

Goniophotometry Report

1_PHOT_REFLEKTER-XL-4300lmChip-3000K-38Deg_2303
www.factorylux.com



Tested Light Source - 1_PHOT_REFLEKTER-XL-4300lmChip-3000K-38Deg_2303

Laboratory and Equipment

Laboratory Owner and Location
Goniospectrometer System and Type
Spectrometer Manufacturer and Model

Factorylux, Greenhill Mills, Hebden Bridge, HX7 5QF, UK
BaseSpion – Type C, horizontal
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

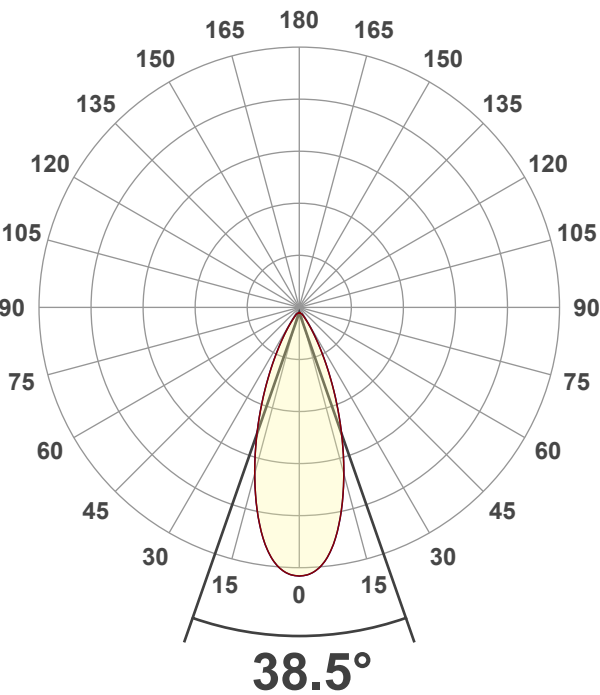
32 planes – 11.25°
1.5°
4.50 m
41.5 W – PF 0.97 – DPF 0.97
241 V – 0.178 A
50 Hz

Main Light Measurement Results

Output
Efficiency
Peak Intensity and Beam Angle
Color Rendering Index

3577 lm
86 lm/W
6814 cd – 38.5°
CRI 92.6

Light Intensity Distribution



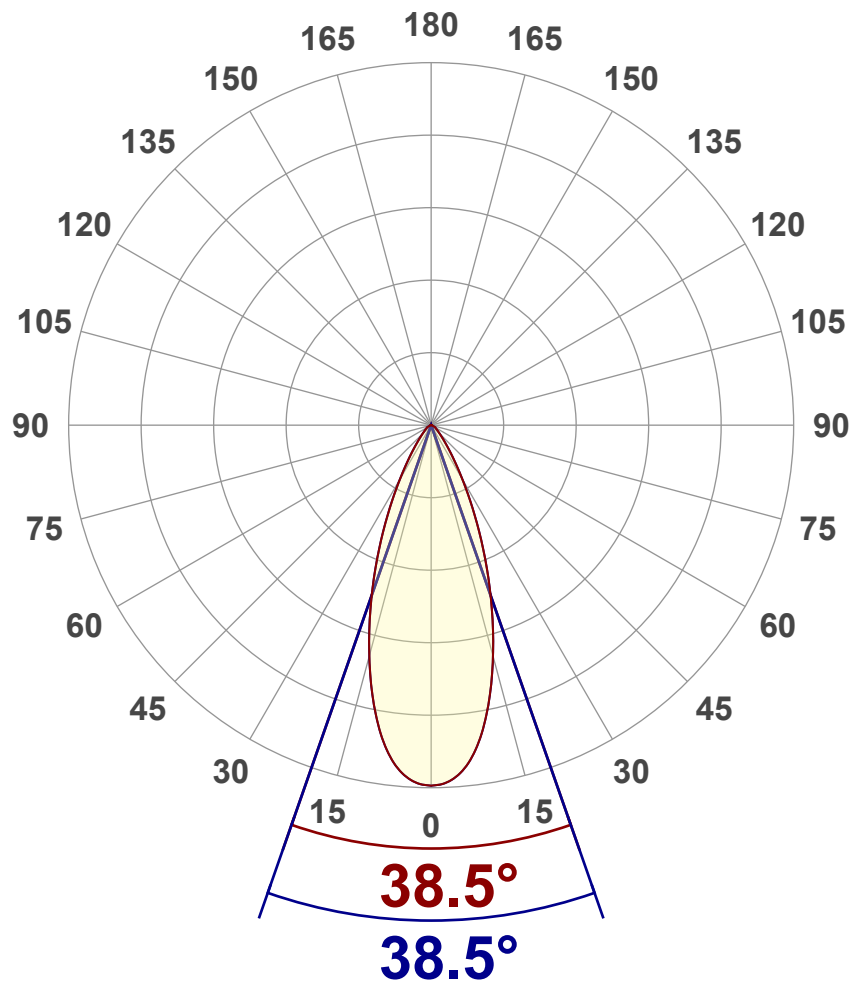
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	3577 lm
Peak Intensity	6814 cd
Beam Angle (50%)	38.5°
Beam Angle (90%)	38.5°
Beam Angle (10%)	38.5°

