

# Report of Test LL20365

Hawko Lighting Surface-mount LED Luminaire. Product ID: ES-Surface 14.4W Opal Diffuser.

Extruded aluminium body with silver finish, extent ~ 1015 x 18 x 16 mm deep.

Opal diffuser forms luminous opening of 1010 x 15 x 0.5 mm deep.

Nineteen sections of Hawko LED strip centred 12 mm above L/O.

Remote Tridonic LCU 035/12 E 020 120-240V 50/60Hz electronic driver.

Tested at 240 V 50 Hz.

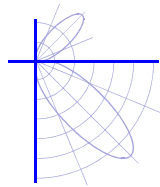


## Performance Summary

|                   |           |
|-------------------|-----------|
| Luminous flux     | 464 lm    |
| Luminaire Power   | 19.5 W    |
| Luminous Efficacy | 23.7 lm/W |
| SHR Nominal       | 1.50      |
| SHR Maximum       | 1.66      |

**PREPARED FOR : Hawko Lighting, Caloundra. QLD. 4551.**





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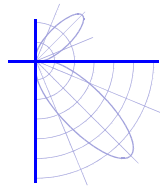
Opal diffuser forms luminous opening of 1010 x 15 x 0.5 mm deep.

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Tested at 240 V 50 Hz.

### LM-79 Performance Data

|                 |                                                        |                |
|-----------------|--------------------------------------------------------|----------------|
| <b>Spectral</b> | CIE 1931 (x, y) <sup>(1)</sup>                         | (0.446, 0.414) |
|                 | CIE 1976 (u', v') <sup>(1)</sup>                       | (0.253, 0.527) |
|                 | Correlated Colour Temperature (CCT) <sup>(1)</sup>     | 2920 K         |
|                 | Colour Spatial Uniformity <sup>(2)</sup>               | 0.0014         |
|                 | Colour Rendering Index (Ra) <sup>(1)</sup>             | 64.0           |
|                 | Special CRI 9 (R <sub>9</sub> ) <sup>(1),(3)</sup>     | -24            |
|                 | Distance from Planckian Locus (Duv) <sup>(1),(3)</sup> | 0.0025         |
|                 | Scotopic/Photopic Ratio <sup>(1),(3)</sup>             | 1.02           |

|                   |              |         |
|-------------------|--------------|---------|
| <b>Electrical</b> | Voltage      | 240 V   |
|                   | Frequency    | 50 Hz   |
|                   | Current      | 0.090 A |
|                   | Power        | 19.5 W  |
|                   | Power Factor | 0.91    |
|                   | Current THD  | 11.2 %  |

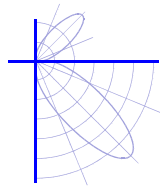
Performance data in accordance with IESNA LM-79-08. Spectral calculations are for a CIE 2° observer

(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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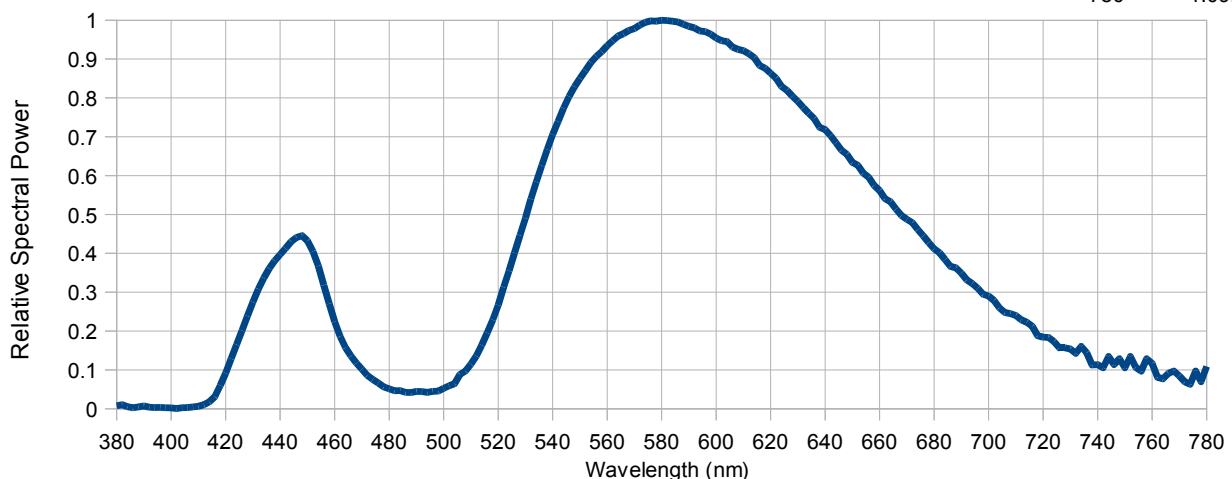
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Tested at 240 V 50 Hz.

