

Tested Light Source - 1_PHOT_NINETY-NINE-1925lmChip-4000K-38Deg-HoneycombLouvre_2303

Laboratory and Equipment

| | |
|-------------------------------------|---------------------------------------------------------|
| Laboratory Owner and Location | Factorylux, Greenhill Mills, Hebden Bridge, HX7 5QF, UK |
| Goniospectrometer System and Type | BaseSpion – Type C, horizontal |
| Spectrometer Manufacturer and Model | Ibsen Photonics, Denmark – Freedom VIS (Custom Viso) |

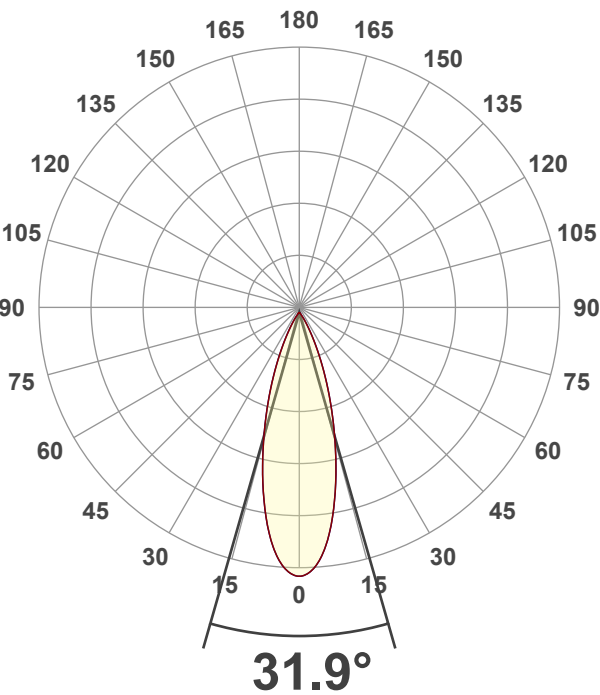
Measurement Conditions

| | |
|---------------------------------------|----------------------------|
| Number of C-planes and Resolution | 32 planes – 11.25° |
| γ (gamma)-Resolution | 1.5° |
| Test Distance | 1.50 m |
| Input Power, Power and Displ. Factors | 14.6 W – PF 0.46 – DPF 0.8 |
| Input RMS Voltage and Current | 240 V – 0.132 A |
| Frequency of Input Power | 50 Hz |

Main Light Measurement Results

| | |
|-------------------------------|-----------------|
| Output | 943 lm |
| Efficiency | 65 lm/W |
| Peak Intensity and Beam Angle | 2664 cd – 31.9° |
| Color Rendering Index | CRI 93.0 |

Light Intensity Distribution



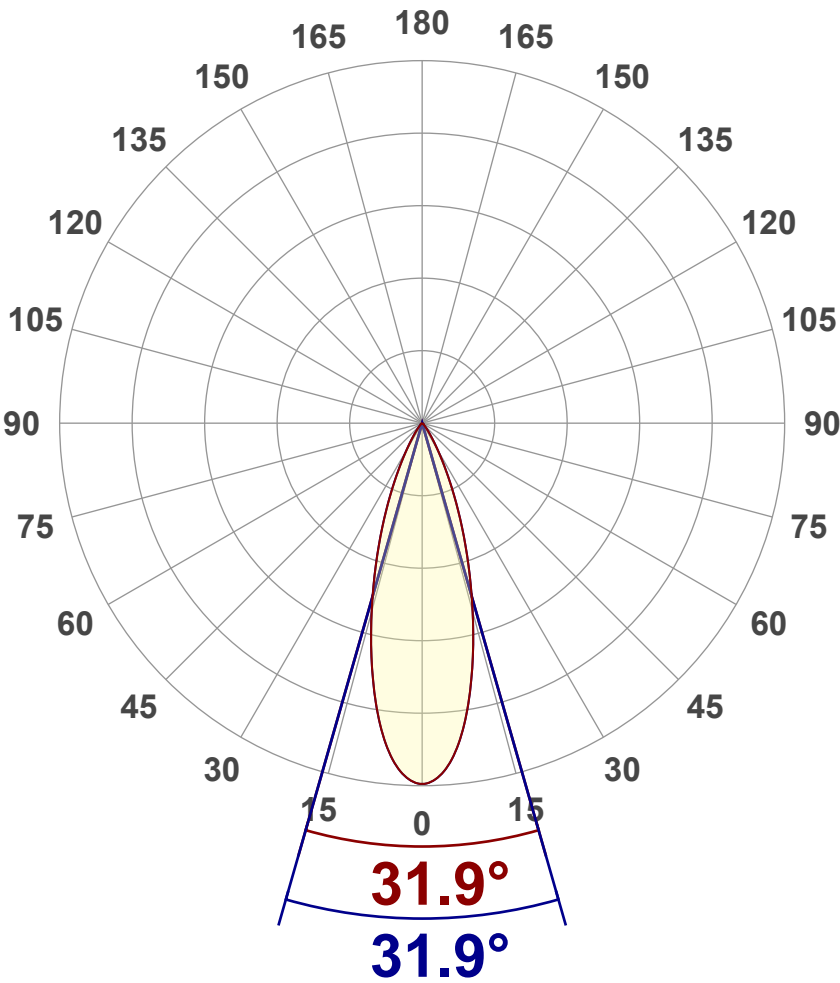
Goniophotometry Report

1_PHOT_NINETY-NINE-1925lmChip-4000K-38Deg-HoneycombLouvre_2303
www.factorylux.com



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

| | |
|----------------------|---------|
| Output (total Lumen) | 943 lm |
| Peak Intensity | 2664 cd |
| Beam Angle (50%) | 31.9° |
| Beam Angle (90%) | 31.9° |
| Beam Angle (10%) | 31.9° |