Cut-off Angle

Average 2,5%	97.3°
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Field Angle

Average 10%	69.2°
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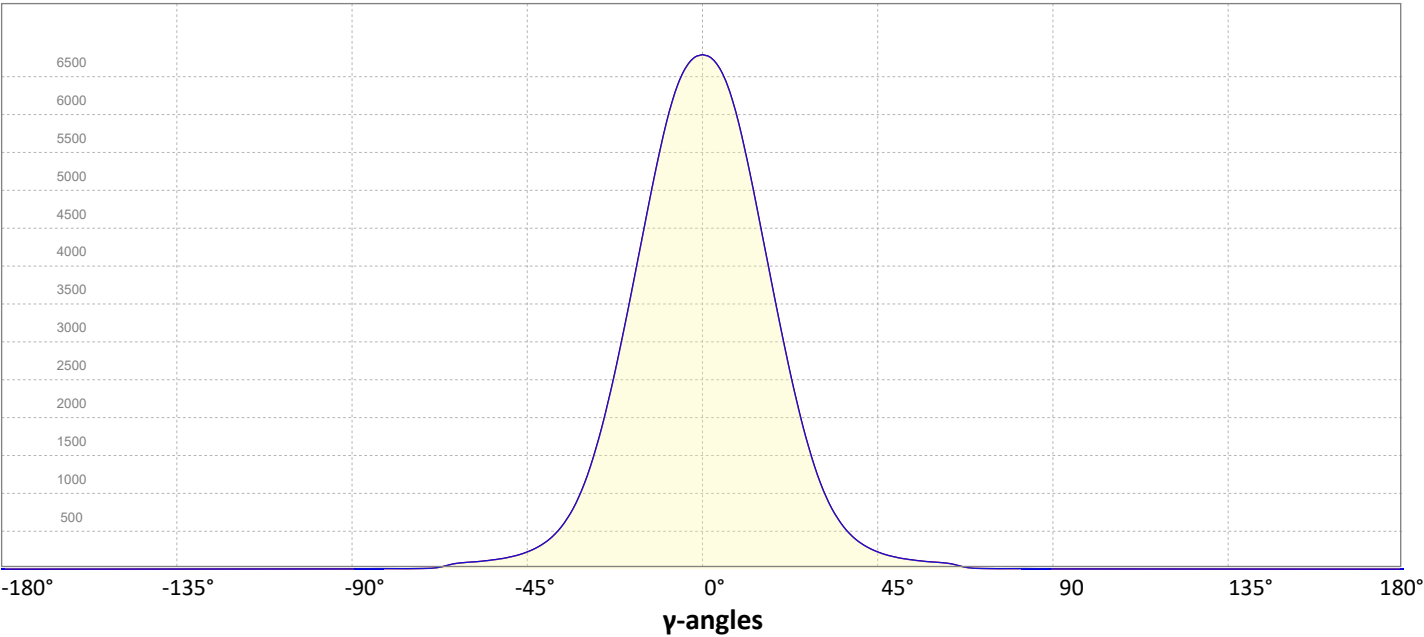
Intensity Ratio