### LM-79 Performance Data

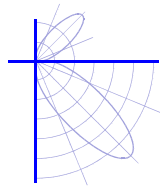
#### Summary Relative Spectral Irradiance Distribution (wavelength – nm, irradiance – relative to peak = 1)

|     |          |     |          |     |          |     |          |
|-----|----------|-----|----------|-----|----------|-----|----------|
| 380 | 7.63E-03 | 480 | 5.11E-02 | 580 | 1.00E+00 | 680 | 4.12E-01 |
| 385 | 3.72E-03 | 485 | 4.44E-02 | 585 | 9.96E-01 | 685 | 3.75E-01 |
| 390 | 7.09E-03 | 490 | 4.46E-02 | 590 | 9.84E-01 | 690 | 3.49E-01 |
| 395 | 3.23E-03 | 495 | 4.36E-02 | 595 | 9.71E-01 | 695 | 3.16E-01 |
| 400 | 2.17E-03 | 500 | 5.22E-02 | 600 | 9.54E-01 | 700 | 2.90E-01 |
| 405 | 2.81E-03 | 505 | 7.64E-02 | 605 | 9.38E-01 | 705 | 2.54E-01 |
| 410 | 6.37E-03 | 510 | 1.15E-01 | 610 | 9.22E-01 | 710 | 2.40E-01 |
| 415 | 2.45E-02 | 515 | 1.79E-01 | 615 | 8.94E-01 | 715 | 2.17E-01 |
| 420 | 9.15E-02 | 520 | 2.67E-01 | 620 | 8.63E-01 | 720 | 1.84E-01 |
| 425 | 1.83E-01 | 525 | 3.78E-01 | 625 | 8.25E-01 | 725 | 1.65E-01 |
| 430 | 2.74E-01 | 530 | 4.90E-01 | 630 | 7.91E-01 | 730 | 1.54E-01 |
| 435 | 3.49E-01 | 535 | 6.05E-01 | 635 | 7.54E-01 | 735 | 1.52E-01 |
| 440 | 3.97E-01 | 540 | 7.06E-01 | 640 | 7.19E-01 | 740 | 1.14E-01 |
| 445 | 4.35E-01 | 545 | 7.89E-01 | 645 | 6.75E-01 | 745 | 1.24E-01 |
| 450 | 4.32E-01 | 550 | 8.50E-01 | 650 | 6.34E-01 | 750 | 1.06E-01 |
| 455 | 3.43E-01 | 555 | 8.99E-01 | 655 | 6.01E-01 | 755 | 1.02E-01 |
| 460 | 2.24E-01 | 560 | 9.34E-01 | 660 | 5.61E-01 | 760 | 1.17E-01 |
| 465 | 1.46E-01 | 565 | 9.62E-01 | 665 | 5.23E-01 | 765 | 8.41E-02 |
| 470 | 1.02E-01 | 570 | 9.79E-01 | 670 | 4.88E-01 | 770 | 8.50E-02 |
| 475 | 7.08E-02 | 575 | 9.96E-01 | 675 | 4.53E-01 | 775 | 8.02E-02 |
|     |          |     |          |     |          | 780 | 1.09E-01 |



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





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Remote Tridonic LCU 035/12 E 020 120-240V 50/60Hz electronic driver.

Tested at 240 V 50 Hz.