Cut-off Angle

| | |
|--------------|-----|
| Average 2,5% | 75° |
|--------------|-----|

Field Angle

| | |
|-------------|-------|
| Average 10% | 58.5° |
|-------------|-------|

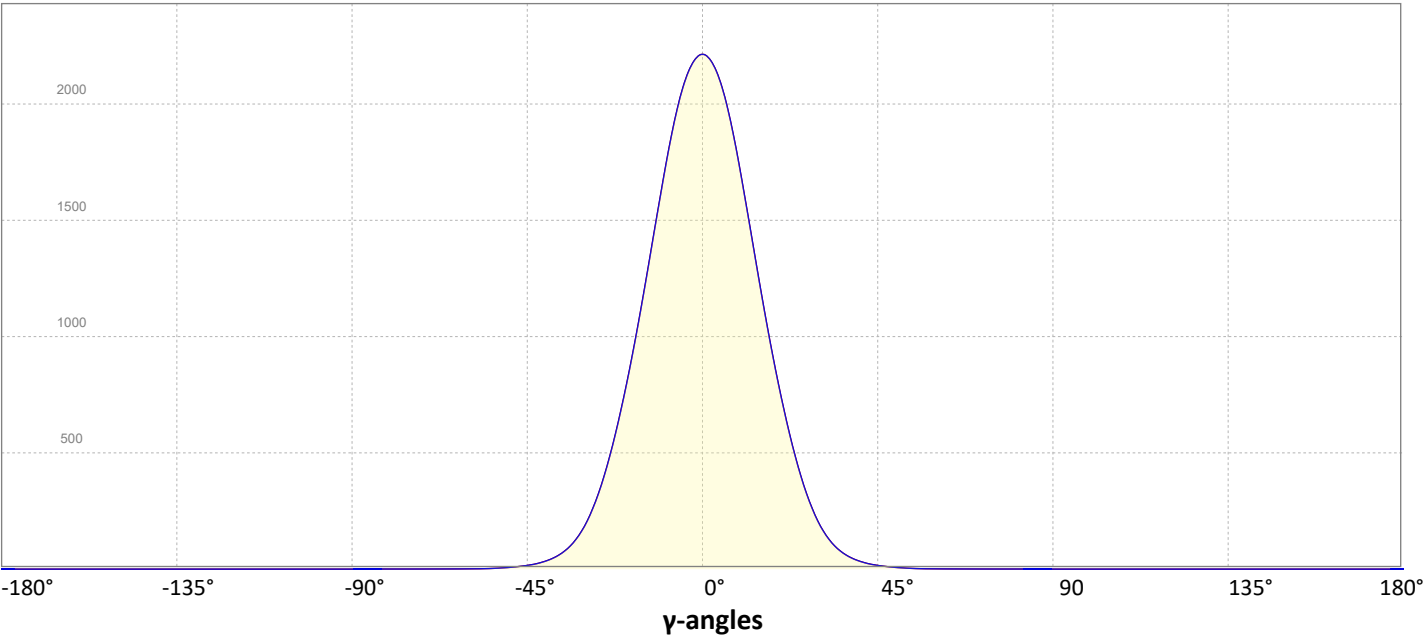
Intensity Ratio

| | |
|--------------|-------|
| In 120° cone | 99.6% |
| In 90° cone | 98.7% |

C000-C180

C090-C270

Linear distribution diagram - Intensity (candela) vs γ-angle

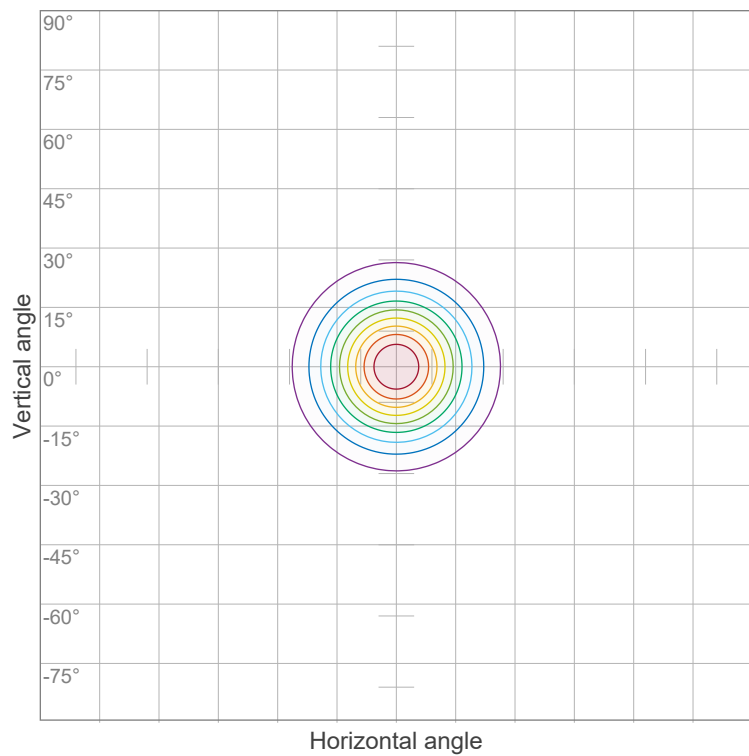


Goniophotometry Report

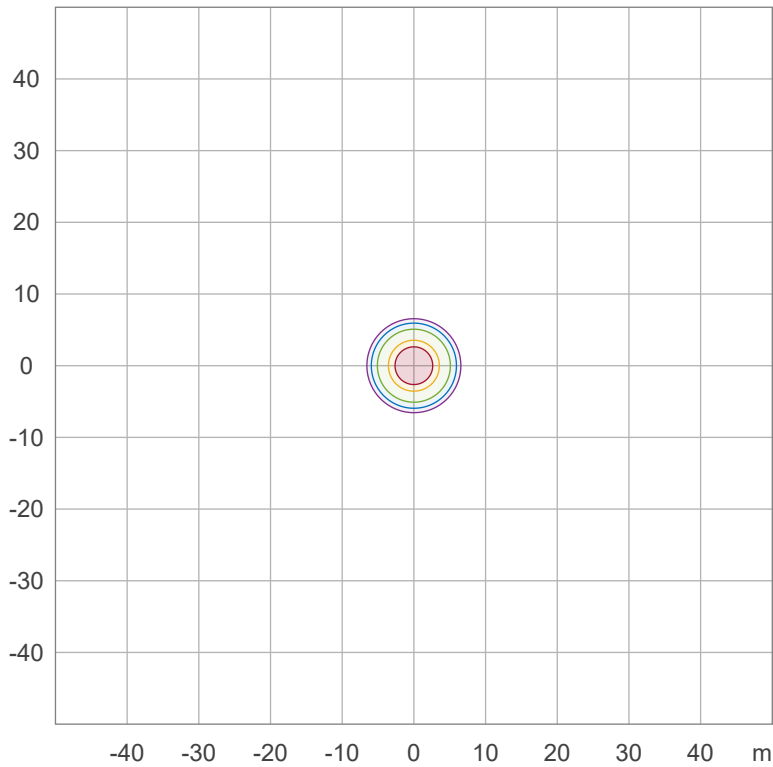
1_PHOT_NINETY-NINE-1925lmChip-4000K-38Deg-HoneycombLouvre_2303
www.factorylux.com