In 120° cone	97.8%
In 90° cone	92.7%

C000-C180

C090-C270

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

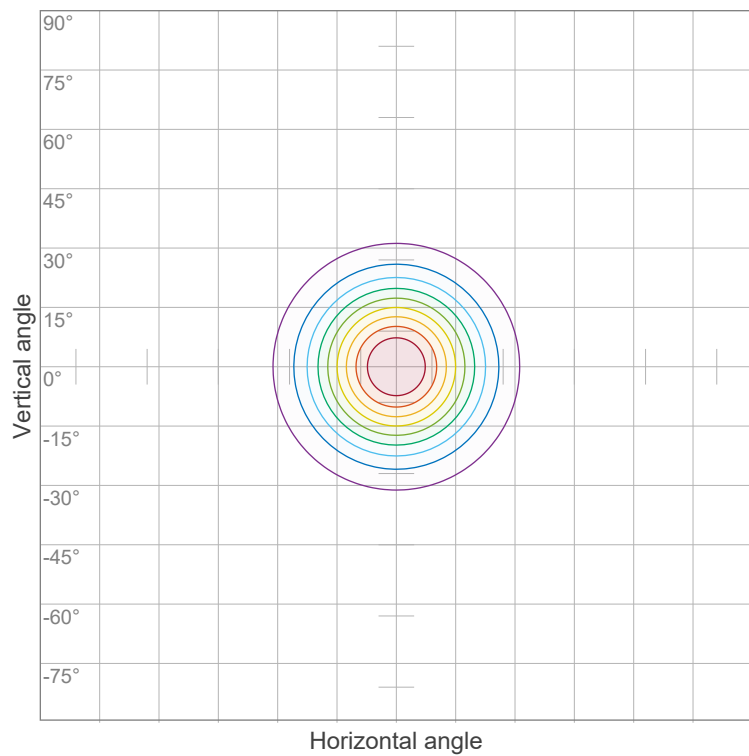


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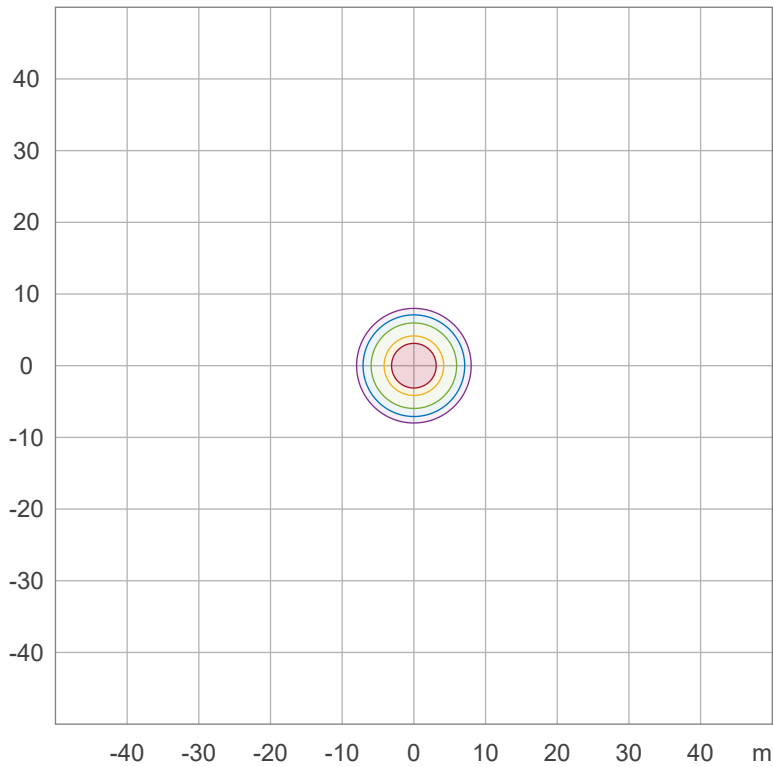
Iso-intensity Diagram (Iso-candela)



90 %	6133.0 cd
80 %	5451.6 cd
70 %	4770.1 cd
60 %	4088.7 cd
50 %	3407.2 cd
40 %	2725.8 cd
30 %	2044.3 cd
20 %	1362.9 cd
10 %	681.4 cd

Peak intensity: 6814.5 cd
Number of c-planes: 32

Iso-illuminance Diagram (Iso-lux)



50.0 %	34.1 lx
30.0 %	20.4 lx
10.0 %	6.8 lx
5.0 %	3.4 lx
3.0 %	2.0 lx

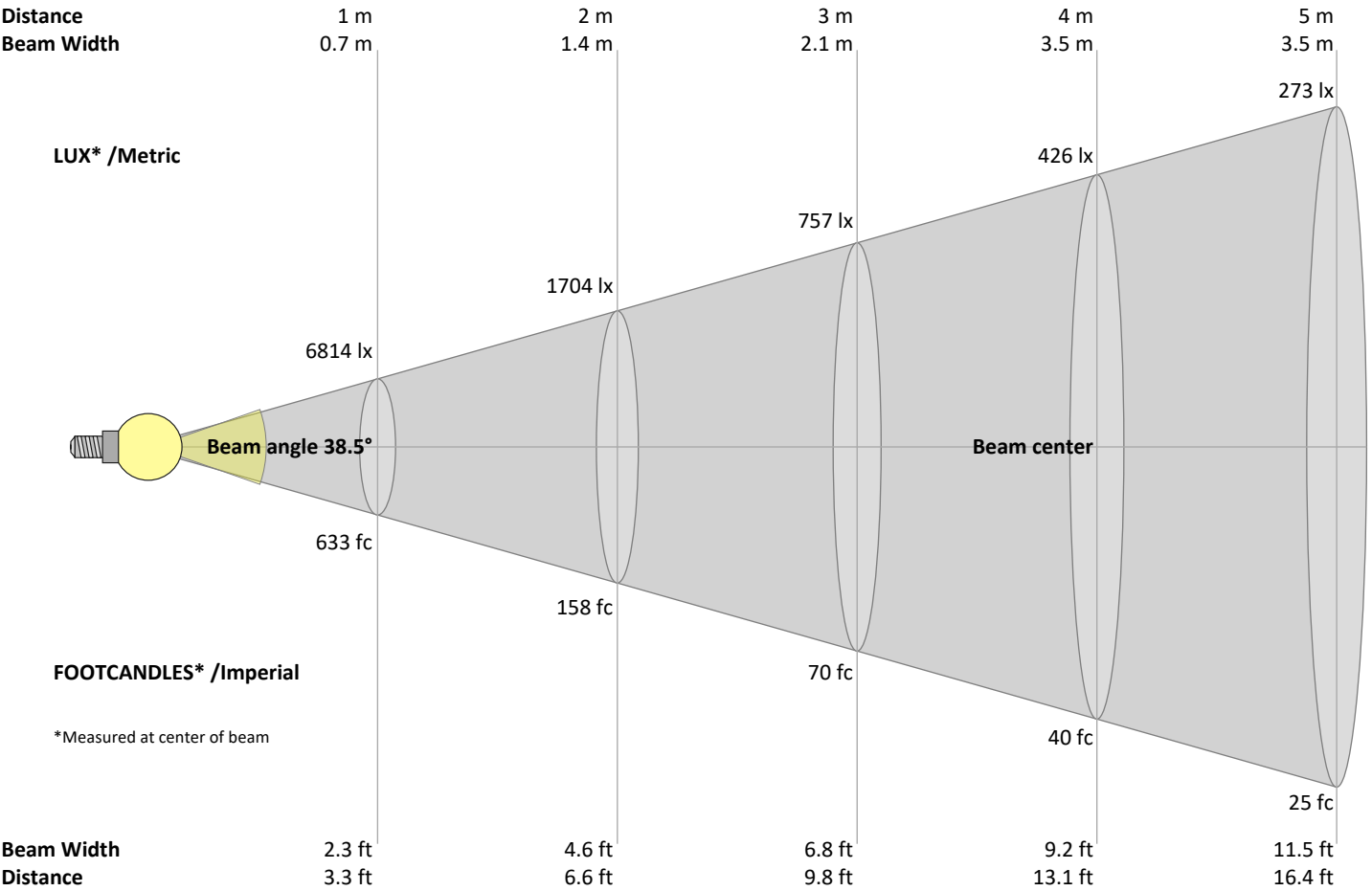
Peak illuminance: 68.1 lx
Mounting height: 10.0 m
Number of c-planes: 32

