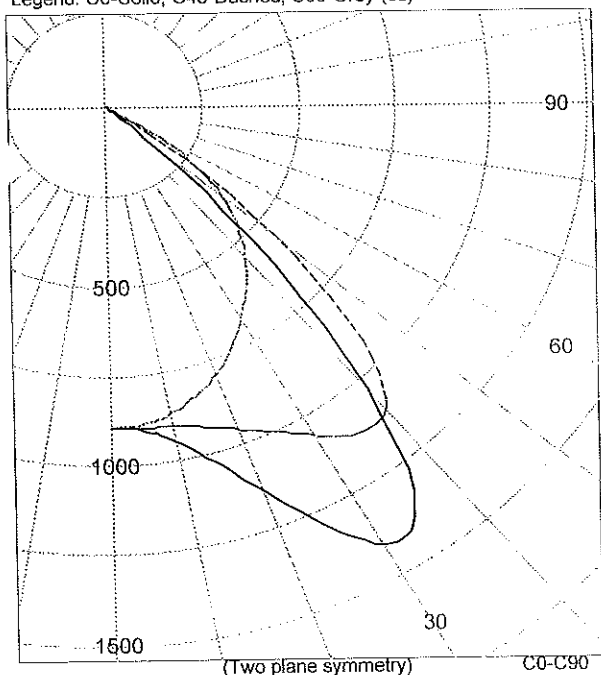
IESNA LM-79-08 Calculator v4.7 (13th Sep 2013)

**丙電器(馬)有限公司**  
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**Test Report No. LL17351-E**

PCO Lite Electrical 600 x 600 (nom.) mm Recessed Troffer. Product ID: LEDTINO VDU 312/9T-P2/AS.  
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Tested at 240 V 50 Hz.

Legend: C0-Solid, C45-Dashed, C90-Grey (cd)



**AVERAGE LUMINANCE (cd / sq.m)**

Gamma	C0	C45	C90
45.0	5094	9183	4681
55.0	279	2248	3345
65.0	91	253	341
75.0	46	53	56
85.0	40	65	46

**INTENSITY SUMMARY (cd)**

Gamma	C-Plane					Flux (lm)
	C0	C22.5	C45	C67.5	C90	
0.0	895	895	895	895	895	
5.0	907	905	899	893	890	86
10.0	948	936	907	880	869	
15.0	1029	999	927	861	836	265
20.0	1148	1091	961	838	792	
25.0	1295	1212	1006	812	738	469
30.0	1418	1328	1064	787	679	
35.0	1371	1341	1120	766	616	649
40.0	1036	1116	1107	750	546	
45.0	515	664	929	724	474	535
50.0	126	234	565	651	382	
55.0	23	50	184	465	275	203
60.0	10	23	39	144	122	
65.0	5	18	15	18	21	24
70.0	3	8	6	3	3	
75.0	2	2	2	2	2	2
80.0	1	1	1	1	1	
85.0	1	1	1	1	1	1
90.0	0	0	0	0	0	

**ZONAL FLUX AND PERCENTAGES**

Zone	Flux (lm)	% Lamp	% Luminaire
0-30	821	N/A	36.7
0-40	1470	N/A	65.8
0-60	2208	N/A	98.8
0-90	2235	N/A	100.0
40-90	765	N/A	34.2
60-90	27	N/A	1.2
90-180	0	N/A	0.0
0-180	2235	N/A	100.0

Total Light Output = 2235 lm

SHR-NOM = 0.75      Calculated using the TM5  
SHR-MAX = 0.94      fine grid method.

CERTIFIED BY: *K Monaghan*

Kevin Monaghan  
Authorised Signatory

Date of test            4-Feb-2014  
Date of report        24-Feb-2014

丙電器(馬)有限公司  
PCO ELECTRICAL (M) SDN. BHD.  
(CO. NO: 605617-A)

Page 6 of 10

**Test Report No. LL17351-E**

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and ~ 60 mm above L/O. Osram OT FIT 35/220-240/700 CS L, 220-240V 0/50/60Hz electronic controller.  
Tested at 240 V 50 Hz.