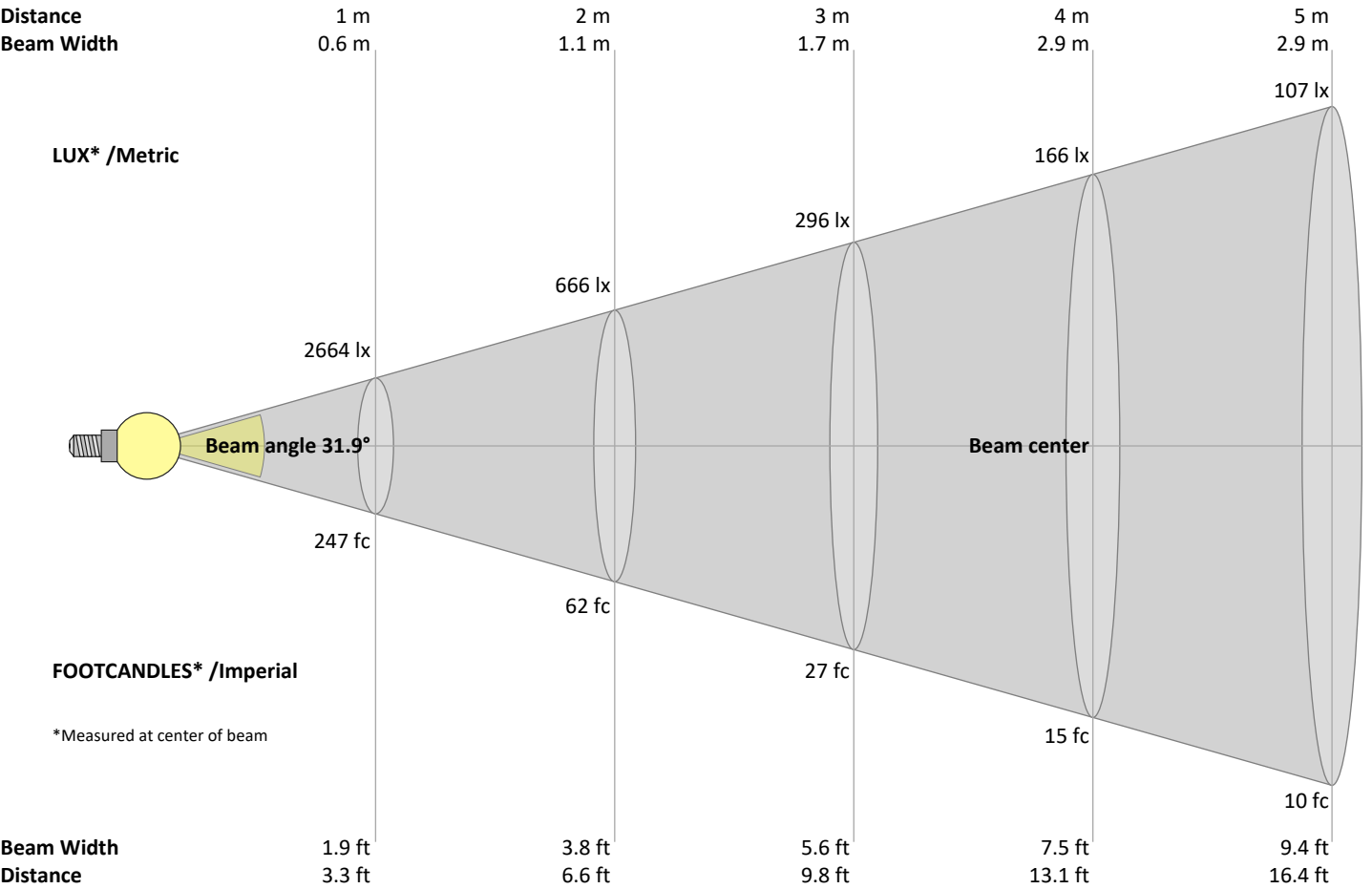
Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



Beam Details



| Beam intensities from 1 – 20 m | | | | | | | | | | | | | | | | | | | | |
|--------------------------------|------|------|------|------|------|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | m |
| 3.3 | 6.6 | 9.8 | 13.1 | 16.4 | 19.7 | 23 | 26.2 | 29.5 | 32.8 | 36.1 | 39.4 | 42.7 | 45.9 | 49.2 | 52.5 | 55.8 | 59.1 | 62.3 | 65.6 | ft |
| 2664 | 666 | 296 | 166 | 107 | 74 | 54 | 42 | 33 | 27 | 22 | 18 | 16 | 14 | 12 | 10 | 9 | 8 | 7 | 7 | lux |
| 247.5 | 61.9 | 27.5 | 15.5 | 9.9 | 6.9 | 5.1 | 3.9 | 3.1 | 2.5 | 2 | 1.7 | 1.5 | 1.3 | 1.1 | 1 | 0.9 | 0.8 | 0.7 | 0.6 | fc |

| Intensities in 0° c-plane | | | | | | | | | | | | | | | | | | | | |
|---------------------------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|
| 0° | 2° | 4° | 6° | 8° | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ |
| 2664 | 2637 | 2555 | 2421 | 2243 | 2027 | 1795 | 1559 | 1328 | 1111 | 912 | 732 | 572 | 436 | 324 | 235 | 169 | 119 | 85 | 61 | cd |
| 100% | 99% | 96% | 91% | 84% | 76% | 67% | 59% | 50% | 42% | 34% | 27% | 21% | 16% | 12% | 9% | 6% | 4% | 3% | 2% | of 0°val |

