

Light Measurement Report

Print date: 27-11-2024

Measurement date and time: 27-11-2024 12:52:17 – Measurement no. VFR-241127-2210-MS

Measurement tracking No. and Link: [VT241127-001707](#)

Operator:



Laboratory and Equipment

Laboratory Owner and Location
Goniospectrometer System and Type
Sensor Name, Calibr. Date and Serial No.
Spectrometer Manufacturer and Model

Viso Systems, Copenhagen V, Denmark
LabSpion – Type C, horizontal
LabSensor Model2 – 11-1-2024 – 3130191315
Ibsen Photonics, Denmark – Freedom VIS (Custom Viso)

Measurement Conditions

Number of C-planes and Resolution
 γ (gamma)-Resolution
Test Distance
Input Power, Power and Displ. Factors
Input RMS Voltage and Current
Frequency of Input Power
Warm-up Time and Variation

12 planes – 30°
5°
1,99 m
1,5 W – PF 0,79 – DPF 0,99
230 V – 0,008 A
50 Hz
Lamp stabilized in 15 min 3 sec – 2,0%

Tested Light Source

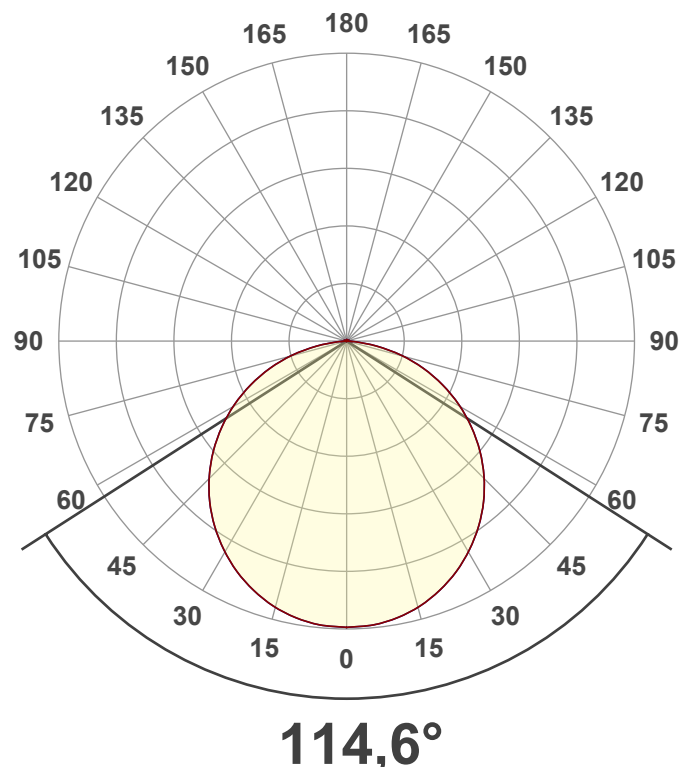
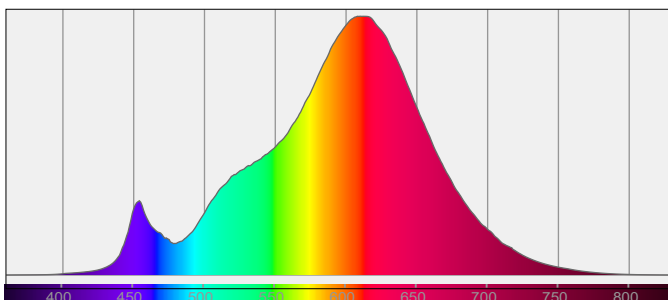
Product Name
Item No. and Manufacturer
Product Description (line 1)

271494-2700K
271494-2700K – Dutchfulfillment
LED MINI INBOUWSPOT PHOBOS 1.5W DIM ZILVER

Main Light Measurement Results

Output – Total Lumen (Up% / Down%)
Efficiency
Peak Intensity and Beam Angle
Correlated Color Temperature, Target/Measured
Color Rendering Index
Color Rendering TM30-18
Color Shift, CIE duv and MacAdam Steps
Flicker

74,5 lm – 0,36% / 99,64%
49 lm/W
25,4 cd – 114,6°
CCT = 2700 K / 2553 K
CRI 84,4
 R_f 86,9 – R_g 94,5
Duv 0,0025 – SDCM 7,8
SVM 0,32 – PstLM 0,1



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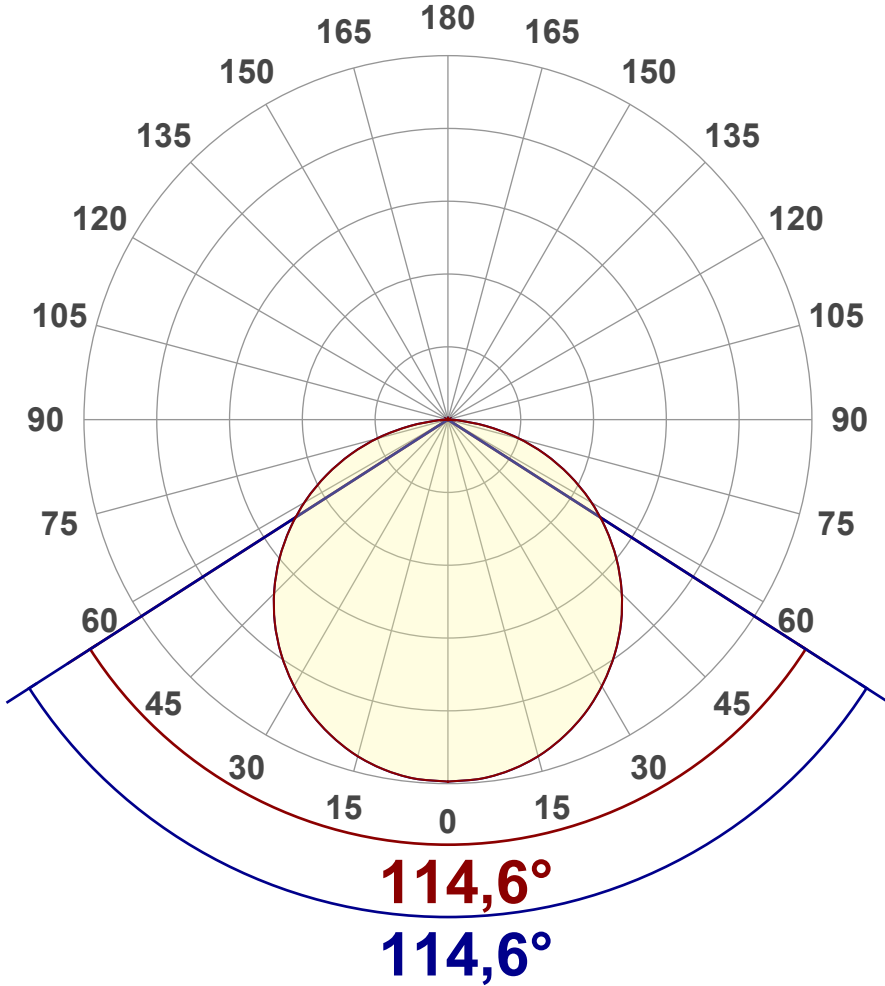
Measurement tracking No. and Link: [VT241127-001707](https://vt241127-001707)