**Intensity data (cd)**

Gamma	C-Plane				
	C0	C22.5	C45	C67.5	C90
0.0	895	895	895	895	895
2.5	899	898	897	895	894
5.0	907	905	899	893	890
7.5	923	917	903	888	881
10.0	948	936	907	880	869
12.5	984	964	915	871	853
15.0	1029	999	927	861	836
17.5	1080	1041	942	850	816
20.0	1148	1091	961	838	792
22.5	1215	1146	980	826	767
25.0	1295	1212	1006	812	738
27.5	1365	1274	1034	799	709
30.0	1418	1328	1064	787	679
32.5	1428	1357	1095	775	646
35.0	1371	1341	1120	766	616
37.5	1242	1260	1128	758	580
40.0	1036	1116	1107	750	546
42.5	771	909	1045	740	512
45.0	515	664	929	724	474
47.5	288	425	754	697	432
50.0	126	234	565	651	382
52.5	41	111	357	579	334
55.0	23	50	184	465	275
57.5	13	31	88	305	211
60.0	10	23	39	144	122
62.5	7	21	22	50	63
65.0	5	18	15	18	21
67.5	4	13	9	6	4
70.0	3	8	6	3	3
72.5	2	4	3	3	2
75.0	2	2	2	2	2
77.5	1	1	2	2	2
80.0	1	1	1	1	1
82.5	1	1	1	1	1
85.0	1	1	1	1	1
87.5	1	0	1	1	0
90.0	0	0	0	0	0

**Test Report No. LL17351-E**

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Tested at 240 V 50 Hz.

**Calculations of luminaire VDT Categories in accordance with CIBSE LG3 : 1996 & LG3 2001 Addendum**

Parameter description for average luminance	Symbol	Value	Unit
Luminance in Azimuth Plane	Bc	refer Table 2	cd/m <sup>2</sup>
Intensity at angle Gamma in given azimuth plane	I	from data	cd/klm
Number of lamps	N	120	
Output of each lamp (initial flux as specified)	F	19	lm
Multiplying factor	K	1	
Luminous area in horizontal plane used in calculations	A*	0.1409	sq.m.
Angle to the downward vertical from light centre	γ	from data	°

Table 1 - Calculation parameters for determination of Average Luminance

γ (°)	C plane (°)												
	0	15	30	45	60	75	90	105	120	135	150	165	180
55	309	652	761	2577	5426	5289	3396	5284	5234	1988	494	662	257
60	<200	342	282	626	1596	2725	1727	2641	1348	479	263	346	<200
65	<200	289	286	264	267	414	347	347	233	249	315	305	<200
70	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
75	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
80	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
85	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200

Table 2 - Average Luminance (cd/m<sup>2</sup>) for defined C plane, Gamma angle

γ range (°)	Average Luminance (cd/m <sup>2</sup> )				
	Maximum measured	Maximum limit for screen type & software category used **			
		Type I, II screen Some neg. s'ware	Type I, II screen Only pos. s'ware	Type III screen Some neg. s'ware	Type III screen Only pos. s'ware
55 to 90	5426	1000	1500	200	500
65 to 90	414	1000	1500	200	500

Table 3 - Tabulation of Average Luminance (cd/m<sup>2</sup>) and luminance limits for gamma ranges

CIBSE LG3, 2001  
Category 2 -  
500cd/m2 at 65°  
elevation. Type III  
screen

**Notes:**

\* The parameter 'Area' is derived from 'Length x Width' as specified in CIBSE LG3:1996 for rectangular luminous openings. For non-rectangular openings, 'Area' is determined by summing the regions of the opening that contribute to the luminous intensity.

\*\* Type I & II screens have 'Good or moderate screen treatment', Type III screens have 'No screen treatment' as specified in the LG3 2001 addendum. Positive and negative software categories are described briefly in the addendum.

The limits in Table 3 above are specified in Table 8.1 of the LG3 2001 addendum and its accompanying notes.