| Intensities in 90° c-plane | | | | | | | | | | | | | | | | | | | | |
|----------------------------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|
| 0° | 2° | 4° | 6° | 8° | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ |
| 2664 | 2637 | 2555 | 2421 | 2243 | 2027 | 1795 | 1559 | 1328 | 1111 | 912 | 732 | 572 | 436 | 324 | 235 | 169 | 119 | 85 | 61 | cd |
| 100% | 99% | 96% | 91% | 84% | 76% | 67% | 59% | 50% | 42% | 34% | 27% | 21% | 16% | 12% | 9% | 6% | 4% | 3% | 2% | of 0°val |

| Intensities in 180° c-plane | | | | | | | | | | | | | | | | | | | | |
|-----------------------------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|
| 0° | 2° | 4° | 6° | 8° | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ |
| 2664 | 2637 | 2555 | 2421 | 2243 | 2027 | 1795 | 1559 | 1328 | 1111 | 912 | 732 | 572 | 436 | 324 | 235 | 169 | 119 | 85 | 61 | cd |
| 100% | 99% | 96% | 91% | 84% | 76% | 67% | 59% | 50% | 42% | 34% | 27% | 21% | 16% | 12% | 9% | 6% | 4% | 3% | 2% | of 0°val |

| Intensities in 270° c-plane | | | | | | | | | | | | | | | | | | | | |
|-----------------------------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|
| 0° | 2° | 4° | 6° | 8° | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ |
| 2664 | 2637 | 2555 | 2421 | 2243 | 2027 | 1795 | 1559 | 1328 | 1111 | 912 | 732 | 572 | 436 | 324 | 235 | 169 | 119 | 85 | 61 | cd |
| 100% | 99% | 96% | 91% | 84% | 76% | 67% | 59% | 50% | 42% | 34% | 27% | 21% | 16% | 12% | 9% | 6% | 4% | 3% | 2% | of 0°val |

Goniophotometry Report

1_PHOT_NINETY-NINE-1925lmChip-4000K-38Deg-HoneycombLouvre_2303
www.factorylux.com



Light Planning – UGR table

Uncorrected, comprehensive UGR table according to 117-1995

| Reflectances | | | | | | | | | | | |
|-------------------------------------|-----------|----------------------------------------------------|------|------|------|------|--------------------------------------------------|------|------|------|------|
| | p Ceiling | 70 | 70 | 50 | 50 | 30 | 70 | 70 | 50 | 50 | 30 |
| | p Walls | 50 | 30 | 50 | 30 | 30 | 50 | 30 | 50 | 30 | 30 |
| | p Floor | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Room size | | Viewed Crosswise | | | | | Viewed Endwise | | | | |
| H = mounting height above eye level | | (Viewing direction orthogonal to lamp length axis) | | | | | (Viewing direction parallel to lamp length axis) | | | | |
| X | Y | | | | | | | | | | |
| 2H | 2H | 12.2 | 12.7 | 12.3 | 12.9 | 13.1 | 12.2 | 12.7 | 12.3 | 12.9 | 13.1 |
| | 3H | 11.9 | 12.5 | 12.3 | 12.7 | 12.9 | 11.9 | 12.5 | 12.3 | 12.7 | 12.9 |
| | 4H | 11.8 | 12.4 | 12.2 | 12.7 | 12.9 | 11.8 | 12.4 | 12.2 | 12.7 | 12.9 |
| | 6H | 11.9 | 12.3 | 12.2 | 12.6 | 13.0 | 11.9 | 12.3 | 12.2 | 12.6 | 13.0 |
| | 8H | 11.8 | 12.3 | 12.1 | 12.6 | 13.0 | 11.8 | 12.3 | 12.1 | 12.6 | 13.0 |
| | 12H | 11.8 | 12.3 | 12.1 | 12.6 | 13.0 | 11.8 | 12.3 | 12.1 | 12.6 | 13.0 |
| 4H | 2H | 11.8 | 12.4 | 12.2 | 12.7 | 12.9 | 11.8 | 12.4 | 12.2 | 12.7 | 12.9 |
| | 3H | 11.7 | 12.2 | 12.1 | 12.6 | 13.0 | 11.7 | 12.2 | 12.1 | 12.6 | 13.0 |
| | 4H | 11.6 | 12.0 | 12.0 | 12.5 | 13.0 | 11.6 | 12.0 | 12.0 | 12.5 | 13.0 |
| | 6H | 11.6 | 12.1 | 12.1 | 12.4 | 12.7 | 11.6 | 12.1 | 12.1 | 12.4 | 12.7 |
| | 8H | 11.5 | 12.0 | 12.1 | 12.3 | 12.7 | 11.5 | 12.0 | 12.1 | 12.3 | 12.7 |
| | 12H | 11.5 | 11.9 | 12.0 | 12.3 | 12.7 | 11.5 | 11.9 | 12.0 | 12.3 | 12.7 |
| 8H | 4H | 11.5 | 11.9 | 12.0 | 12.3 | 12.6 | 11.5 | 11.9 | 12.0 | 12.3 | 12.6 |
| | 6H | 11.5 | 11.8 | 12.0 | 12.2 | 12.7 | 11.5 | 11.8 | 12.0 | 12.2 | 12.7 |
| | 8H | 11.5 | 11.8 | 12.0 | 12.3 | 12.9 | 11.5 | 11.8 | 12.0 | 12.3 | 12.9 |
| | 12H | 11.6 | 11.8 | 12.2 | 12.3 | 12.9 | 11.6 | 11.8 | 12.2 | 12.3 | 12.9 |
| 12H | 4H | 11.4 | 11.8 | 11.9 | 12.2 | 12.6 | 11.4 | 11.8 | 11.9 | 12.2 | 12.6 |
| | 6H | 11.5 | 11.7 | 12.0 | 12.2 | 12.8 | 11.5 | 11.7 | 12.0 | 12.2 | 12.8 |
| | 8H | 11.5 | 11.7 | 12.1 | 12.2 | 12.8 | 11.5 | 11.7 | 12.1 | 12.2 | 12.8 |