Operator:



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

| | |
|----------------------|----------------|
| Output (total Lumen) | 74,5 lm |
| Lumen Up% / Down% | 0,36% / 99,64% |
| Peak Intensity | 25,4 cd |
| Beam Angle (50%) | 114,6° |
| Beam Angle (90%) | 114,6° |
| Beam Angle (10%) | 114,6° |

Cut-off Angle

| | |
|--------------|--------|
| Average 2,5% | 173,1° |
|--------------|--------|

Field Angle

| | |
|-------------|--------|
| Average 10% | 161,8° |
|-------------|--------|

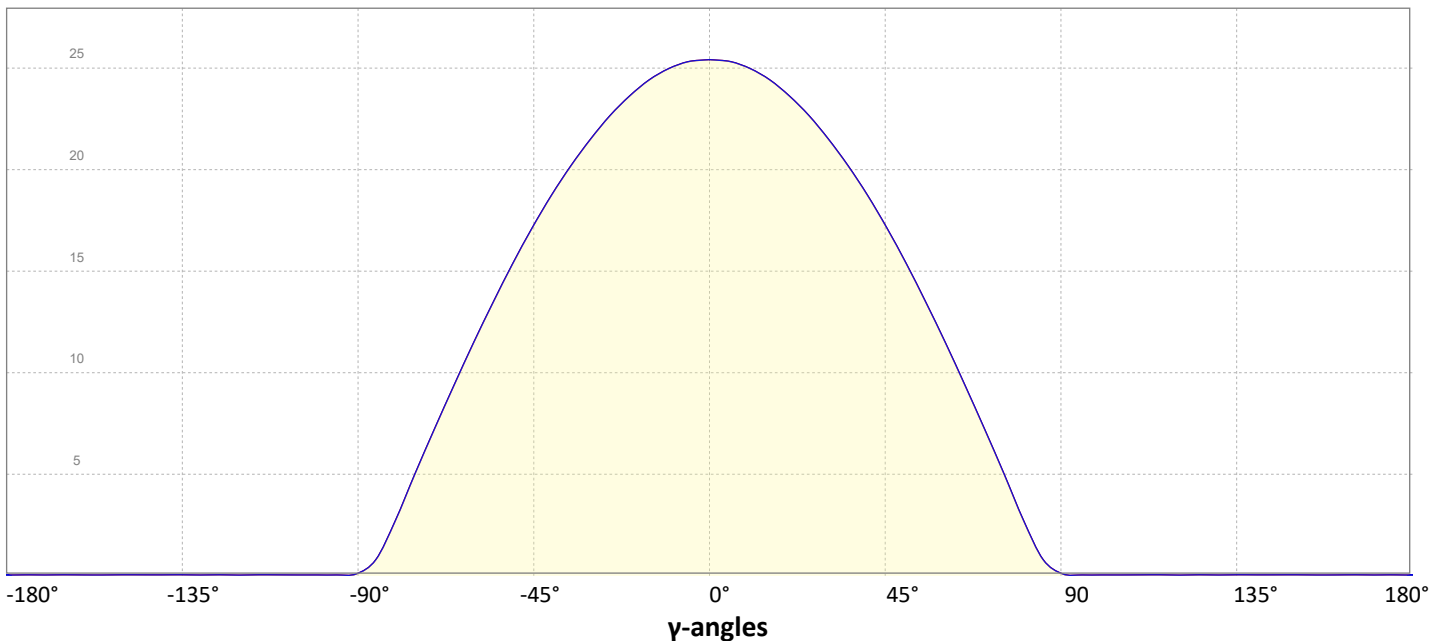
Intensity Ratio

| | |
|--------------|-------|
| In 120° cone | 77,8% |
| In 90° cone | 52,6% |

C000-C180

C090-C270

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



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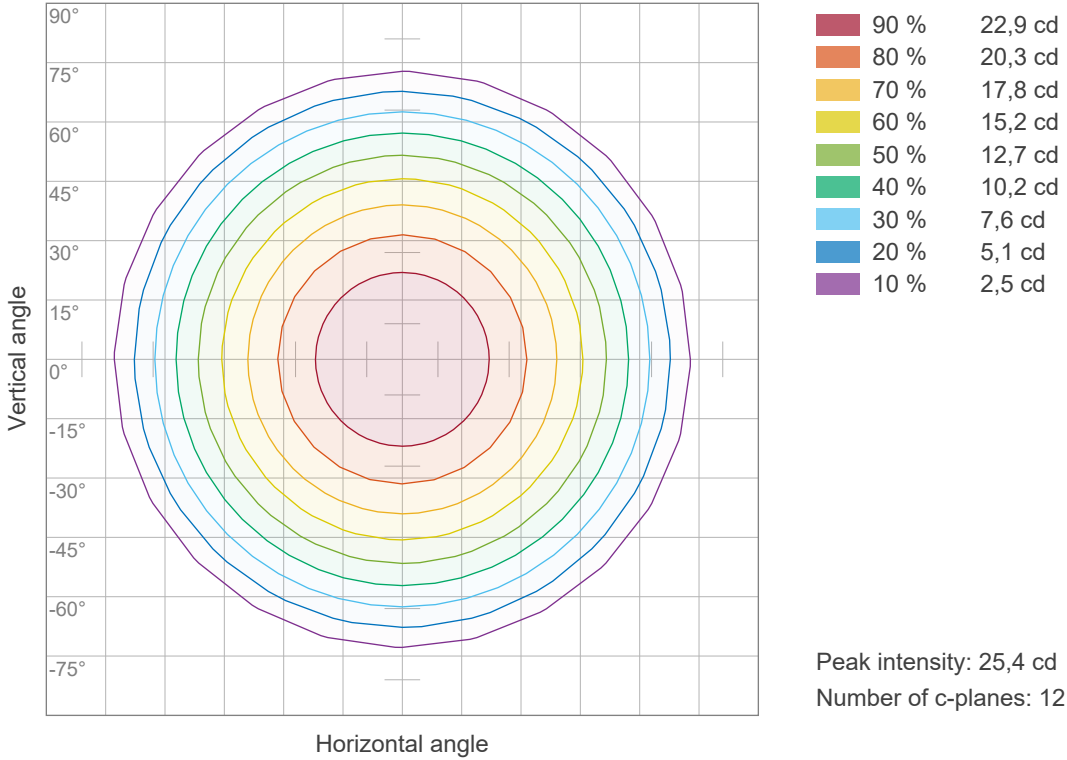
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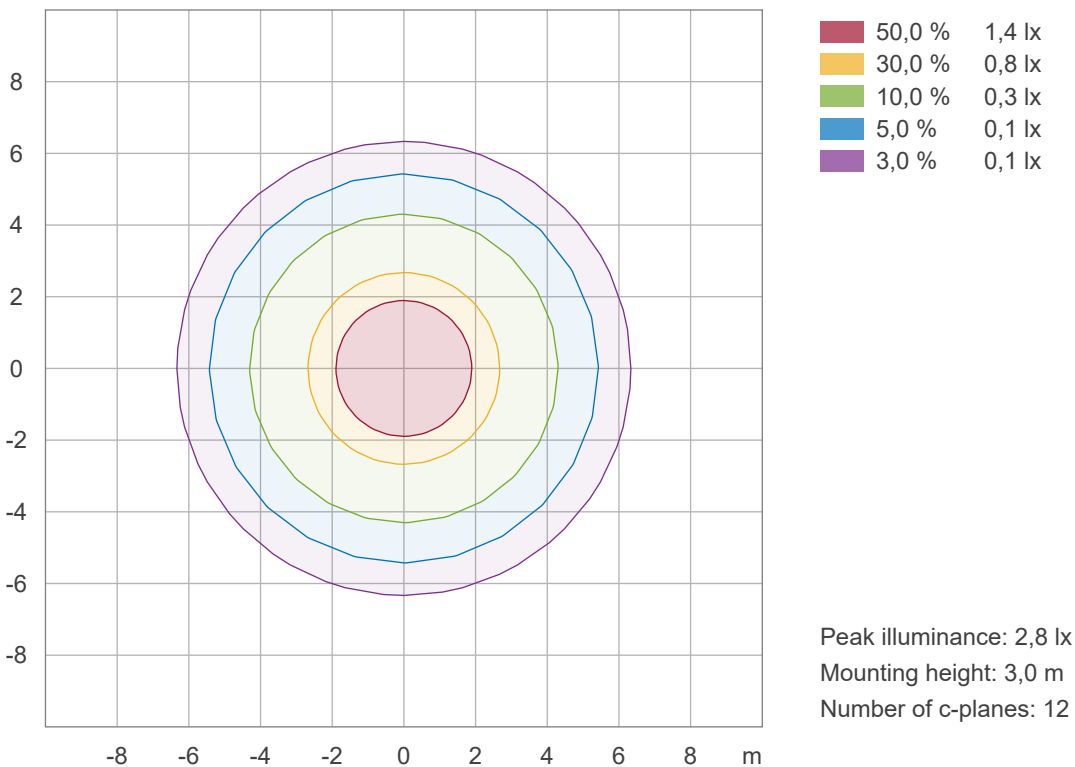
Operator:



Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



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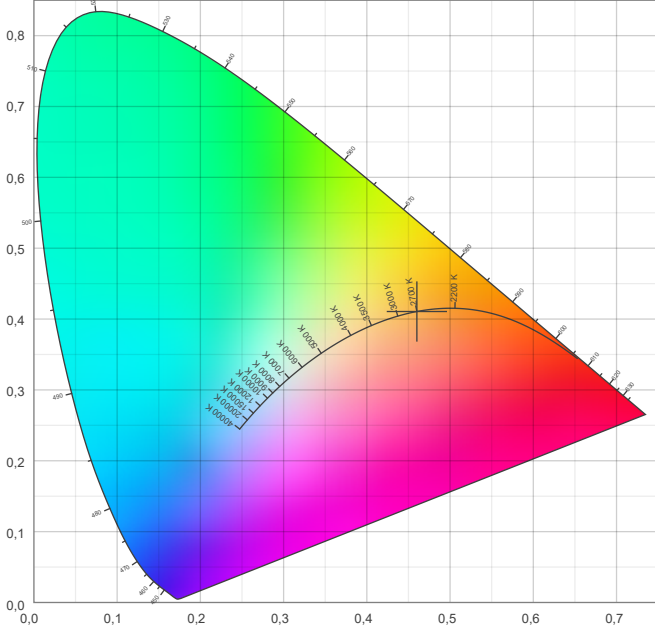


Color details

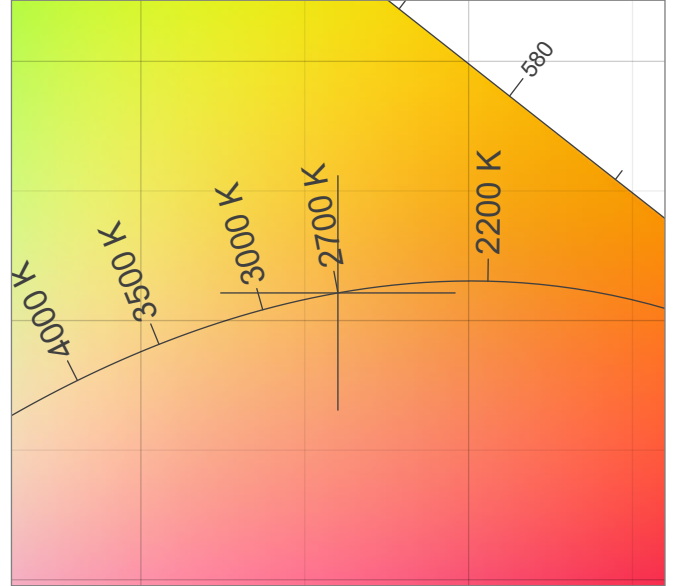
Correlated Color Temperature, Target CCT = 2700 K
 Correlated Color Temperature, Measured CCT = 2553 K
 Color Rendering Index CRI 84,4
 Color Rendering Index, R9 (red component) R9 = 13,5
 Color Rendering TM30-18 R_f 86,9 – R_g 94,5
 Color Quality Scale CQS = 83,7

MacAdam Steps SDCM = 7,8
 Color coordinates CIE 1931 (x;y) = (0,460;0,411)
 Color coordinate CIEs 1960 (u;v) = (0,263;0,352)
 Color deviation from BBL Duv = 0,0025
 Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,263;0,527)

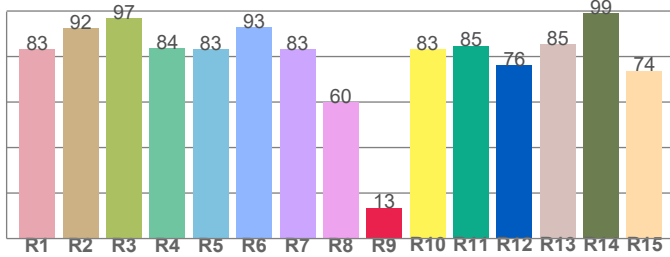
CIE 1931



CIE 1931 – zoomed on Planckian locus



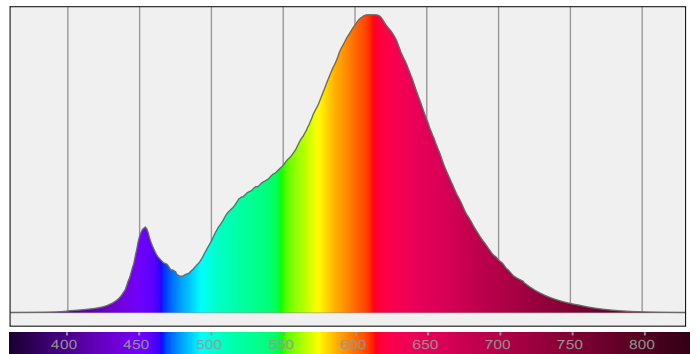
Color Rendering Index per reference color (CIE 1995)



