

Goniophotometry Report

1_PHOT_REFLEKTER-XL-4300lmChip-3000K-58Deg_2303
www.factorylux.com



Tested Light Source - 1_PHOT_REFLEKTER-XL-4300lmChip-3000K-58Deg_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

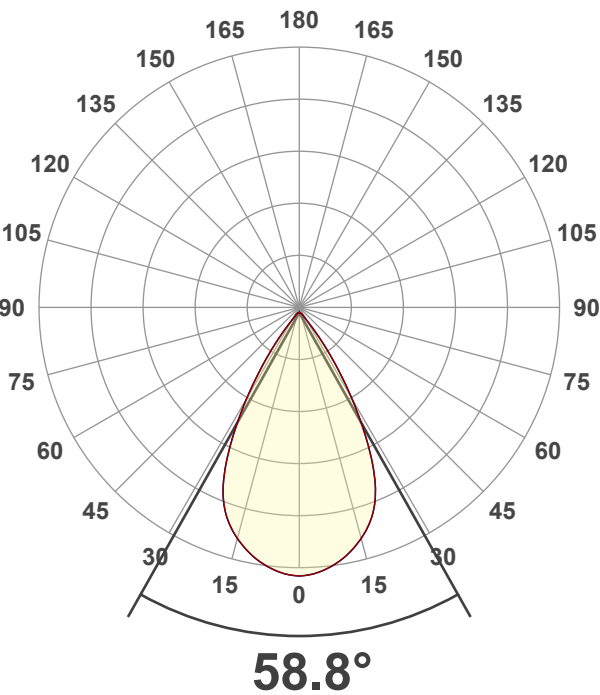
32 planes – 11.25°
2°
4.50 m
41.5 W – PF 0.97 – DPF 0.97
239 V – 0.180 A
50 Hz

Main Light Measurement Results

Output
Efficiency
Peak Intensity and Beam Angle
Color Rendering Index

3624 lm
87 lm/W
4113 cd – 58.8°
CRI 92.6

Light Intensity Distribution



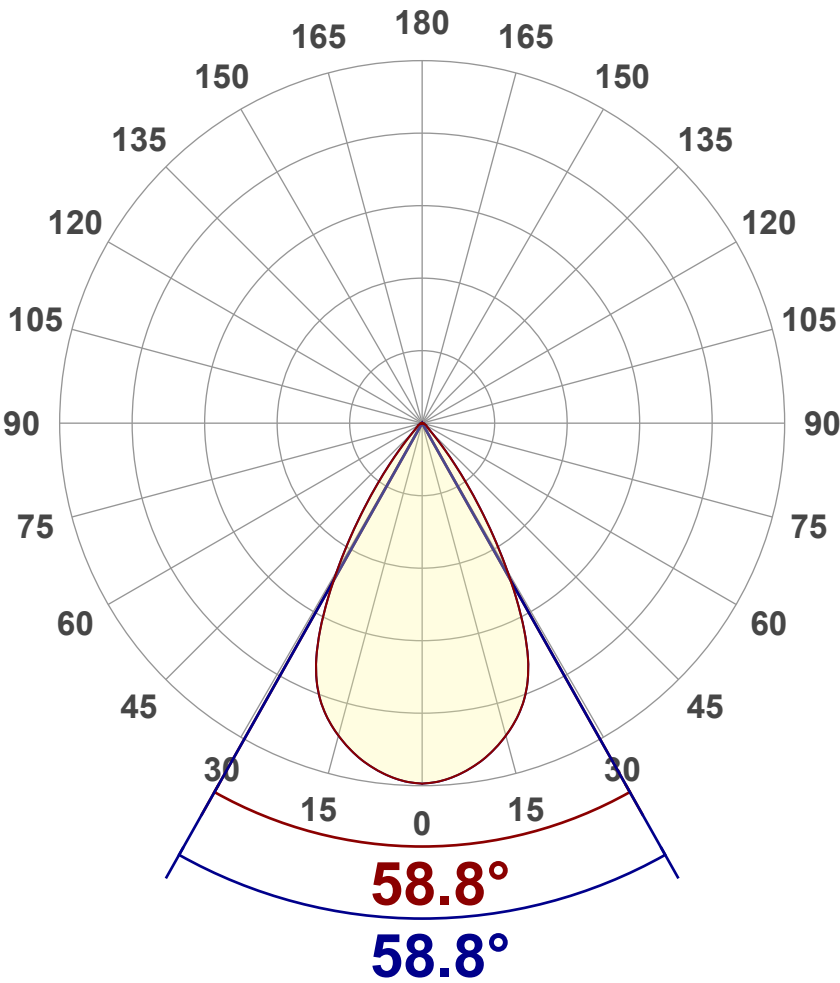
Goniophotometry Report

1_PHOT_REFLEKTER-XL-4300lmChip-3000K-58Deg_2303
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	3624 lm
Peak Intensity	4113 cd
Beam Angle (50%)	58.8°
Beam Angle (90%)	58.8°
Beam Angle (10%)	58.8°