Variations with the observer position for the luminaire spacings, S:

| | | |
|----------|------------|------------|
| S = 1.0H | 5.3 / -6.8 | 5.3 / -6.8 |
| S = 1.5H | 7.9 / -7.3 | 7.9 / -7.3 |
| S = 2.0H | 9.9 / -7.6 | 9.9 / -7.6 |

Coefficients of Utilization

| Ceiling reflectance | 80 | | | 70 | | | 50 | | | 30 | | | 10 | | | 0 | | |
|---------------------|-----|---------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Wall reflectance | 70 | 50 | 30 | 10 | 70 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 0 |
| Floor reflectance | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 0 |
| RCR | | (RCR: Room Cavity Ratio) Room Values are expressed as percentage of Lumen delivered to the task surface | | | | | | | | | | | | | | | | |
| 0 | 119 | 119 | 119 | 119 | 116 | 116 | 116 | 116 | 111 | 111 | 111 | 106 | 106 | 106 | 102 | 102 | 102 | 100 |
| 1 | 114 | 112 | 110 | 108 | 112 | 110 | 108 | 106 | 106 | 104 | 103 | 102 | 101 | 100 | 99 | 98 | 97 | 95 |
| 2 | 110 | 106 | 103 | 100 | 108 | 104 | 101 | 99 | 101 | 99 | 97 | 98 | 96 | 95 | 96 | 94 | 93 | 91 |
| 3 | 106 | 101 | 97 | 93 | 104 | 99 | 96 | 93 | 97 | 94 | 91 | 94 | 92 | 90 | 92 | 90 | 88 | 87 |
| 4 | 102 | 96 | 91 | 88 | 100 | 95 | 91 | 87 | 93 | 89 | 86 | 91 | 88 | 85 | 89 | 87 | 85 | 83 |
| 5 | 98 | 92 | 87 | 83 | 97 | 91 | 86 | 83 | 89 | 85 | 82 | 87 | 84 | 82 | 86 | 83 | 81 | 80 |
| 6 | 95 | 88 | 83 | 79 | 93 | 87 | 82 | 79 | 85 | 82 | 79 | 84 | 81 | 78 | 83 | 80 | 78 | 76 |
| 7 | 91 | 84 | 79 | 76 | 90 | 83 | 79 | 76 | 82 | 78 | 75 | 81 | 78 | 75 | 80 | 77 | 74 | 73 |
| 8 | 88 | 81 | 76 | 73 | 87 | 80 | 76 | 72 | 79 | 75 | 72 | 78 | 75 | 72 | 77 | 74 | 72 | 70 |
| 9 | 85 | 78 | 73 | 70 | 84 | 77 | 73 | 70 | 76 | 72 | 69 | 75 | 72 | 69 | 75 | 71 | 69 | 68 |
| 10 | 82 | 75 | 70 | 67 | 82 | 74 | 70 | 67 | 74 | 70 | 67 | 73 | 69 | 67 | 72 | 69 | 66 | 65 |

Goniophotometry Report

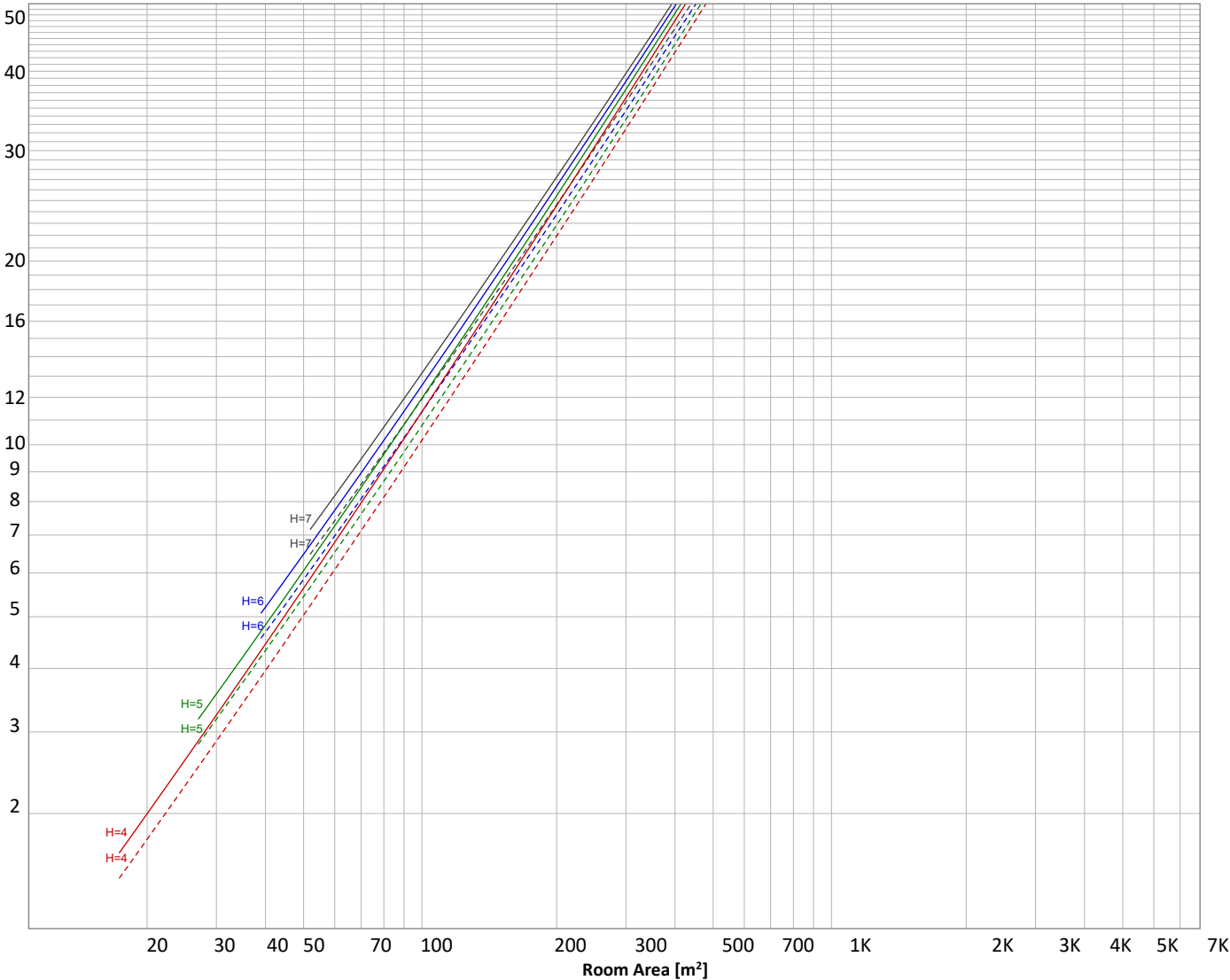
1_PHOT_NINETY-NINE-1925lmChip-4000K-38Deg-HoneycombLouvre_2303
www.factorylux.com



Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

| | | | | |
|---------------------------------------------------|---------------|-----------|---------------------|-------------------|
| H = Room height | Flux = 943 lm | p(%) | | |
| H _{down} = Lamp distance from ceiling = | 0.00 m | Line type | Ceiling reflectance | Wall reflectance |
| H _{work} = Work area height from floor = | 0.00 m | ----- | 70 | 50 |
| E _{work} = Average lux on work area = | 100 lx | ----- | 50 | 30 |
| | | | | Floor reflectance |
| | | | | 20 |

Zonal Lumen Summary

| | | | | | | | | |
|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 0°-10° | 10°-20° | 20°-30° | 30°-40° | 40°-50° | 50°-60° | 60°-70° | 70°-80° | 80°-90° |
| 223 lm | 394 lm | 233 lm | 68.9 lm | 16.4 lm | 3.43 lm | 1.10 lm | 0.732 lm | 0.628 lm |
| 90°-100° | 100°-110° | 110°-120° | 120°-130° | 130°-140° | 140°-150° | 150°-160° | 160°-170° | 170°-180° |
| 0.270 lm | 0.262 lm | 0.246 lm | 0.222 lm | 0.148 lm | 0.102 lm | 0.075 lm | 0.046 lm | 0.015 lm |

Outdoor Light Planning

Lumen per Zone

| Zone (γ) | Lumen | % Total |
|----------|--------|---------|
| 0-10° | 223 lm | 23.7% |
| 10-20° | 394 lm | 41.8% |
| 20-30° | 233 lm | 24.7% |
| 30-40° | 69 lm | 7.3% |
| 40-50° | 16 lm | 1.7% |
| 50-60° | 3 lm | 0.4% |
| 60-70° | 1 lm | 0.1% |
| 70-80° | 1 lm | 0.1% |
| 80-90° | 1 lm | 0.1% |
| 90-100° | 0 lm | 0.0% |
| 100-110° | 0 lm | 0.0% |
| 110-120° | 0 lm | 0.0% |
| 120-130° | 0 lm | 0.0% |
| 130-140° | 0 lm | 0.0% |
| 140-150° | 0 lm | 0.0% |
| 150-160° | 0 lm | 0.0% |
| 160-170° | 0 lm | 0.0% |
| 170-180° | 0 lm | 0.0% |
| Total | 943 lm | 100.0% |

Intensity peaks

| | |
|----------------|---------|
| Max intensity | 2664 cd |
| Intensity, 90° | 0 cd |
| Intensity, 0° | 2664 cd |

Zonal Lumen summary

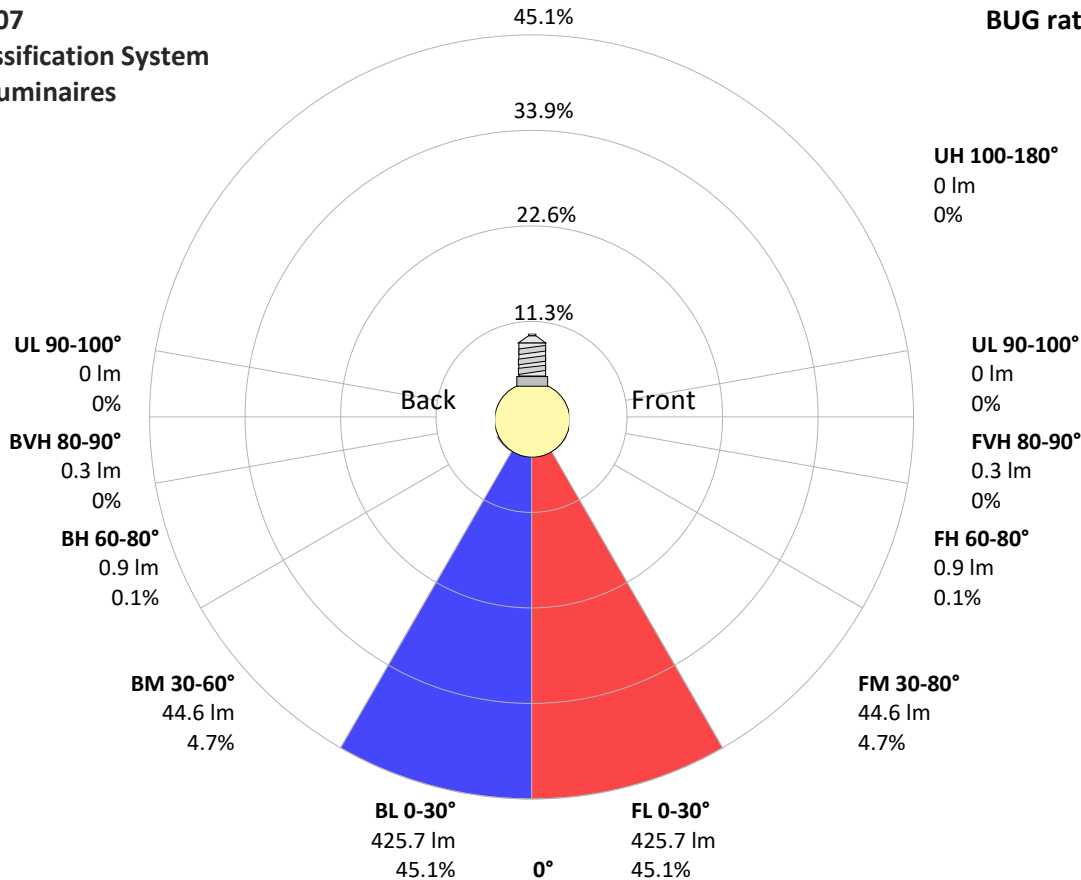
| Zone (γ) | Lumen | % Total |
|----------|--------|---------|
| 0-30° | 850 lm | 90.2% |
| 0-40° | 919 lm | 97.5% |
| 0-60° | 939 lm | 99.6% |
| 60-90° | 2 lm | 0.3% |
| 70-100° | 2 lm | 0.2% |
| 90-120° | 1 lm | 0.1% |
| 0-90° | 942 lm | 99.9% |
| 90-180° | 1 lm | 0.1% |
| 0-180° | 943 lm | 100.0% |