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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
6814	1704	757	426	273	189	139	106	84	68	56	47	40	35	30	27	24	21	19	17	lux
633.1	158.3	70.3	39.6	25.3	17.6	12.9	9.9	7.8	6.3	5.2	4.4	3.7	3.2	2.8	2.5	2.2	2	1.8	1.6	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
6814	6781	6664	6462	6156	5755	5289	4782	4256	3731	3218	2728	2270	1853	1493	1182	932	735	579	460	cd
100%	100%	98%	95%	90%	84%	78%	70%	62%	55%	47%	40%	33%	27%	22%	17%	14%	11%	8%	7%	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
6814	6781	6664	6462	6156	5755	5289	4782	4256	3731	3218	2728	2270	1853	1493	1182	932	735	579	460	cd
100%	100%	98%	95%	90%	84%	78%	70%	62%	55%	47%	40%	33%	27%	22%	17%	14%	11%	8%	7%	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
6814	6781	6664	6462	6156	5755	5289	4782	4256	3731	3218	2728	2270	1853	1493	1182	932	735	579	460	cd
100%	100%	98%	95%	90%	84%	78%	70%	62%	55%	47%	40%	33%	27%	22%	17%	14%	11%	8%	7%	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
6814	6781	6664	6462	6156	5755	5289	4782	4256	3731	3218	2728	2270	1853	1493	1182	932	735	579	460	cd
100%	100%	98%	95%	90%	84%	78%	70%	62%	55%	47%	40%	33%	27%	22%	17%	14%	11%	8%	7%	of 0°val

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Light Planning – UGR table

Uncorrected, comprehensive UGR table according to 117-1995

Reflectances											
	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											
H = mounting height above eye level											
X	Y	Viewed Crosswise					Viewed Endwise				
		(Viewing direction orthogonal to lamp length axis)					(Viewing direction parallel to lamp length axis)				
2H	2H	22.1	22.7	22.2	22.9	23.1	22.1	22.7	22.2	22.9	23.1
	3H	22.0	22.7	22.4	22.9	23.1	22.0	22.7	22.4	22.9	23.1
	4H	21.9	22.6	22.3	22.9	23.1	21.9	22.6	22.3	22.9	23.1
	6H	22.0	22.5	22.3	22.8	23.2	22.0	22.5	22.3	22.8	23.2
	8H	21.9	22.5	22.2	22.8	23.2	21.9	22.5	22.2	22.8	23.2
	12H	21.9	22.4	22.2	22.8	23.2	21.9	22.4	22.2	22.8	23.2
4H	2H	22.0	22.7	22.4	23.0	23.2	22.0	22.7	22.4	23.0	23.2
	3H	22.1	22.7	22.5	23.0	23.4	22.1	22.7	22.5	23.0	23.4
	4H	22.0	22.5	22.4	22.9	23.4	22.0	22.5	22.4	22.9	23.4
	6H	22.0	22.5	22.4	22.8	23.2	22.0	22.5	22.4	22.8	23.2
	8H	21.9	22.4	22.4	22.8	23.1	21.9	22.4	22.4	22.8	23.1
	12H	21.9	22.3	22.4	22.7	23.1	21.9	22.3	22.4	22.7	23.1
8H	4H	21.9	22.4	22.4	22.7	23.1	21.9	22.4	22.4	22.7	23.1
	6H	21.9	22.2	22.4	22.7	23.2	21.9	22.2	22.4	22.7	23.2
	8H	21.9	22.2	22.4	22.7	23.3	21.9	22.2	22.4	22.7	23.3
	12H	21.9	22.1	22.5	22.6	23.2	21.9	22.1	22.5	22.6	23.2
12H	4H	21.8	22.2	22.3	22.6	23.1	21.8	22.2	22.3	22.6	23.1
	6H	21.9	22.1	22.4	22.7	23.3	21.9	22.1	22.4	22.7	23.3
	8H	21.8	22.1	22.4	22.6	23.2	21.8	22.1	22.4	22.6	23.2