### LM-79 Performance Data

#### Spatial measurements

| Gamma angle (deg) | CIE 1976 (u',v') coordinates |                |
|-------------------|------------------------------|----------------|
|                   | C 0 plane                    | C 90 plane     |
| 0                 | (0.253, 0.527)               | (0.253, 0.527) |
| 10                | (0.253, 0.527)               | (0.253, 0.527) |
| 20                | (0.253, 0.527)               | (0.253, 0.527) |
| 30                | (0.253, 0.527)               | (0.253, 0.527) |
| 40                | (0.253, 0.526)               | (0.253, 0.527) |
| 50                | (0.252, 0.526)               | (0.253, 0.526) |
| 60                | (0.252, 0.526)               | (0.252, 0.526) |
| 40                | (0.252, 0.526)               | (0.252, 0.526) |
| 80                | (0.253, 0.527)               | (0.251, 0.526) |
| 90                | I <= 10 %                    | I <= 10 %      |

#### Spatial measurements

| Gamma angle (deg) | CIE 1976 (u',v') coordinates |            |
|-------------------|------------------------------|------------|
|                   | C 0 plane                    | C 90 plane |
| 90                | I <= 10 %                    | I <= 10 %  |
| -                 | -                            | -          |
| -                 | -                            | -          |
| -                 | -                            | -          |
| -                 | -                            | -          |
| -                 | -                            | -          |
| -                 | -                            | -          |
| -                 | -                            | -          |
| -                 | -                            | -          |

#### 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 16 hour  
Total Operation Time 17.25 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    | ± 0.5° |                   |         |

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         | ± 0.004  | CCT                         | ± 150 K |
| CIE (u', v') coordinates       | ± 0.0025 | CRI (Ra)                    | ± 2     |
| Δ (u', v') Colour difference   | ± 0.001  | Scotopic / Photopic Ratio * | ± 0.02  |
| Relative Spectral Irradiance * | ± 2 %    | R9 *                        | ± 2     |

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

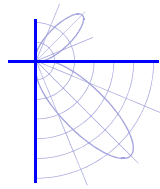
|               |         |              |          |
|---------------|---------|--------------|----------|
| Voltage       | ± 0.5 % | Frequency *  | ± 0.1 Hz |
| Current       | ± 0.5 % | Power        | ± 0.5 %  |
| Current THD * | ± 3 %   | Power Factor | ± 0.02   |

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

IESNA LM-79-08 Calculator v5.2 (1st Jul 2016)







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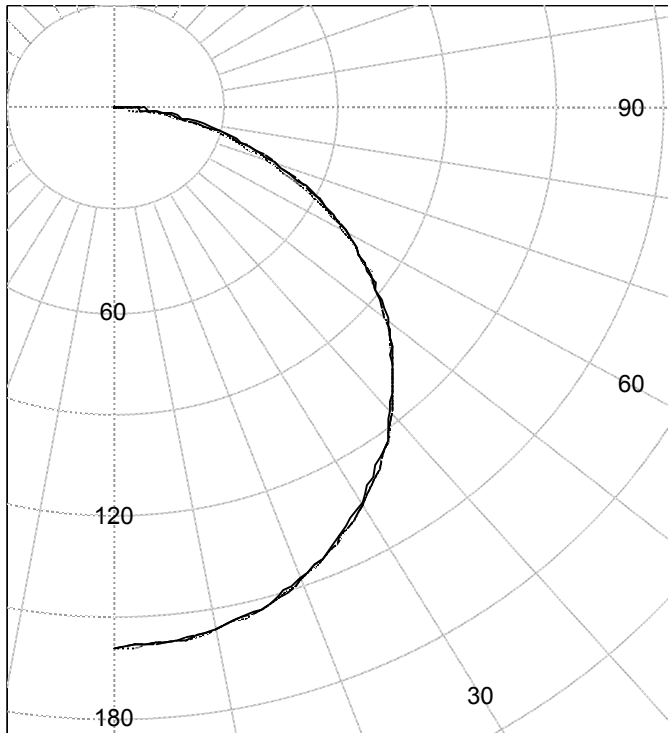
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Remote Tridonic LCU 035/12 E 020 120-240V 50/60Hz electronic driver.

Tested at 240 V 50 Hz.