Cut-off Angle

Average 2,5%	97.4°
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Field Angle

Average 10%	80.5°
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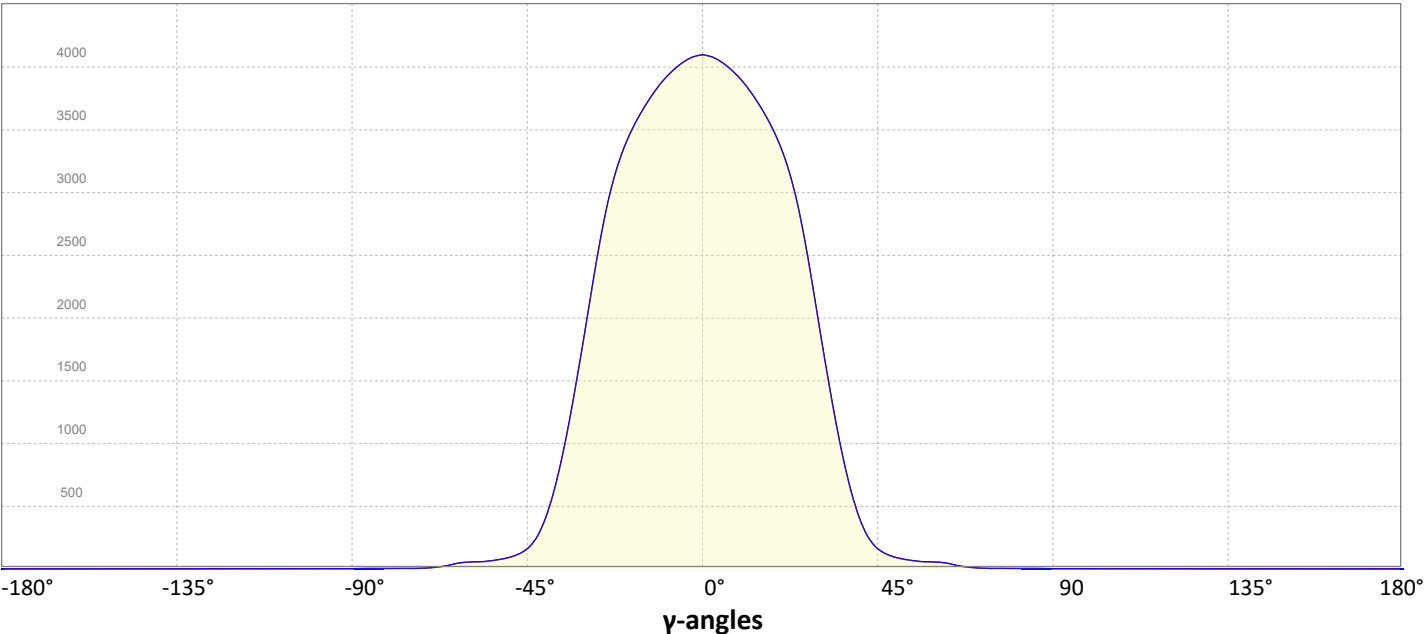
Intensity Ratio