BUG rating

| | Lumen | % Total |
|----------------------|--------|---------|
| Forward light | | |
| Low(0-30°) | 426 lm | 45.1% |
| Medium(30-60°) | 45 lm | 4.7% |
| High(60-80°) | 1 lm | 0.1% |
| Very high(80-90°) | 0 lm | 0.0% |
| Back light | | |
| Low(0-30°) | 426 lm | 45.1% |
| Medium(30-60°) | 45 lm | 4.7% |
| High(60-80°) | 1 lm | 0.1% |
| Very high(80-90°) | 0 lm | 0.0% |
| Uplight | | |
| Low(90-100°) | 0 lm | 0.0% |
| High(100-180°) | 0 lm | 0.0% |

IESNA TM-15-07
Luminaire Classification System
For Outdoor Luminaires

BUG rating B1 U1 G0



Goniophotometry Report

1_PHOT_NINETY-NINE-1925lmChip-4000K-38Deg-HoneycombLouvre_2303
www.factorylux.com



Power Details

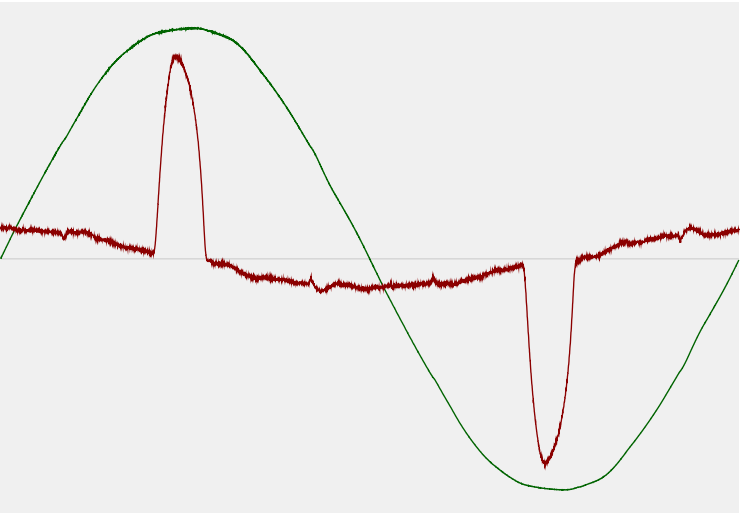
Input Power

| | |
|-----------------------------------------------------|----------|
| Power feed to light source | 14.6 W |
| Frequency of input power | 50 Hz |
| RMS Input voltage feed, V_{RMS} | 240 V |
| RMS Input current feed, I_{RMS} | 0.132 A |
| Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$ | 31.74 VA |
| Displacement factor of AC power feed | 0.8 |
| Power factor of AC current feed | 0.46 |
| Total harmonic distortion of the current | 139.71% |
| Total harmonic distortion of the voltage | 1.19% |

Efficiency

| | |
|---------------------------|---------|
| Radiated power efficiency | 23.7% |
| <div><div></div></div> | |
| Lumen efficiency | 65 lm/W |
| <div><div></div></div> | |

Input Power Curve



Goniophotometry Report

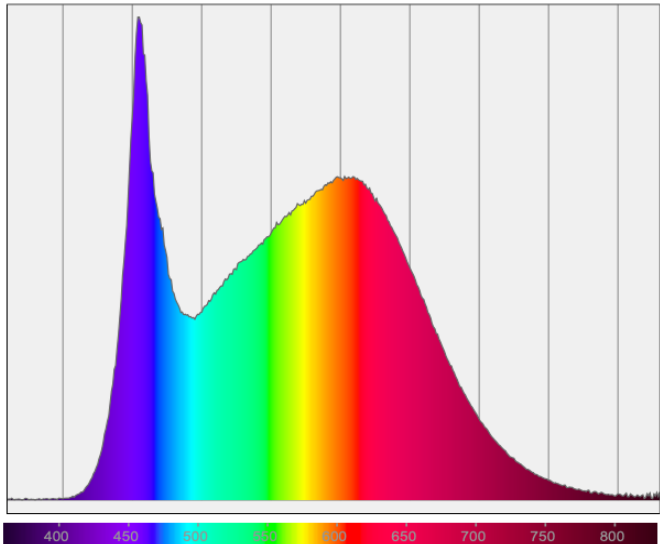
1_PHOT_NINETY-NINE-1925lmChip-4000K-38Deg-HoneycombLouvre_2303
www.factorylux.com



Color Measurements

| | |
|------------------------------|-------------------------------------------|
| Correlated Color Temperature | CCT = 4000 K |
| Color Rendering TM30-18 | R _f 88.9 – R _g 98.5 |
| Color Shift, CIE duv | Duv ±0.0003 |