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



(Two plane symmetry)

C0-C90

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

| Gamma | C0   | C45  | C90  |
|-------|------|------|------|
| 45.0  | 9971 | 9984 | 9970 |
| 55.0  | 9674 | 9724 | 9711 |
| 65.0  | 9302 | 9193 | 9027 |
| 75.0  | 8557 | 8191 | 7650 |
| 85.0  | 9925 | 7816 | 4067 |

### INTENSITY SUMMARY (cd)

| Gamma | C-Plane |       |     |       |     | Flux (lm) |
|-------|---------|-------|-----|-------|-----|-----------|
|       | C0      | C22.5 | C45 | C67.5 | C90 |           |
| 0.0   | 159     | 159   | 159 | 159   | 159 | 15        |
| 5.0   | 158     | 158   | 158 | 158   | 158 |           |
| 10.0  | 156     | 156   | 156 | 156   | 156 |           |
| 15.0  | 153     | 153   | 153 | 152   | 152 | 43        |
| 20.0  | 147     | 148   | 148 | 148   | 148 |           |
| 25.0  | 141     | 142   | 142 | 142   | 142 | 65        |
| 30.0  | 134     | 134   | 135 | 135   | 135 |           |
| 35.0  | 126     | 126   | 126 | 126   | 126 | 79        |
| 40.0  | 116     | 117   | 117 | 117   | 117 |           |
| 45.0  | 107     | 107   | 107 | 107   | 107 | 82        |
| 50.0  | 96      | 96    | 96  | 96    | 96  |           |
| 55.0  | 84      | 85    | 85  | 83    | 84  | 75        |
| 60.0  | 72      | 72    | 72  | 71    | 72  |           |
| 65.0  | 60      | 59    | 59  | 58    | 58  | 58        |
| 70.0  | 46      | 46    | 45  | 45    | 44  |           |
| 75.0  | 34      | 33    | 32  | 31    | 30  | 34        |
| 80.0  | 22      | 22    | 19  | 17    | 17  |           |
| 85.0  | 13      | 12    | 10  | 7     | 5   | 11        |
| 90.0  | 7       | 6     | 4   | 1     | 0   |           |

### ZONAL FLUX AND PERCENTAGES

| Zone   | Flux (lm) | % Lamp | % Luminaire |
|--------|-----------|--------|-------------|
| 0-30   | 123       | N / A  | 26.6        |
| 0-40   | 202       | N / A  | 43.6        |
| 0-60   | 360       | N / A  | 77.5        |
| 0-90   | 463       | N / A  | 99.7        |
| 40-90  | 260       | N / A  | 56.1        |
| 60-90  | 103       | N / A  | 22.1        |
| 90-180 | 2         | N / A  | 0.3         |
| 0-180  | 464       | N / A  | 100.0       |

Total Light Output = 464 lm

CERTIFIED BY:

Mikael Altoff  
Authorised Signatory

SHR-NOM = 1.50

SHR-MAX = 1.66

Calculated using the TM5

fine grid method.

Date of test

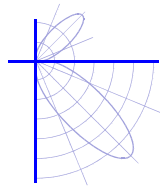
20-Jul-2017

Date of report

31-Jul-2017



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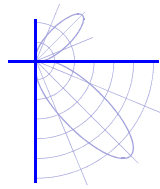
Remote Tridonic LCU 035/12 E 020 120-240V 50/60Hz electronic driver.

Tested at 240 V 50 Hz.