In 120° cone	98.2%
In 90° cone	95.2%

C000-C180

C090-C270

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

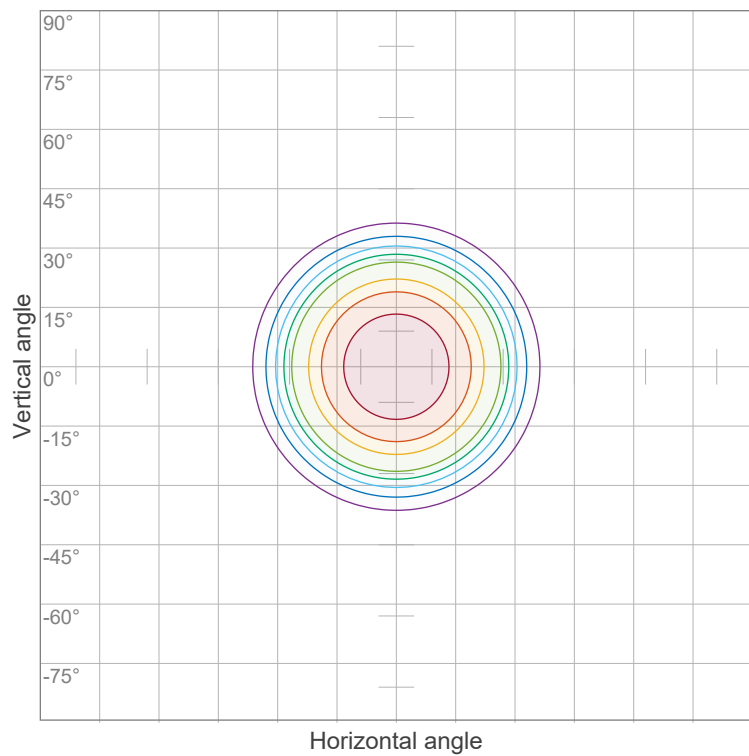


Goniophotometry Report

1_PHOT_REFLEKTER-XL-4300lmChip-3000K-58Deg_2303
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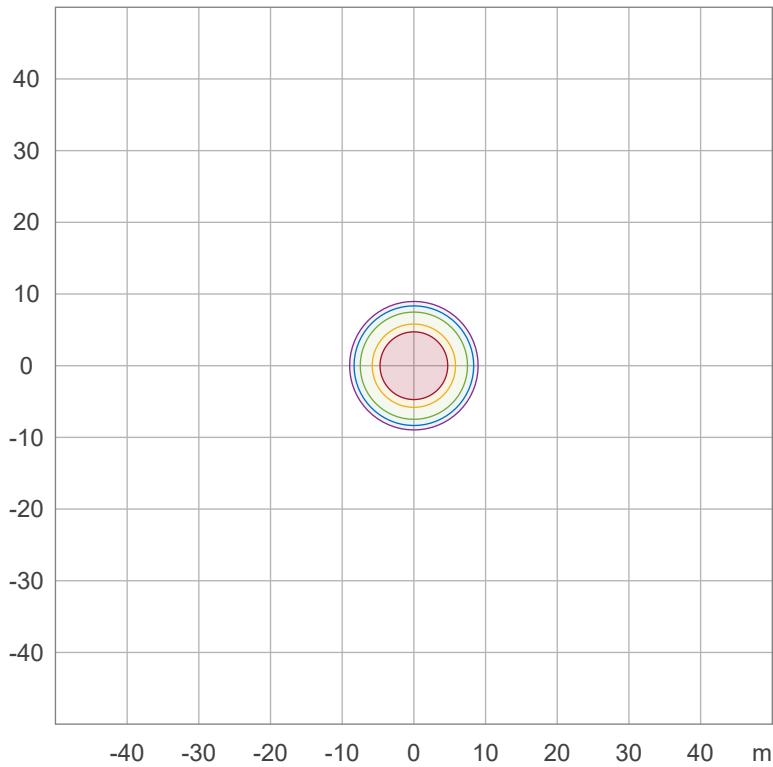
Iso-intensity Diagram (Iso-candela)



90 %	3701.7 cd
80 %	3290.4 cd
70 %	2879.1 cd
60 %	2467.8 cd
50 %	2056.5 cd
40 %	1645.2 cd
30 %	1233.9 cd
20 %	822.6 cd
10 %	411.3 cd

Peak intensity: 4113.0 cd
Number of c-planes: 32

Iso-illuminance Diagram (Iso-lux)