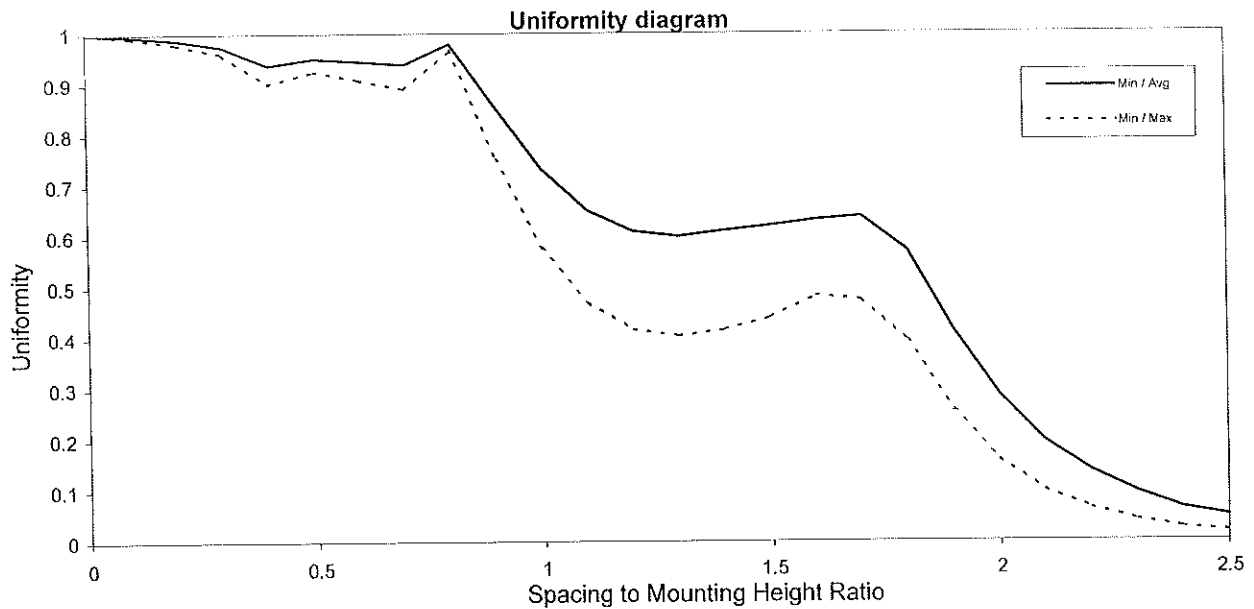
Measurement method and calculations in accordance with Publications CIBSE LG3:1996 (2001 Addendum) and BS5225:Part 1:1975.

The laboratory uncertainty in measurement for luminance is +/- 6% at the 95% confidence interval.



**Test Report No. LL17351-E**

PCO Lite Electrical 600 x 600 (nom.) mm Recessed Troffer. Product ID: LEDTINO VDU 312/9T-P2/AS.  
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Tested at 240 V 50 Hz.

**Test Distance:** 8.0 metres  
**Test Temperature:** 24.5 degrees Celsius

**Significance:** This laboratory has no control over the selection of samples to be tested.  
All testing is performed on the understanding that the significance of the  
report is limited to the extent that the test sample is representative of  
production units.

**Special Notes:** The intensity values contained in this report are shown as tested. When  
using these values in calculations the appropriate Ballast Factor and  
Manufacturer's rated lumens MUST be taken into account.  
It should also be noted that prorating the lumen output for the use of other  
lamp/ballast combinations, or for use in different environmental  
conditions, than that tested may produce erroneous results.

This report is free of erasures and corrections.  
Photometric intensity values are reported using the CIE Cgamma  
coordinate system as described in CIE Publication number 121.

For full product details refer to report LL17351-B.

**Uncertainties:** At the 95% confidence interval with a factor k = 2, the uncertainties for  
this report are :-

- Temperature +/- 1 degree Celsius
- Light Output Ratio +/- 4%
- Luminous Intensity +/- 4%
- Angular displacement +/- 0.25 degrees.

**Testing Procedure:** Tested in accordance with the applicable sections of CIE Publication  
Number 121; and with reference to Australian Standard AS1680, Part 3,  
1991.