### Intensity data (cd)

| Gamma | C-Plane |       |     |       |     |
|-------|---------|-------|-----|-------|-----|
|       | C0      | C22.5 | C45 | C67.5 | C90 |
| 0.0   | 159     | 159   | 159 | 159   | 159 |
| 2.5   | 158     | 159   | 159 | 158   | 159 |
| 5.0   | 158     | 158   | 158 | 158   | 158 |
| 7.5   | 157     | 157   | 157 | 157   | 157 |
| 10.0  | 156     | 156   | 156 | 156   | 156 |
| 12.5  | 154     | 154   | 154 | 154   | 154 |
| 15.0  | 153     | 153   | 153 | 152   | 152 |
| 17.5  | 150     | 150   | 150 | 150   | 150 |
| 20.0  | 147     | 148   | 148 | 148   | 148 |
| 22.5  | 144     | 145   | 145 | 145   | 145 |
| 25.0  | 141     | 142   | 142 | 142   | 142 |
| 27.5  | 138     | 138   | 138 | 138   | 138 |
| 30.0  | 134     | 134   | 135 | 135   | 135 |
| 32.5  | 130     | 130   | 131 | 131   | 131 |
| 35.0  | 126     | 126   | 126 | 126   | 126 |
| 37.5  | 121     | 121   | 122 | 122   | 122 |
| 40.0  | 116     | 117   | 117 | 117   | 117 |
| 42.5  | 112     | 112   | 112 | 112   | 112 |
| 45.0  | 107     | 107   | 107 | 107   | 107 |
| 47.5  | 101     | 102   | 102 | 101   | 102 |
| 50.0  | 96      | 96    | 96  | 96    | 96  |
| 52.5  | 91      | 90    | 90  | 90    | 90  |
| 55.0  | 84      | 85    | 85  | 83    | 84  |
| 57.5  | 78      | 78    | 79  | 77    | 78  |
| 60.0  | 72      | 72    | 72  | 71    | 72  |
| 62.5  | 66      | 66    | 65  | 64    | 64  |
| 65.0  | 60      | 59    | 59  | 58    | 58  |
| 67.5  | 52      | 52    | 52  | 51    | 51  |
| 70.0  | 46      | 46    | 45  | 45    | 44  |
| 72.5  | 40      | 39    | 39  | 38    | 37  |
| 75.0  | 34      | 33    | 32  | 31    | 30  |
| 77.5  | 28      | 27    | 26  | 24    | 23  |
| 80.0  | 22      | 22    | 19  | 17    | 17  |
| 82.5  | 17      | 17    | 14  | 12    | 11  |
| 85.0  | 13      | 12    | 10  | 7     | 5   |
| 87.5  | 9       | 9     | 6   | 4     | 2   |
| 90.0  | 7       | 6     | 4   | 1     | 0   |





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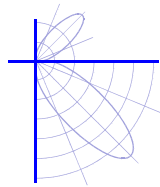
Tested at 240 V 50 Hz.

### Intensity data (cd)

| Gamma | C-Plane |       |     |       |     |
|-------|---------|-------|-----|-------|-----|
|       | C0      | C22.5 | C45 | C67.5 | C90 |
| 90.0  | 7       | 6     | 4   | 1     | 0   |
| 92.5  | 5       | 3     | 2   | 0     | 0   |
| 95.0  | 3       | 2     | 1   | 0     | 0   |
| 97.5  | 2       | 1     | 0   | 0     | 0   |
| 100.0 | 0       | 1     | 0   | 0     | 0   |
| 102.5 | 0       | 0     | 0   | 0     | 0   |
| 105.0 | 0       | 0     | 0   | 0     | 0   |
| 107.5 | 0       | 0     | 0   | 0     | 0   |
| 110.0 | 0       | 0     | 0   | 0     | 0   |
| 112.5 | 0       | 0     | 0   | 0     | 0   |
| 115.0 | 0       | 0     | 0   | 0     | 0   |
| 117.5 | 0       | 0     | 0   | 0     | 0   |
| 120.0 | 0       | 0     | 0   | 0     | 0   |
| 122.5 | 0       | 0     | 0   | 0     | 0   |
| 125.0 | 0       | 0     | 0   | 0     | 0   |
| 127.5 | 0       | 0     | 0   | 0     | 0   |
| 130.0 | 0       | 0     | 0   | 0     | 0   |
| 132.5 | 0       | 0     | 0   | 0     | 0   |
| 135.0 | 0       | 0     | 0   | 0     | 0   |
| 137.5 | 0       | 0     | 0   | 0     | 0   |
| 140.0 | 0       | 0     | 0   | 0     | 0   |
| 142.5 | 0       | 0     | 0   | 0     | 0   |
| 145.0 | 0       | 0     | 0   | 0     | 0   |
| 147.5 | 0       | 0     | 0   | 0     | 0   |
| 150.0 | 0       | 0     | 0   | 0     | 0   |
| 152.5 | 0       | 0     | 0   | 0     | 0   |
| 155.0 | 0       | 0     | 0   | 0     | 0   |
| 157.5 | 0       | 0     | 0   | 0     | 0   |
| 160.0 | 0       | 0     | 0   | 0     | 0   |
| 162.5 | 0       | 0     | 0   | 0     | 0   |
| 165.0 | 0       | 0     | 0   | 0     | 0   |
| 167.5 | 0       | 0     | 0   | 0     | 0   |
| 170.0 | 0       | 0     | 0   | 0     | 0   |
| 172.5 | 0       | 0     | 0   | 0     | 0   |
| 175.0 | 0       | 0     | 0   | 0     | 0   |
| 177.5 | 0       | 0     | 0   | 0     | 0   |
| 180.0 | 0       | 0     | 0   | 0     | 0   |