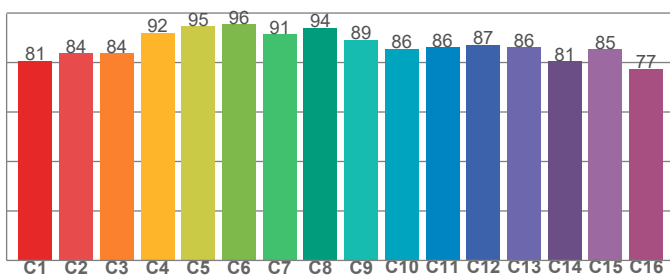
CRI R values, only R1-R8 are used to calculate final CRI value

| R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 | R10 | R11 | R12 | R13 | R14 | R15 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 83,2 | 92,4 | 96,7 | 83,5 | 83,2 | 93,0 | 83,1 | 59,9 | 13,5 | 83,2 | 84,8 | 76,1 | 85,4 | 99,1 | 73,7 |

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



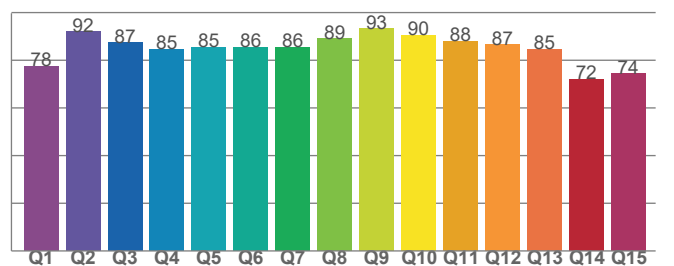
TM30-18 R_f-values per hue bin



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 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 80,7 | 83,7 | 83,9 | 92,1 | 94,8 | 95,5 | 91,3 | 94,1 | 89,2 | 85,6 | 86,3 | 87,1 | 86,2 | 80,5 | 85,4 | 77,5 |

Color Quality Scale by reference color



CQS Q values

| Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 | Q15 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 77,5 | 91,9 | 87,4 | 84,5 | 85,4 | 85,5 | 85,6 | 89,0 | 93,3 | 90,5 | 88,0 | 86,6 | 84,7 | 72,1 | 74,3 |

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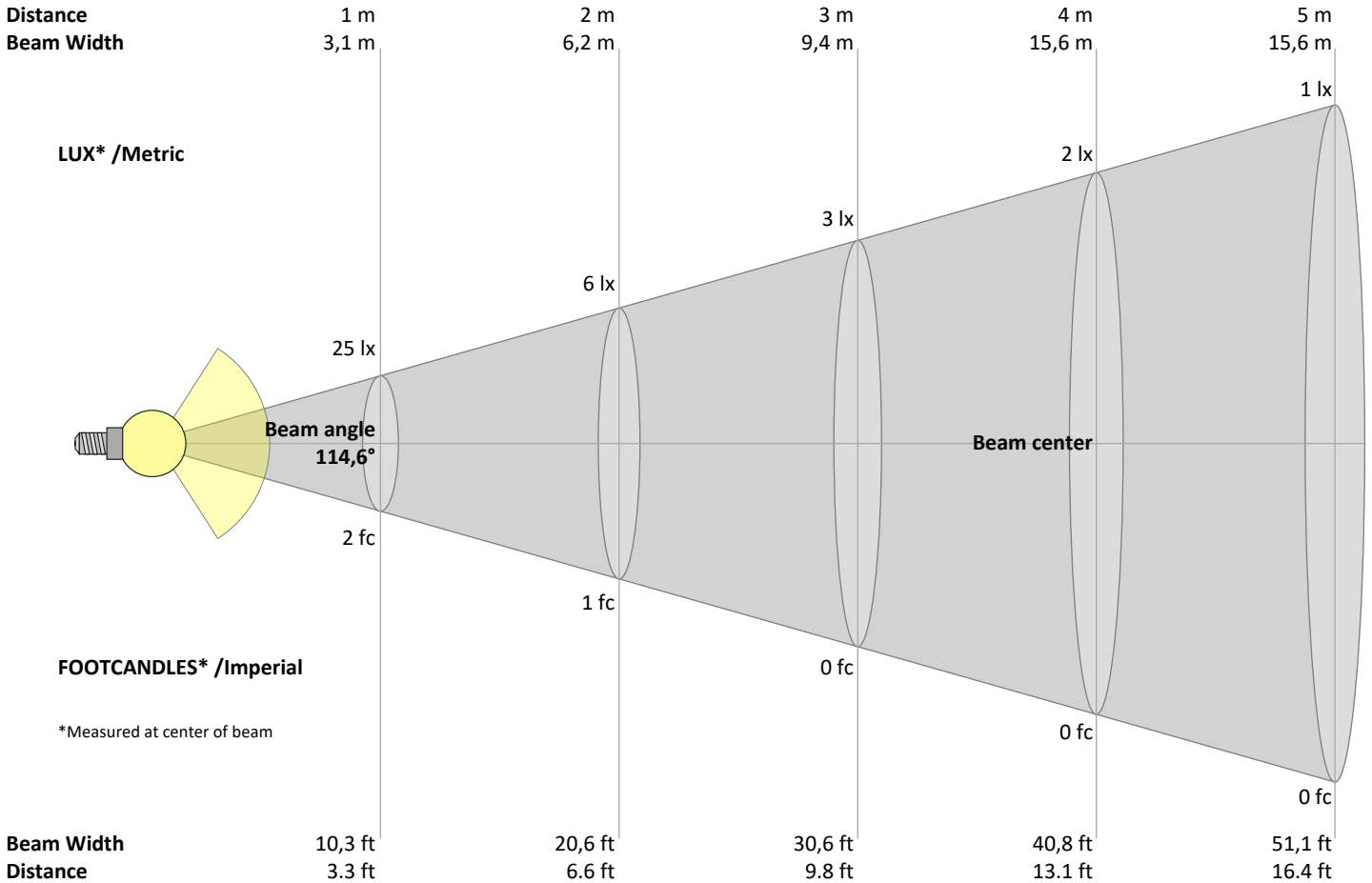
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Operator:



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 |
| 25 | 6 | 3 | 2 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | lux |
| 2,4 | 0,6 | 0,3 | 0,1 | 0,1 | 0,1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | fc |

Intensities in 0° c-plane

| 0° | 5° | 10° | 15° | 20° | 25° | 30° | 35° | 40° | 45° | 50° | 55° | 60° | 65° | 70° | 75° | 80° | 85° | 90° | 95° | γ |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|----------|
| 25,4 | 25,3 | 25,0 | 24,5 | 23,7 | 22,8 | 21,6 | 20,3 | 18,9 | 17,3 | 15,5 | 13,6 | 11,6 | 9,6 | 7,4 | 5,2 | 2,9 | 1,0 | 0,2 | 0,0 | cd |
| 100% | 100% | 98% | 96% | 93% | 90% | 85% | 80% | 74% | 68% | 61% | 54% | 46% | 38% | 29% | 20% | 11% | 4% | 1% | 0% | of 0°val |