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

S = 1.0H	2.9 / -2.4	2.9 / -2.4
S = 1.5H	5.1 / -2.9	5.1 / -2.9
S = 2.0H	6.7 / -7.3	6.7 / -7.3

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	111	108	106	111	109	107	105	105	103	101	101	99	98	97	96	95	94
2	108	104	100	96	106	102	98	95	99	96	93	96	93	91	93	91	89	88
3	103	97	92	89	101	96	91	88	93	89	86	91	88	85	88	86	84	82
4	98	91	86	82	97	90	85	82	88	84	81	86	82	80	84	81	79	77
5	94	86	81	77	92	85	80	76	83	79	76	82	78	75	80	77	74	73
6	90	81	76	72	88	81	75	72	79	75	71	78	74	71	76	73	70	69
7	86	77	72	68	85	77	71	68	75	71	67	74	70	67	73	69	66	65
8	82	74	68	64	81	73	68	64	72	67	64	71	67	63	70	66	63	62
9	79	70	65	61	78	70	64	61	69	64	61	68	64	60	67	63	60	59
10	76	67	62	58	75	67	61	58	66	61	58	65	61	58	64	60	57	56

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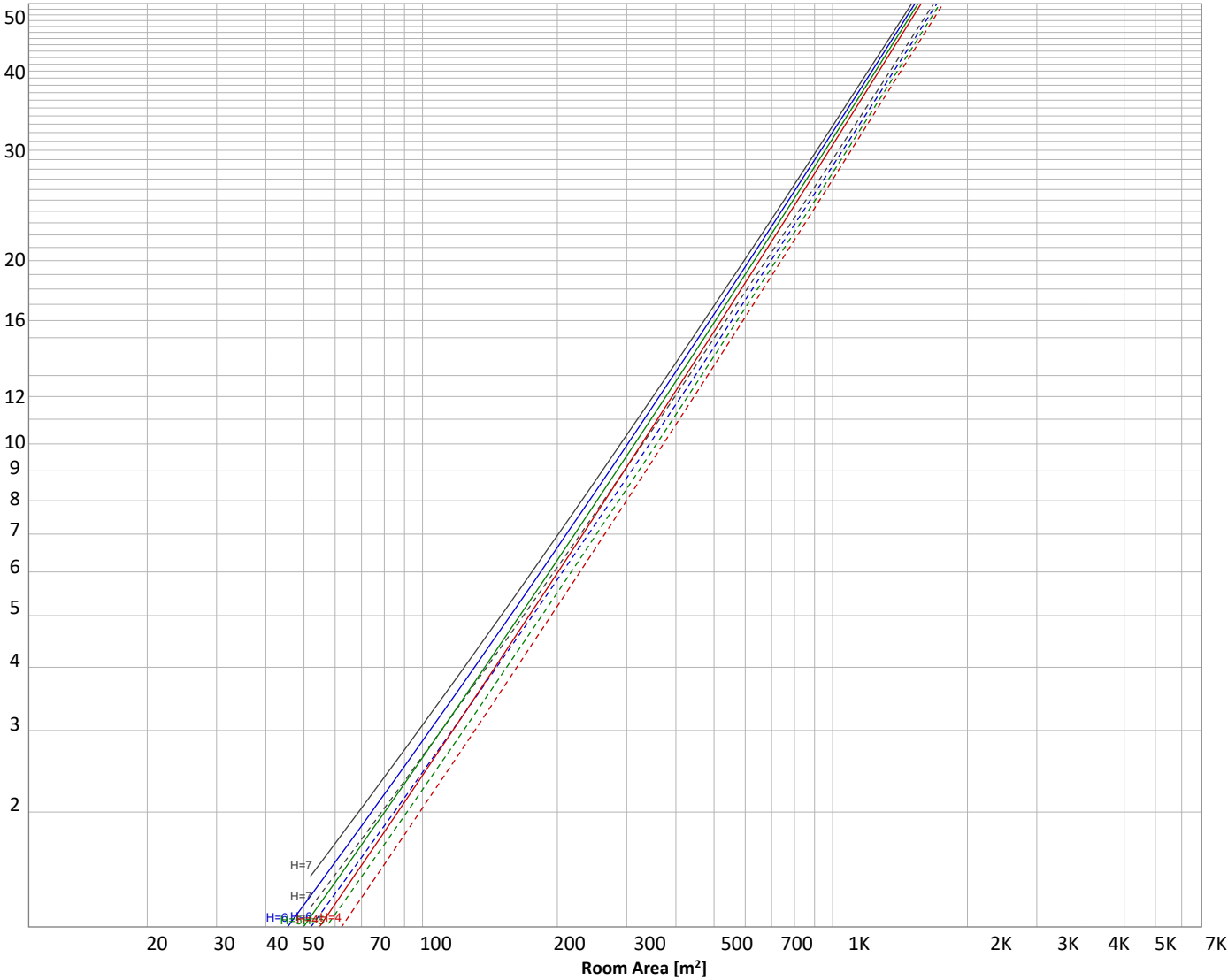
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 3577 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°
603 lm	1238 lm	944 lm	425 lm	182 lm	105 lm	52.3 lm	8.56 lm	6.48 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
3.14 lm	3.04 lm	2.85 lm	2.58 lm	1.02 lm	0.000 lm	0.000 lm	0.000 lm	0.000 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	603 lm	16.8%
10-20°	1238 lm	34.6%
20-30°	944 lm	26.4%
30-40°	425 lm	11.9%
40-50°	182 lm	5.1%
50-60°	105 lm	2.9%
60-70°	52 lm	1.5%
70-80°	9 lm	0.2%
80-90°	6 lm	0.2%
90-100°	3 lm	0.1%
100-110°	3 lm	0.1%
110-120°	3 lm	0.1%
120-130°	3 lm	0.1%
130-140°	1 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	3577 lm	100.0%