50.0 %	20.6 lx
30.0 %	12.3 lx
10.0 %	4.1 lx
5.0 %	2.1 lx
3.0 %	1.2 lx

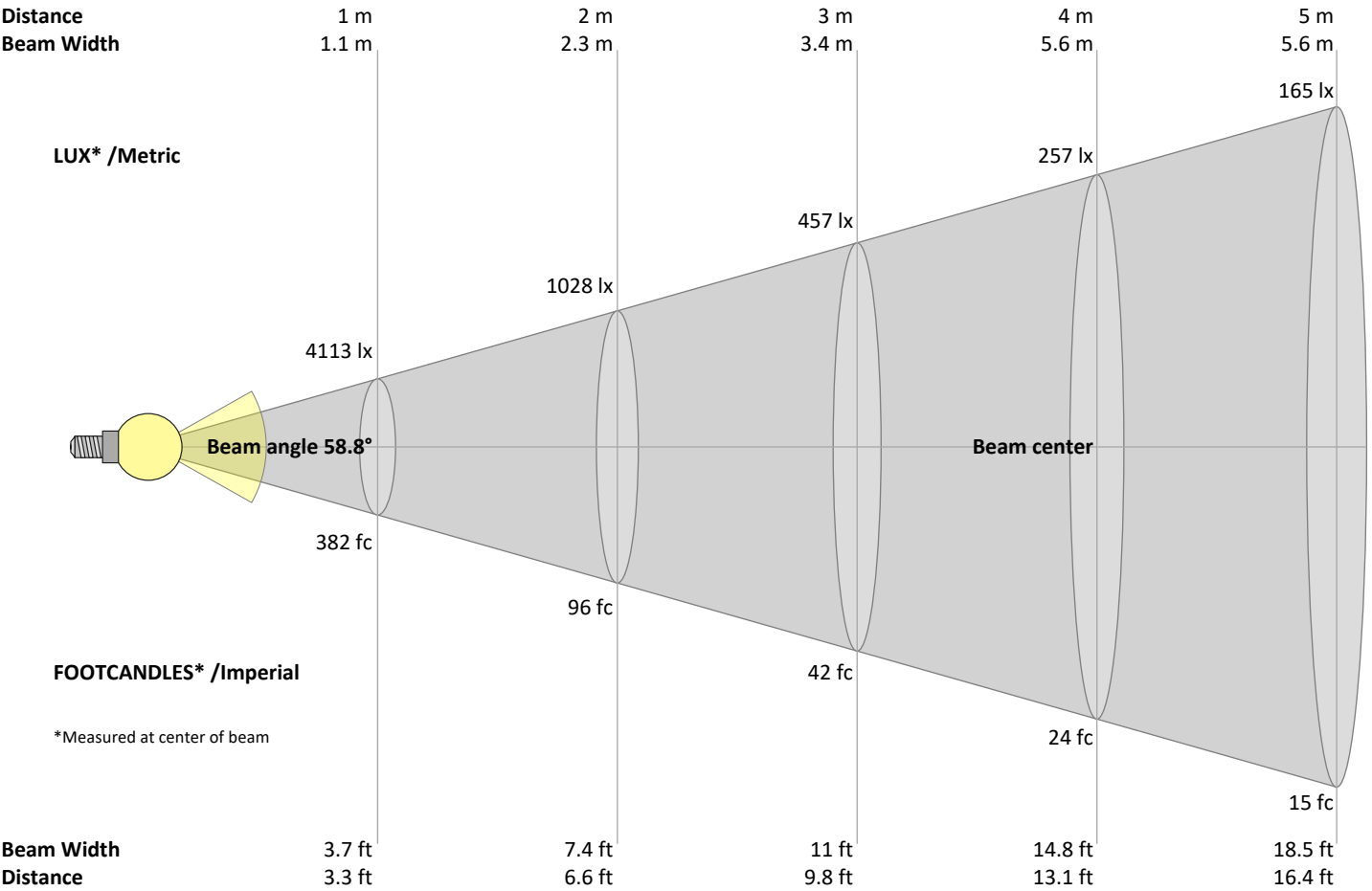
Peak illuminance: 41.1 lx
Mounting height: 10.0 m
Number of c-planes: 32

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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
4113	1028	457	257	165	114	84	64	51	41	34	29	24	21	18	16	14	13	11	10	lux
382.1	95.5	42.5	23.9	15.3	10.6	7.8	6	4.7	3.8	3.2	2.7	2.3	1.9	1.7	1.5	1.3	1.2	1.1	1	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
4113	4101	4073	4031	3976	3911	3832	3741	3639	3522	3381	3203	2971	2672	2318	1939	1569	1219	907	644	cd
100%	100%	99%	98%	97%	95%	93%	91%	88%	86%	82%	78%	72%	65%	56%	47%	38%	30%	22%	16%	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
4113	4101	4073	4031	3976	3911	3832	3741	3639	3522	3381	3203	2971	2672	2318	1939	1569	1219	907	644	cd
100%	100%	99%	98%	97%	95%	93%	91%	88%	86%	82%	78%	72%	65%	56%	47%	38%	30%	22%	16%	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
4113	4101	4073	4031	3976	3911	3832	3741	3639	3522	3381	3203	2971	2672	2318	1939	1569	1219	907	644	cd
100%	100%	99%	98%	97%	95%	93%	91%	88%	86%	82%	78%	72%	65%	56%	47%	38%	30%	22%	16%	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
4113	4101	4073	4031	3976	3911	3832	3741	3639	3522	3381	3203	2971	2672	2318	1939	1569	1219	907	644	cd
100%	100%	99%	98%	97%	95%	93%	91%	88%	86%	82%	78%	72%	65%	56%	47%	38%	30%	22%	16%	of 0°val