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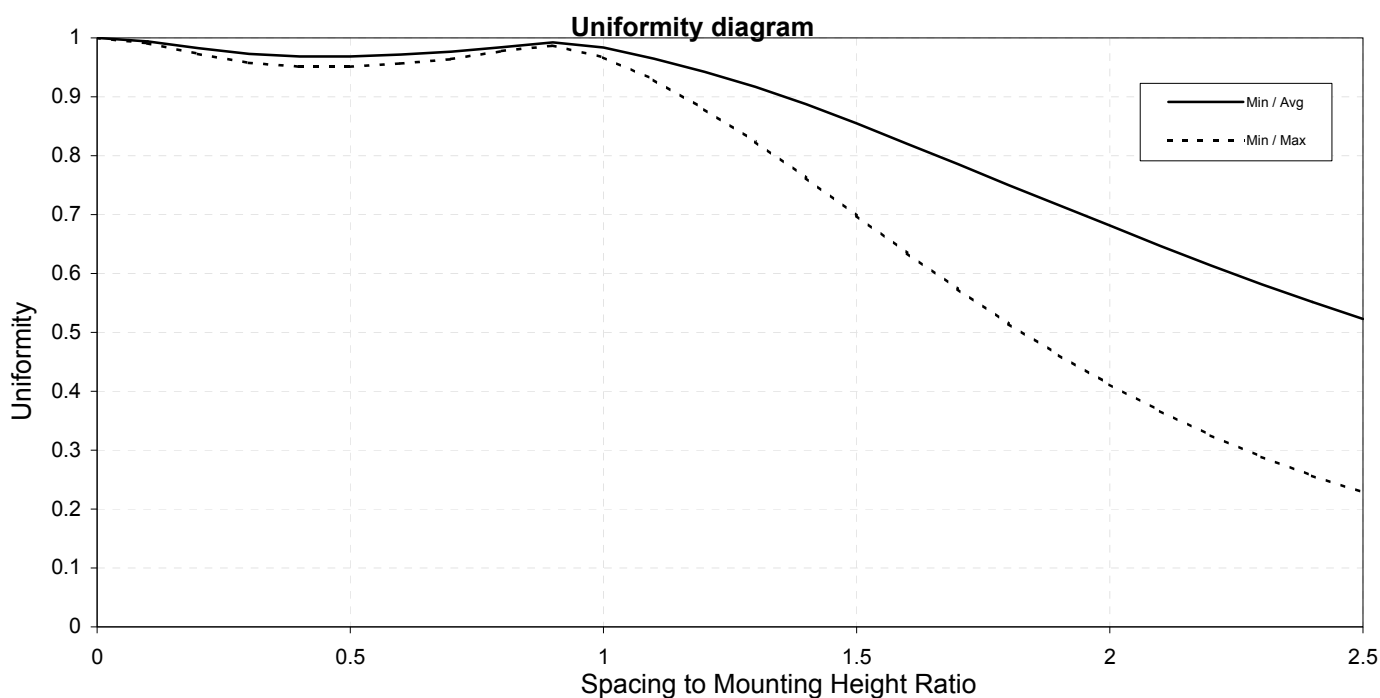
Extruded aluminium body with silver finish, extent ~ 1015 x 18 x 16 mm deep.

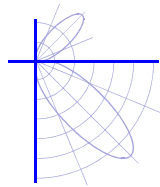
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Tested at 240 V 50 Hz.

**Test Distance:** 8.0 metres

**Test Temperature:** 25.0 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.

**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 | +/- 0.5 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.