Intensities in 90° c-plane

| 0° | 5° | 10° | 15° | 20° | 25° | 30° | 35° | 40° | 45° | 50° | 55° | 60° | 65° | 70° | 75° | 80° | 85° | 90° | 95° | γ |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|----------|
| 25,4 | 25,3 | 25,0 | 24,5 | 23,7 | 22,8 | 21,6 | 20,3 | 18,9 | 17,3 | 15,5 | 13,6 | 11,6 | 9,6 | 7,4 | 5,2 | 2,9 | 1,0 | 0,2 | 0,0 | cd |
| 100% | 100% | 98% | 96% | 93% | 90% | 85% | 80% | 74% | 68% | 61% | 54% | 46% | 38% | 29% | 20% | 11% | 4% | 1% | 0% | of 0°val |

Intensities in 180° c-plane

| 0° | 5° | 10° | 15° | 20° | 25° | 30° | 35° | 40° | 45° | 50° | 55° | 60° | 65° | 70° | 75° | 80° | 85° | 90° | 95° | γ |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|----------|
| 25,4 | 25,3 | 25,0 | 24,5 | 23,7 | 22,8 | 21,6 | 20,3 | 18,9 | 17,3 | 15,5 | 13,6 | 11,6 | 9,6 | 7,4 | 5,2 | 2,9 | 1,0 | 0,2 | 0,0 | cd |
| 100% | 100% | 98% | 96% | 93% | 90% | 85% | 80% | 74% | 68% | 61% | 54% | 46% | 38% | 29% | 20% | 11% | 4% | 1% | 0% | of 0°val |

Intensities in 270° c-plane

| 0° | 5° | 10° | 15° | 20° | 25° | 30° | 35° | 40° | 45° | 50° | 55° | 60° | 65° | 70° | 75° | 80° | 85° | 90° | 95° | γ |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|----------|
| 25,4 | 25,3 | 25,0 | 24,5 | 23,7 | 22,8 | 21,6 | 20,3 | 18,9 | 17,3 | 15,5 | 13,6 | 11,6 | 9,6 | 7,4 | 5,2 | 2,9 | 1,0 | 0,2 | 0,0 | cd |
| 100% | 100% | 98% | 96% | 93% | 90% | 85% | 80% | 74% | 68% | 61% | 54% | 46% | 38% | 29% | 20% | 11% | 4% | 1% | 0% | of 0°val |

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Operator:



Light Planning – UGR table

Uncorrected, comprehensive UGR table according to 117-1995

| Reflectances | | 70 | 70 | 50 | 50 | 30 | 70 | 70 | 50 | 50 | 30 |
|-------------------------------------|-----------|--|------|------|------|------|--|------|------|------|------|
| | ρ Ceiling | 70 | 70 | 50 | 50 | 30 | 70 | 70 | 50 | 50 | 30 |
| | ρ Walls | 50 | 30 | 50 | 30 | 30 | 50 | 30 | 50 | 30 | 30 |
| | ρ 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 | 25,4 | 26,7 | 25,7 | 27,0 | 27,2 | 25,4 | 26,7 | 25,7 | 27,0 | 27,2 |
| | 3H | 26,6 | 27,9 | 27,0 | 28,1 | 28,4 | 26,6 | 27,9 | 27,0 | 28,1 | 28,4 |
| | 4H | 27,0 | 28,2 | 27,4 | 28,5 | 28,8 | 27,0 | 28,2 | 27,4 | 28,5 | 28,8 |
| | 6H | 27,3 | 28,4 | 27,6 | 28,7 | 29,0 | 27,3 | 28,4 | 27,6 | 28,7 | 29,0 |
| | 8H | 27,3 | 28,4 | 27,7 | 28,7 | 29,1 | 27,3 | 28,4 | 27,7 | 28,7 | 29,1 |
| | 12H | 27,3 | 28,3 | 27,7 | 28,7 | 29,1 | 27,3 | 28,3 | 27,7 | 28,7 | 29,1 |
| 4H | 2H | 25,9 | 27,1 | 26,3 | 27,4 | 27,7 | 25,9 | 27,1 | 26,3 | 27,4 | 27,7 |
| | 3H | 27,4 | 28,4 | 27,8 | 28,7 | 29,2 | 27,4 | 28,4 | 27,8 | 28,7 | 29,2 |
| | 4H | 27,8 | 28,8 | 28,3 | 29,2 | 29,7 | 27,8 | 28,8 | 28,3 | 29,2 | 29,7 |
| | 6H | 28,1 | 29,0 | 28,6 | 29,4 | 29,8 | 28,1 | 29,0 | 28,6 | 29,4 | 29,8 |
| | 8H | 28,2 | 29,0 | 28,7 | 29,4 | 29,8 | 28,2 | 29,0 | 28,7 | 29,4 | 29,8 |
| | 12H | 28,2 | 28,9 | 28,7 | 29,3 | 29,8 | 28,2 | 28,9 | 28,7 | 29,3 | 29,8 |
| 8H | 4H | 28,0 | 28,8 | 28,5 | 29,2 | 29,6 | 28,0 | 28,8 | 28,5 | 29,2 | 29,6 |
| | 6H | 28,4 | 29,0 | 28,9 | 29,5 | 30,1 | 28,4 | 29,0 | 28,9 | 29,5 | 30,1 |
| | 8H | 28,5 | 29,1 | 29,1 | 29,6 | 30,3 | 28,5 | 29,1 | 29,1 | 29,6 | 30,3 |
| | 12H | 28,6 | 29,0 | 29,2 | 29,5 | 30,2 | 28,6 | 29,0 | 29,2 | 29,5 | 30,2 |
| 12H | 4H | 28,0 | 28,7 | 28,5 | 29,1 | 29,6 | 28,0 | 28,7 | 28,5 | 29,1 | 29,6 |
| | 6H | 28,5 | 29,0 | 29,0 | 29,5 | 30,2 | 28,5 | 29,0 | 29,0 | 29,5 | 30,2 |
| | 8H | 28,6 | 29,0 | 29,2 | 29,5 | 30,1 | 28,6 | 29,0 | 29,2 | 29,5 | 30,1 |

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

| | | |
|----------|------------|------------|
| S = 1.0H | 0,1 / -0,2 | 0,1 / -0,2 |
| S = 1.5H | 0,3 / -0,4 | 0,3 / -0,4 |
| S = 2.0H | 0,7 / -0,9 | 0,7 / -0,9 |