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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	23.1	23.7	23.2	23.9	24.1	23.1	23.7	23.2	23.9	24.1
	3H	22.8	23.6	23.2	23.8	24.0	22.8	23.6	23.2	23.8	24.0
	4H	22.8	23.5	23.1	23.7	24.0	22.8	23.5	23.1	23.7	24.0
	6H	22.8	23.4	23.1	23.7	24.0	22.8	23.4	23.1	23.7	24.0
	8H	22.7	23.3	23.0	23.6	24.0	22.7	23.3	23.0	23.6	24.0
	12H	22.7	23.2	23.0	23.6	24.0	22.7	23.2	23.0	23.6	24.0
4H	2H	22.8	23.5	23.2	23.7	24.0	22.8	23.5	23.2	23.7	24.0
	3H	22.7	23.3	23.1	23.7	24.1	22.7	23.3	23.1	23.7	24.1
	4H	22.6	23.1	23.0	23.6	24.1	22.6	23.1	23.0	23.6	24.1
	6H	22.5	23.1	23.0	23.4	23.8	22.5	23.1	23.0	23.4	23.8
	8H	22.5	23.0	23.0	23.4	23.7	22.5	23.0	23.0	23.4	23.7
	12H	22.5	22.9	23.0	23.3	23.7	22.5	22.9	23.0	23.3	23.7
8H	4H	22.5	23.0	23.0	23.3	23.7	22.5	23.0	23.0	23.3	23.7
	6H	22.4	22.8	22.9	23.2	23.8	22.4	22.8	22.9	23.2	23.8
	8H	22.5	22.7	23.0	23.2	23.9	22.5	22.7	23.0	23.2	23.9
	12H	22.4	22.7	23.0	23.2	23.8	22.4	22.7	23.0	23.2	23.8
12H	4H	22.4	22.8	22.9	23.2	23.7	22.4	22.8	22.9	23.2	23.7
	6H	22.4	22.7	22.9	23.2	23.9	22.4	22.7	22.9	23.2	23.9
	8H	22.4	22.6	23.0	23.1	23.7	22.4	22.6	23.0	23.1	23.7

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

S = 1.0H	5.1 / -6.2	5.1 / -6.2
S = 1.5H	7.7 / -6.6	7.7 / -6.6
S = 2.0H	9.7 / -9.4	9.7 / -9.4

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	99
1	113	111	108	106	111	108	106	104	104	102	101	100	99	98	97	96	95	93
2	108	103	99	95	105	101	97	94	98	95	92	95	92	90	92	90	88	86
3	102	96	91	87	100	94	90	86	92	88	85	89	86	83	87	84	82	80
4	97	90	84	80	95	89	83	79	86	82	78	84	81	77	82	79	77	75
5	92	84	78	74	91	83	78	74	81	77	73	80	75	72	78	74	72	70
6	88	79	73	69	86	78	73	69	77	72	68	75	71	67	74	70	67	66
7	84	74	68	64	82	74	68	64	72	67	64	71	67	63	70	66	63	61
8	80	70	64	60	78	70	64	60	68	63	60	67	63	59	66	62	59	58
9	76	66	60	56	75	66	60	56	65	60	56	64	59	56	63	59	56	54
10	72	63	57	53	71	62	57	53	61	56	53	61	56	53	60	56	53	51