Intensity peaks

Max intensity	6814 cd
Intensity, 90°	3 cd
Intensity, 0°	6814 cd

Zonal Lumen summary

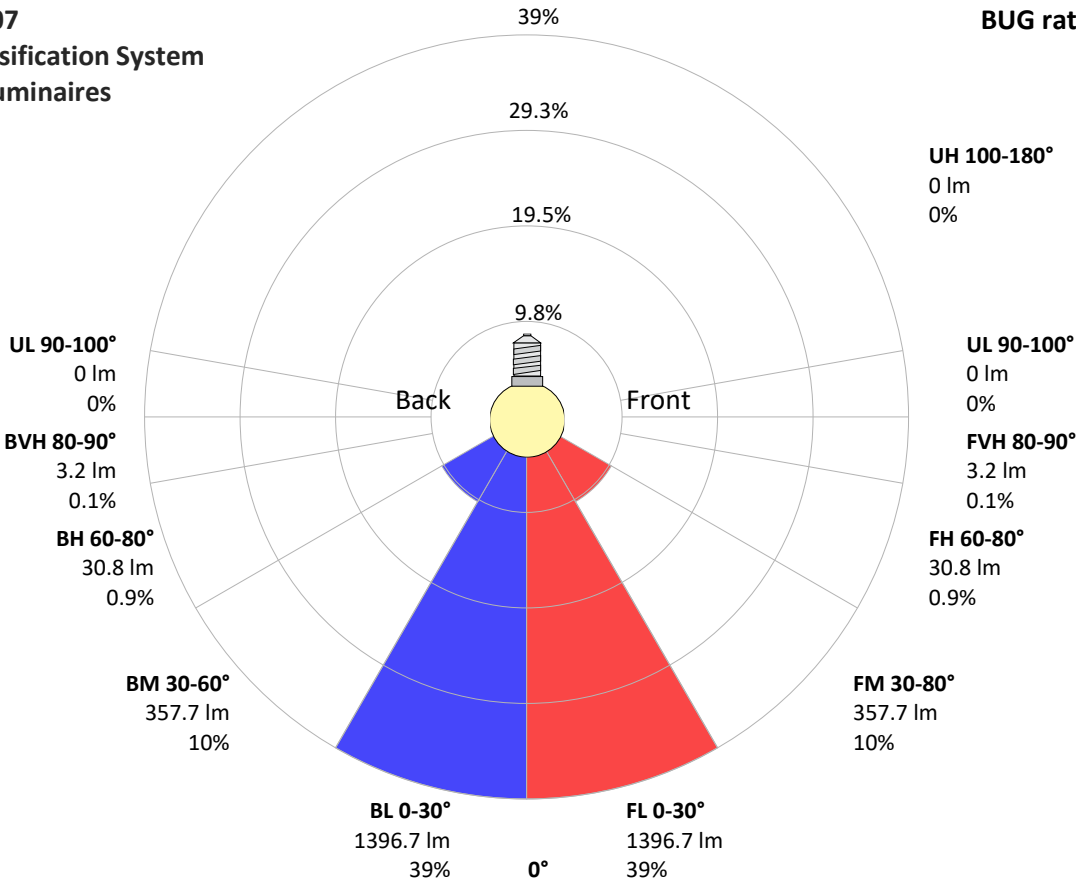
Zone (γ)	Lumen	% Total
0-30°	2784 lm	77.8%
0-40°	3210 lm	89.7%
0-60°	3497 lm	97.8%
60-90°	67 lm	1.9%
70-100°	18 lm	0.5%
90-120°	9 lm	0.3%
0-90°	3564 lm	99.6%
90-180°	13 lm	0.4%
0-180°	3577 lm	100.0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	1397 lm	39.0%
Medium(30-60°)	358 lm	10.0%
High(60-80°)	31 lm	0.9%
Very high(80-90°)	3 lm	0.1%
Back light		
Low(0-30°)	1397 lm	39.0%
Medium(30-60°)	358 lm	10.0%
High(60-80°)	31 lm	0.9%
Very high(80-90°)	3 lm	0.1%
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 B3 U1 G0