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 | 106 | 106 | 106 | 102 | 102 | 102 | 100 | 100 |
| 1 | 109 | 104 | 99 | 95 | 106 | 101 | 97 | 94 | 97 | 94 | 91 | 93 | 90 | 88 | 89 | 87 | 85 | 83 |
| 2 | 99 | 90 | 83 | 77 | 96 | 88 | 82 | 76 | 85 | 79 | 75 | 81 | 77 | 73 | 78 | 74 | 71 | 69 |
| 3 | 90 | 79 | 71 | 64 | 87 | 77 | 70 | 63 | 74 | 68 | 62 | 71 | 66 | 61 | 69 | 64 | 60 | 58 |
| 4 | 82 | 70 | 61 | 54 | 80 | 68 | 60 | 54 | 66 | 59 | 53 | 63 | 57 | 52 | 61 | 56 | 51 | 49 |
| 5 | 75 | 62 | 53 | 46 | 73 | 61 | 53 | 46 | 59 | 51 | 46 | 57 | 50 | 45 | 55 | 49 | 45 | 42 |
| 6 | 69 | 56 | 47 | 40 | 68 | 55 | 46 | 40 | 53 | 46 | 40 | 51 | 45 | 39 | 50 | 44 | 39 | 37 |
| 7 | 64 | 51 | 42 | 36 | 63 | 50 | 41 | 36 | 48 | 41 | 35 | 47 | 40 | 35 | 45 | 39 | 35 | 33 |
| 8 | 60 | 46 | 38 | 32 | 58 | 46 | 37 | 32 | 44 | 37 | 31 | 43 | 36 | 31 | 42 | 36 | 31 | 29 |
| 9 | 56 | 42 | 34 | 29 | 55 | 42 | 34 | 28 | 41 | 33 | 28 | 40 | 33 | 28 | 38 | 32 | 28 | 26 |
| 10 | 52 | 39 | 31 | 26 | 51 | 39 | 31 | 26 | 38 | 30 | 26 | 37 | 30 | 25 | 36 | 30 | 25 | 24 |

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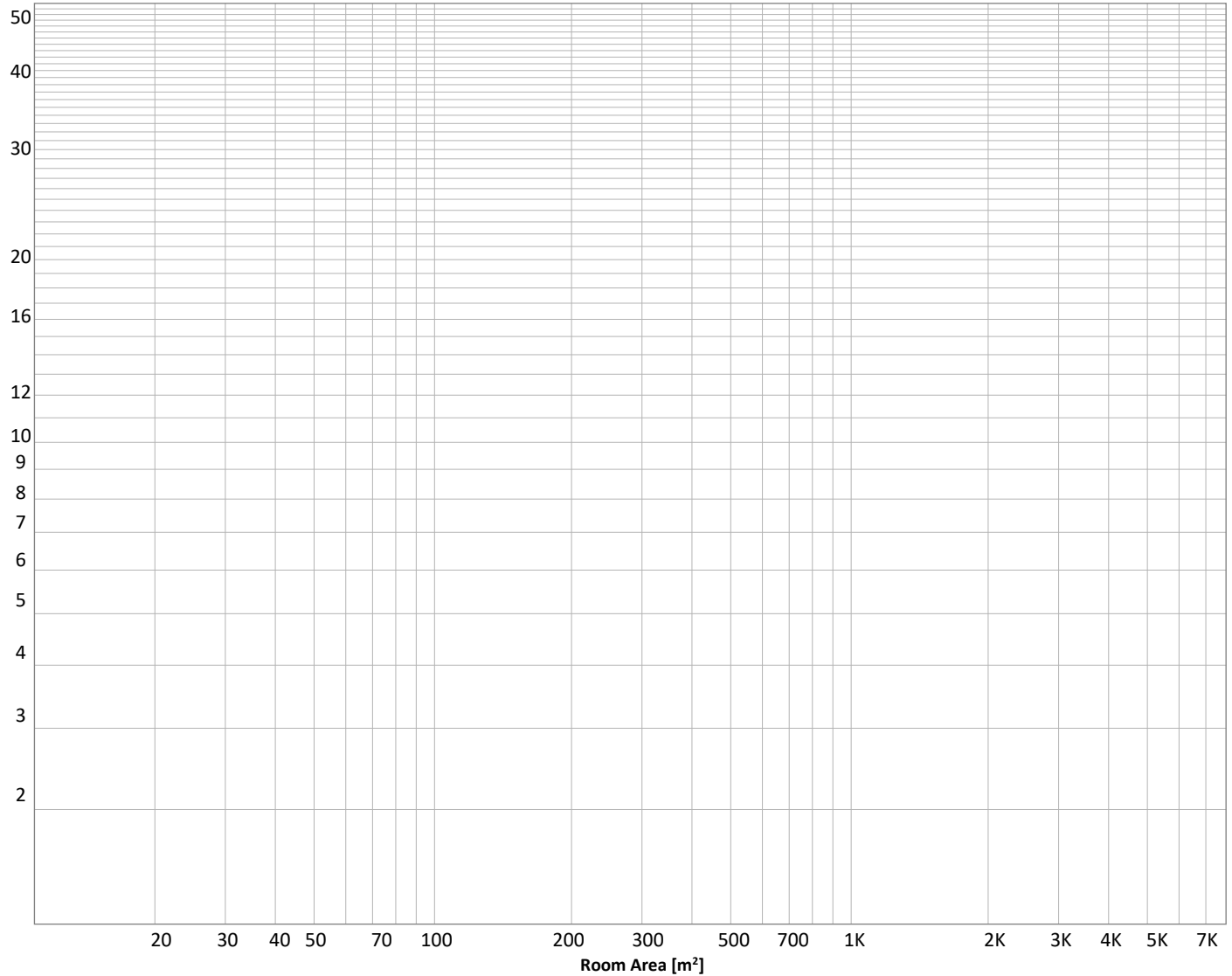
Operator:



Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

| | | | | | |
|---|----------------|------------|---------------------|------------------|-------------------|
| H = Room height | Flux = 74,5 lm | $\rho(\%)$ | | | |
| H _{down} = Lamp distance from ceiling = | 0.00 m | Line type | Ceiling reflectance | Wall reflectance | Floor reflectance |
| H _{work} = Work area height from floor = | 0.00 m | ----- | 70 | 50 | 30 |
| E _{work} = Average lux on work area = | 100 lx | ————— | 50 | 30 | 20 |

Zonal Lumen Summary

| | | | | | | | | |
|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 0°-10° | 10°-20° | 20°-30° | 30°-40° | 40°-50° | 50°-60° | 60°-70° | 70°-80° | 80°-90° |
| 2,41 lm | 6,90 lm | 10,5 lm | 12,7 lm | 13,3 lm | 12,2 lm | 9,44 lm | 5,47 lm | 1,32 lm |
| 90°-100° | 100°-110° | 110°-120° | 120°-130° | 130°-140° | 140°-150° | 150°-160° | 160°-170° | 170°-180° |
| 0,058 lm | 0,041 lm | 0,042 lm | 0,035 lm | 0,033 lm | 0,027 lm | 0,018 lm | 0,012 lm | 0,004 lm |