Spectral distribution



Color details

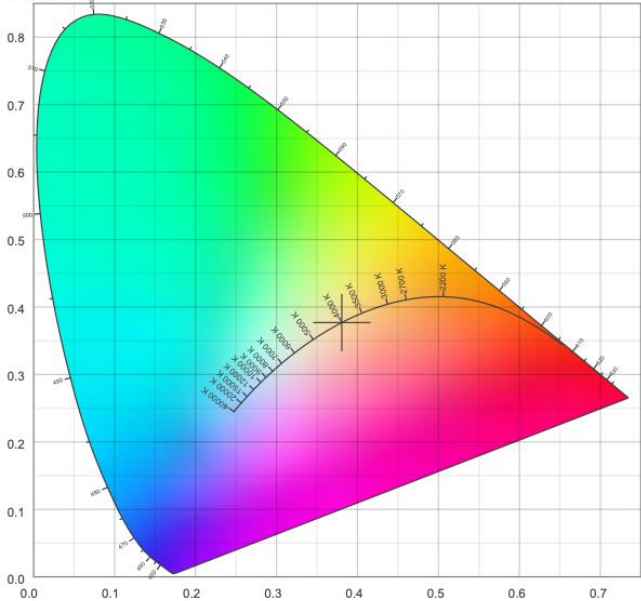
| | | | |
|-------------------------------------------|-------------------------------------------|-------------------------------------|-------------------------|
| Correlated Color Temperature | CCT = 4000 K | Color coordinates CIE 1931 | (x;y) = (0.381;0.377) |
| Color Rendering Index | CRI 92.6 | Color coordinate CIEs 1960 | (u;v) = (0.225;0.334) |
| Color Rendering Index, R9 (red component) | R9 = 72.2 | Color deviation from BBL | Duv = ±0.0003 |
| Color Rendering TM30-18 | R _f 88.9 – R _g 98.5 | Color coordinate CIEs 1976 (CIELUV) | (u';v') = (0.225;0.225) |
| Color Quality Scale | CQS = 88.9 | | |

Goniophotometry Report

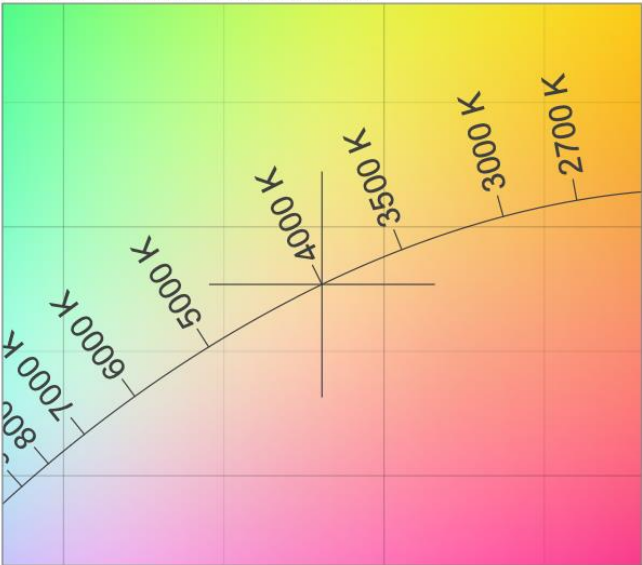
1_PHOT_NINETY-NINE-1925lmChip-4000K-38Deg-HoneycombLouvre_2303
www.factorylux.com



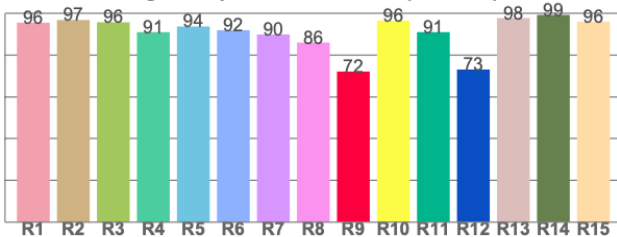
CIE 1931



CIE 1931 – zoomed on Planckian locus



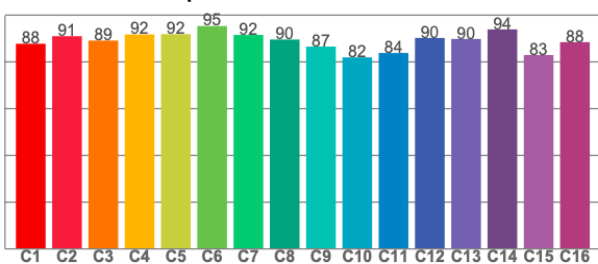
Color Rendering Index per reference color (CIE 1995)



CRI R values, only R1-R8 are used to calculate final CRI value

| R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 | R10 | R11 | R12 | R13 | R14 | R15 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 95.5 | 96.8 | 95.7 | 91.0 | 93.7 | 91.9 | 89.9 | 86.0 | 72.2 | 96.4 | 91.0 | 73.1 | 97.7 | 99.2 | 96.0 |

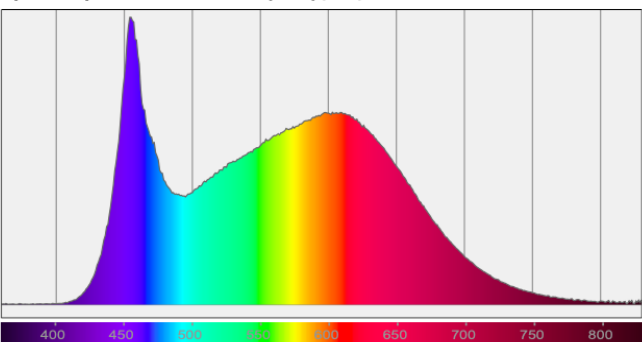
TM30-18 Rf-values per hue bin



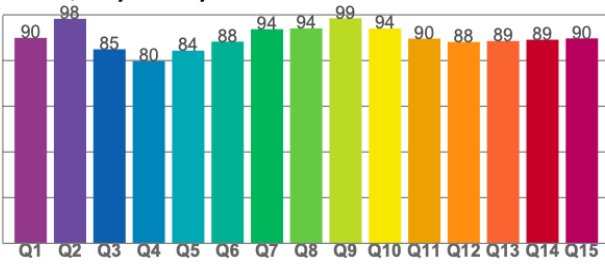
TM30 C values, 16 binned values out of total of 99 C values

| C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | C11 | C12 | C13 | C14 | C15 | C16 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 87.8 | 91.0 | 89.1 | 91.7 | 91.9 | 95.3 | 91.5 | 89.6 | 86.6 | 81.9 | 83.8 | 90.3 | 89.8 | 93.9 | 83.0 | 88.4 |

Spectral power distribution (SPD) / W/nm – 0-100%



Color Quality Scale by reference color



CQS Q values

| Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 | Q15 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 89.9 | 98.3 | 84.9 | 79.8 | 84.3 | 88.3 | 93.7 | 94.1 | 98.5 | 94.0 | 89.6 | 88.1 | 88.6 | 89.1 | 89.7 |