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Power Details

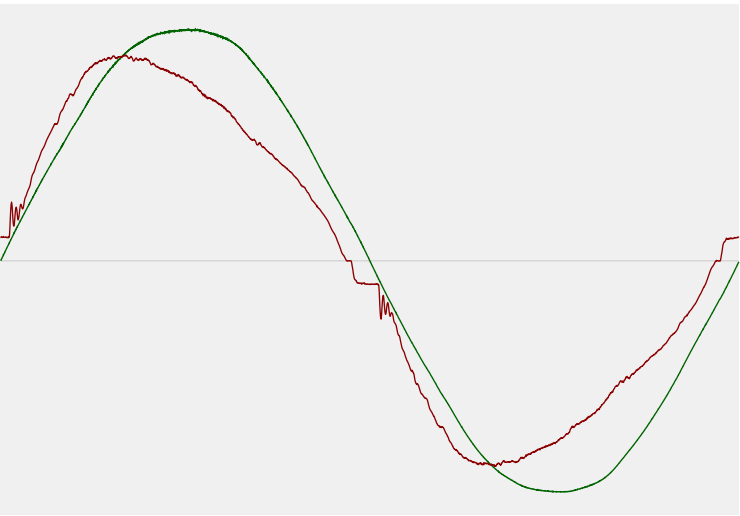
Input Power

Power feed to light source	41.5 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	241 V
RMS Input current feed, I_{RMS}	0.178 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	42.92 VA
Displacement factor of AC power feed	0.97
Power factor of AC current feed	0.97
Total harmonic distortion of the current	10.67%
Total harmonic distortion of the voltage	1.17%

Efficiency

Radiated power efficiency	31.3%
<div><div></div></div>	
Lumen efficiency	86 lm/W
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Input Power Curve



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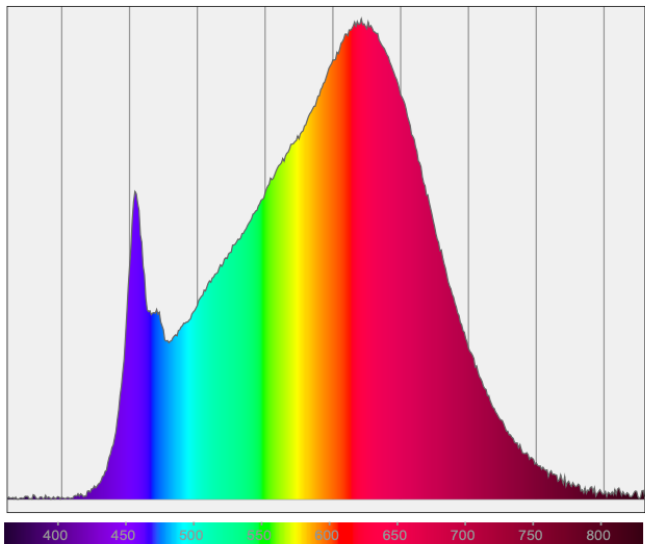
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Color Measurements

Correlated Color Temperature	CCT = 3000 K
Color Rendering TM30-18	R _f 91.0 — R _g 97.7
Color Shift, CIE duv	Duv ±0.0003

Spectral distribution



Color details

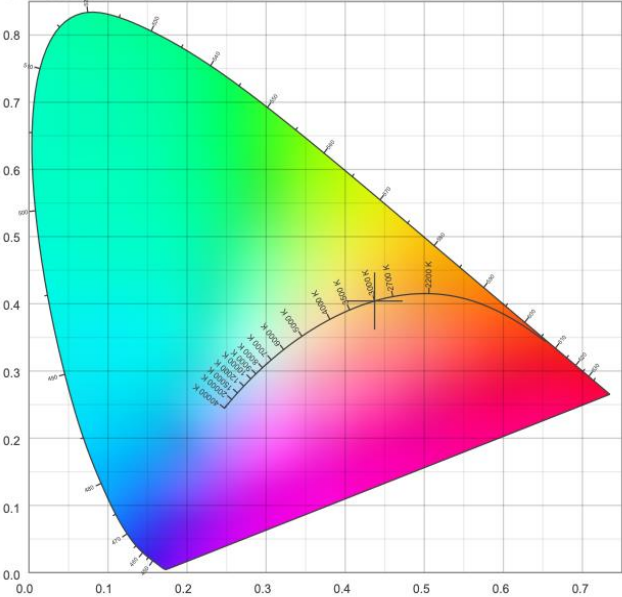
Correlated Color Temperature	CCT = 3000 K	Color coordinates CIE 1931	(x;y) = (0.437;0.404)
Color Rendering Index	CRI 94.1	Color coordinate CIEs 1960	(u;v) = (0.251;0.348)
Color Rendering Index, R9 (red component)	R9 = 68.6	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R _f 91.0 — R _g 97.7	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.251;0.251)
Color Quality Scale	CQS = 91.8		