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Outdoor Light Planning

Lumen per Zone

| Zone (γ) | Lumen | % Total |
|--------------|--------------|---------------|
| 0-10° | 2 lm | 3,2% |
| 10-20° | 7 lm | 9,3% |
| 20-30° | 10 lm | 14,1% |
| 30-40° | 13 lm | 17,1% |
| 40-50° | 13 lm | 17,9% |
| 50-60° | 12 lm | 16,3% |
| 60-70° | 9 lm | 12,7% |
| 70-80° | 5 lm | 7,3% |
| 80-90° | 1 lm | 1,8% |
| 90-100° | 0 lm | 0,1% |
| 100-110° | 0 lm | 0,1% |
| 110-120° | 0 lm | 0,1% |
| 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 | 74 lm | 100,0% |

Intensity peaks

| | |
|----------------|-------|
| Max intensity | 25 cd |
| Intensity, 90° | 0 cd |
| Intensity, 0° | 25 cd |

Zonal Lumen summary

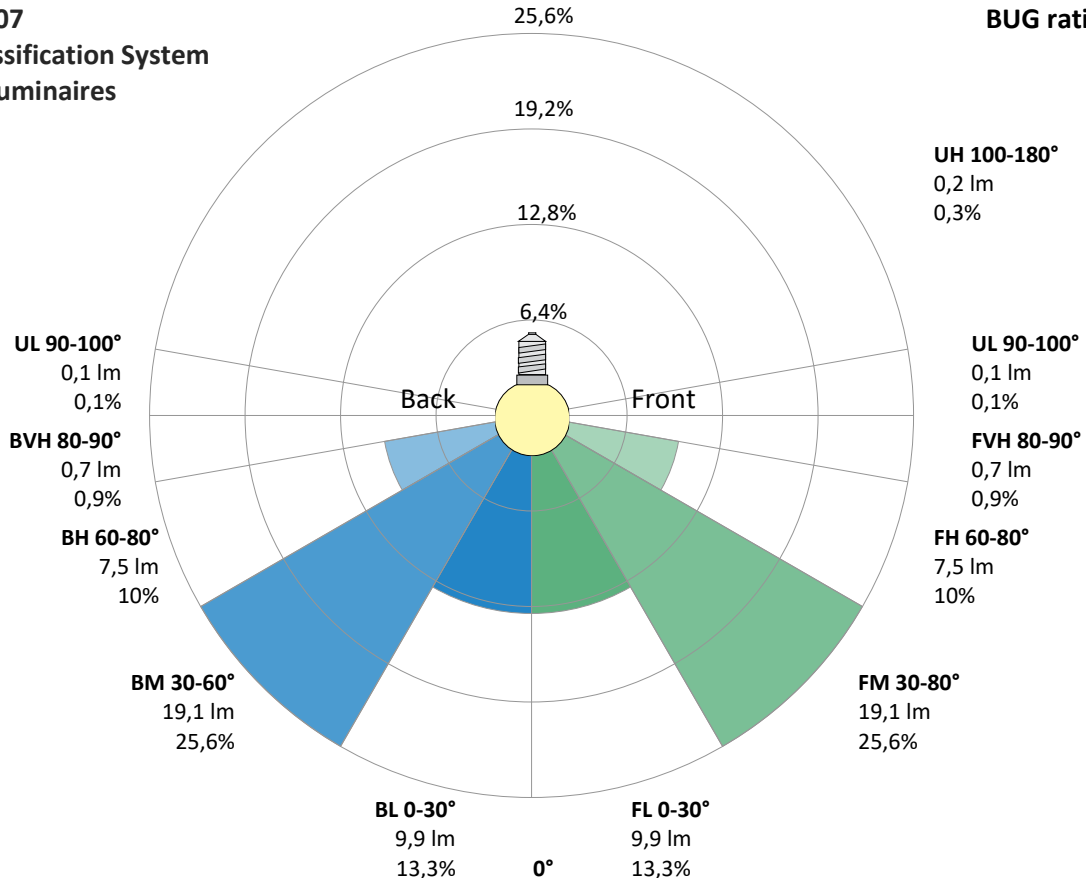
| Zone (γ) | Lumen | % Total |
|----------|-------|---------|
| 0-30° | 20 lm | 26,6% |
| 0-40° | 32 lm | 43,6% |
| 0-60° | 58 lm | 77,8% |
| 60-90° | 16 lm | 21,8% |
| 70-100° | 7 lm | 9,2% |
| 90-120° | 0 lm | 0,2% |
| 0-90° | 74 lm | 99,6% |
| 90-180° | 0 lm | 0,4% |
| 0-180° | 74 lm | 100,0% |

BUG rating

| | Lumen | % Total |
|----------------------|-------|---------|
| Forward light | | |
| Low(0-30°) | 10 lm | 13,3% |
| Medium(30-60°) | 19 lm | 25,6% |
| High(60-80°) | 7 lm | 10,0% |
| Very high(80-90°) | 1 lm | 0,9% |
| Back light | | |
| Low(0-30°) | 10 lm | 13,3% |
| Medium(30-60°) | 19 lm | 25,6% |
| High(60-80°) | 7 lm | 10,0% |
| Very high(80-90°) | 1 lm | 0,9% |
| Uplight | | |
| Low(90-100°) | 0 lm | 0,1% |
| High(100-180°) | 0 lm | 0,3% |

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

BUG rating B0 U0 G0



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Measurement tracking No. and Link: [VT241127-001707](#)

Operator:

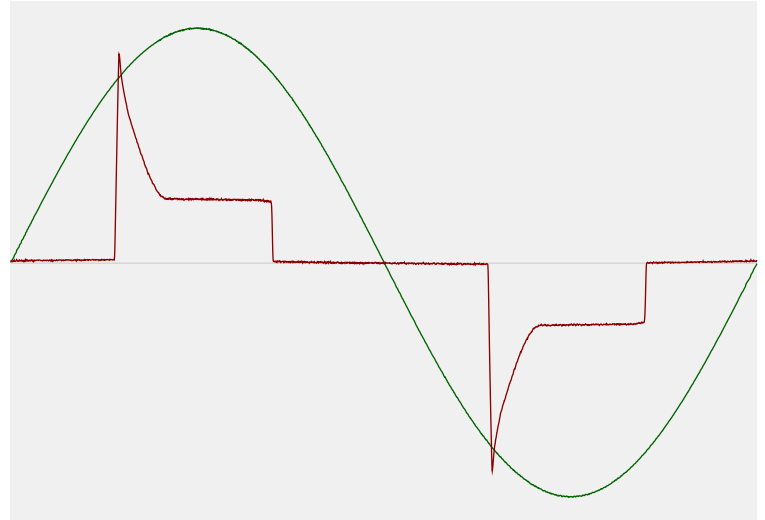


Power Details

Input Power

| | |
|---|---------|
| Power feed to light source | 1,5 W |
| Frequency of input power | 50 Hz |
| RMS Input voltage feed, V_{RMS} | 230 V |
| RMS Input current feed, I_{RMS} | 0,008 A |
| Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$ | 1,94 VA |
| Displacement factor of AC power feed | 0,99 |
| Power factor of AC current feed | 0,79 |
| Total harmonic distortion of the current | 76,48% |
| Total harmonic distortion of the voltage | 0,08% |

Input Power Curve



Efficiency

| | |
|---------------------------|---------|
| Radiated power efficiency | 15,1% |
| Lumen efficiency | 49 lm/W |

Stabilization Details

Warmup Conditions

| | |
|-------------------|--------|
| Stable period | 15 min |
| Stable change max | 2,0% |
| Minimum time | 15 min |

Color Temperature Change

| | |
|-----------|--------|
| CCT start | 2695 K |
| CCT shift | +5 K |
| CCT end | 2700 K |

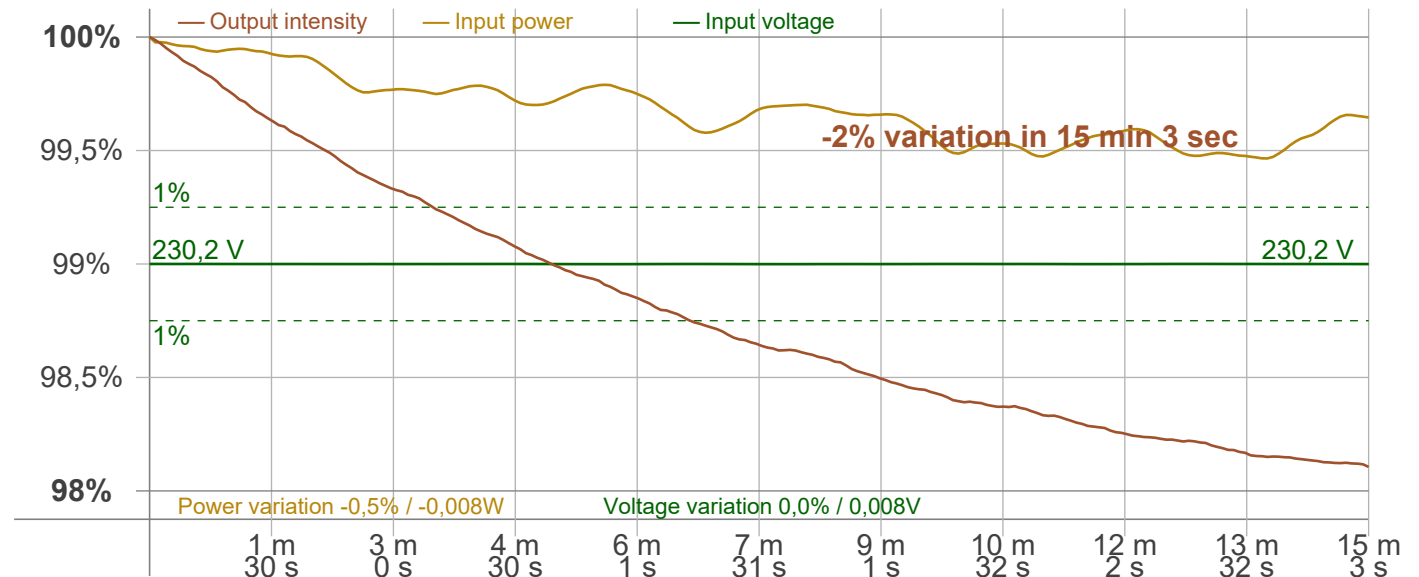
Warmup Result

| | |
|-------------------|---------------------------------|
| Total warmup time | Lamp stabilized in 15 min 3 sec |
| Warmup variation | -2,0% |

Output Change

| | |
|---------------|---------|
| Output start | 75,9 lm |
| Output change | -1,4 lm |
| Output end | 74,5 lm |

Stabilization Curve



Light Measurement Report

Print date: 27-11-2024

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Measurement tracking No. and Link: [VT241127-001707](https://www.viso-systems.com/VT241127-001707)

Operator:



Flicker /TLA details

Flicker Meter Type: Viso Systems LabFlicker
 Frequency of input power: 50 Hz
 Flicker/TLA sample rate: 20000 samples/s

Measurement time
 PstLM: 180 sec
 All other indices: 1,2 sec

Flicker indices according to Illuminating Engineering Society (IES)

Flicker frequency: 100 Hz
 Percent Flicker: 17,15 %
 Flicker index: 0,03

Flicker indices according to California Energy Commission (CEC) 2016b

JA8/10 40 Hz: 0,08 %
 JA8/10 90 Hz: 0,12 %
 JA8/10 200 Hz: 8,45 %
 JA8/10 400 Hz: 13,25 %
 JA8/10 1000 Hz: 16,55 %

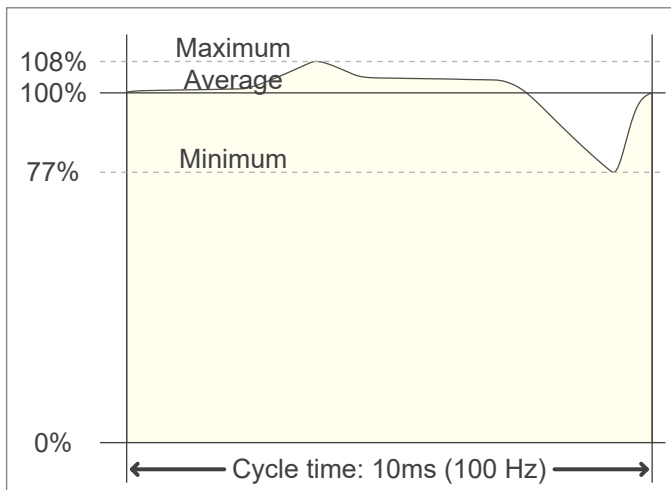
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

PstLM value (F < 80 Hz): 0,1
 SVM value (80 < F < 2000 Hz): 0,32

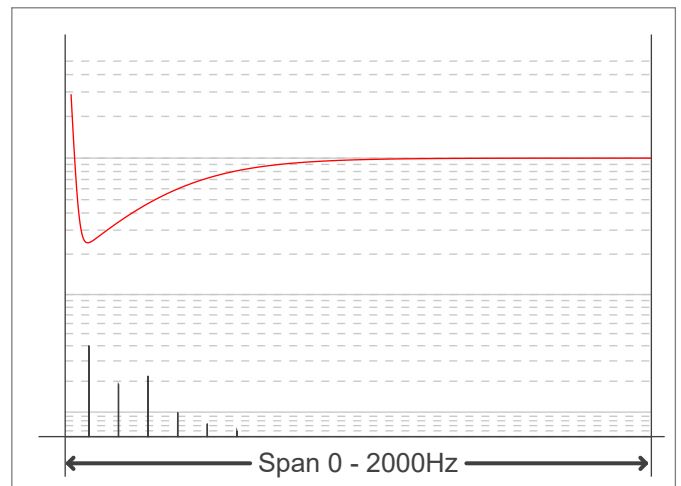
Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp: 0,05

Flicker frame (frame of one flicker period in time domain)



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot