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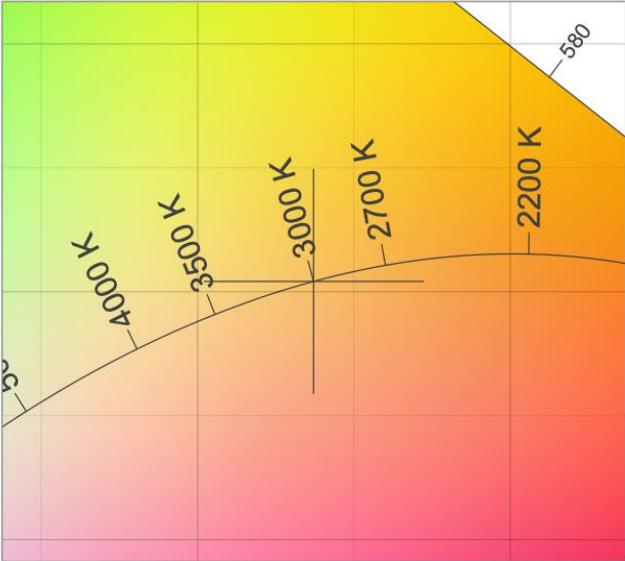
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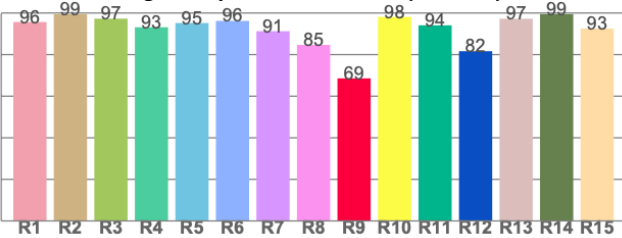
CIE 1931



CIE 1931 – zoomed on Planckian locus



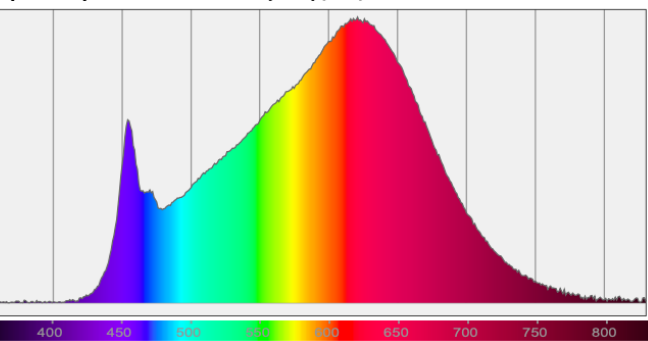
Color Rendering Index per reference color (CIE 1995)



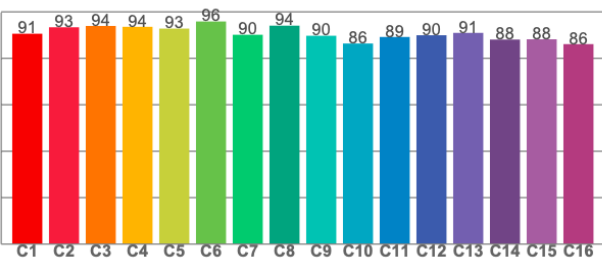
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
95.7	99.5	97.3	93.1	95.2	96.2	91.3	84.6	68.6	98.2	94.1	81.6	97.2	99.5	92.5

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



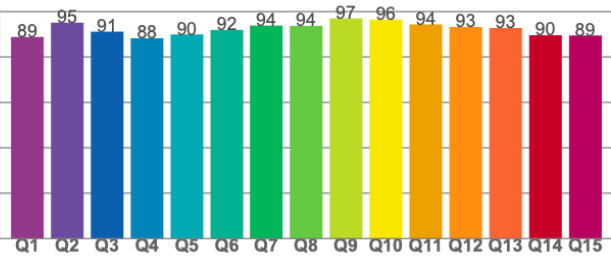
TM30-18 Rf-values per hue bin



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
90.6	93.4	93.9	93.6	92.8	95.9	90.1	94.0	89.7	86.4	89.2	89.9	90.9	88.1	88.2	86.1

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
88.8	95.1	91.2	88.2	89.9	91.9	93.8	93.7	97.0	96.5	94.4	93.2	92.8	89.6	89.5