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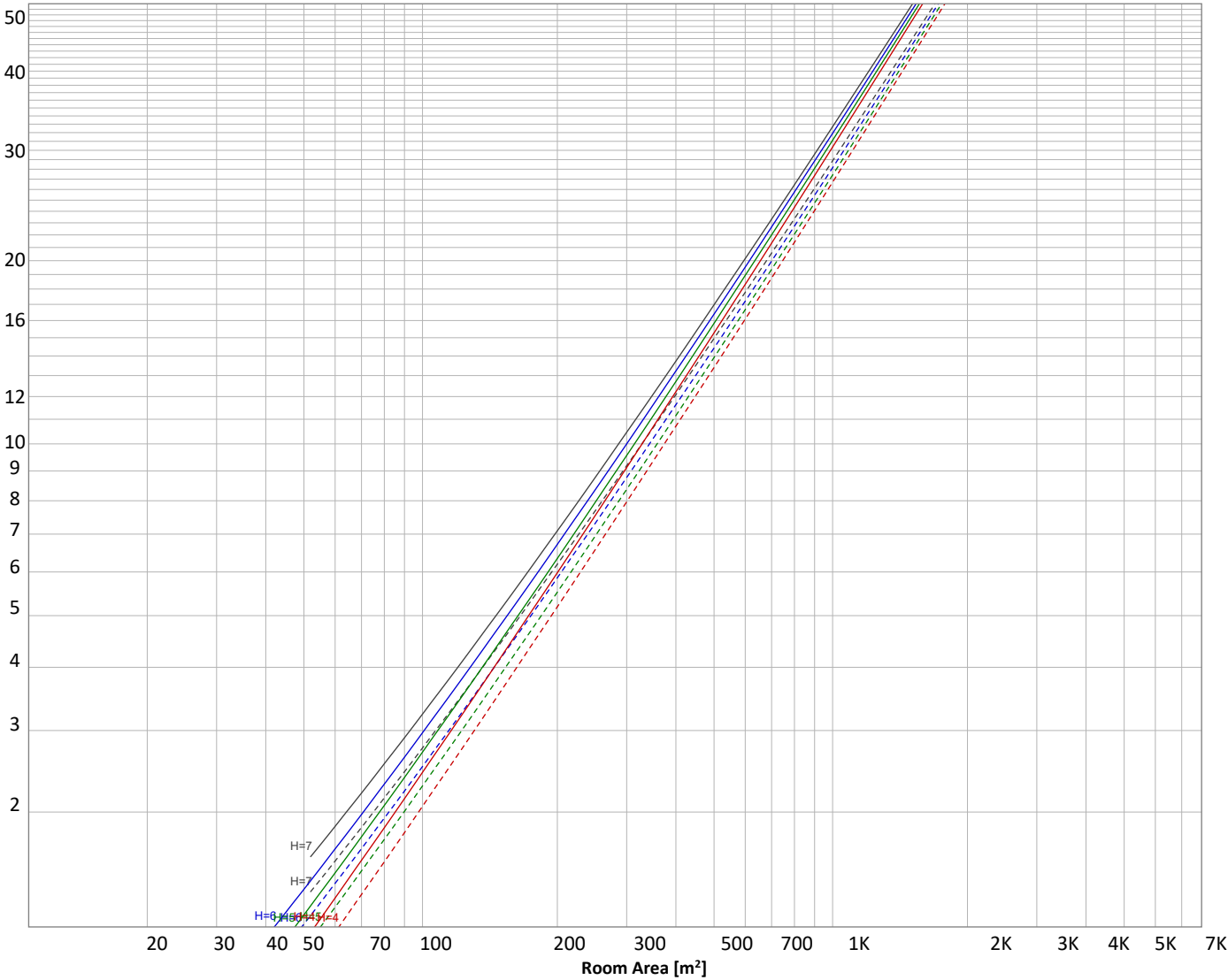
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 3624 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°
382 lm	1034 lm	1260 lm	673 lm	150 lm	60.4 lm	33.3 lm	7.00 lm	5.47 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
3.89 lm	3.77 lm	3.54 lm	3.20 lm	2.07 lm	1.24 lm	0.913 lm	0.559 lm	0.188 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	382 lm	10.5%
10-20°	1034 lm	28.5%
20-30°	1260 lm	34.8%
30-40°	673 lm	18.6%
40-50°	150 lm	4.1%
50-60°	60 lm	1.7%
60-70°	33 lm	0.9%
70-80°	7 lm	0.2%
80-90°	5 lm	0.2%
90-100°	4 lm	0.1%
100-110°	4 lm	0.1%
110-120°	4 lm	0.1%
120-130°	3 lm	0.1%
130-140°	2 lm	0.1%
140-150°	1 lm	0.0%
150-160°	1 lm	0.0%
160-170°	1 lm	0.0%
170-180°	0 lm	0.0%
Total	3624 lm	100.0%

Intensity peaks

Max intensity	4113 cd
Intensity, 90°	4 cd
Intensity, 0°	4113 cd

Zonal Lumen summary

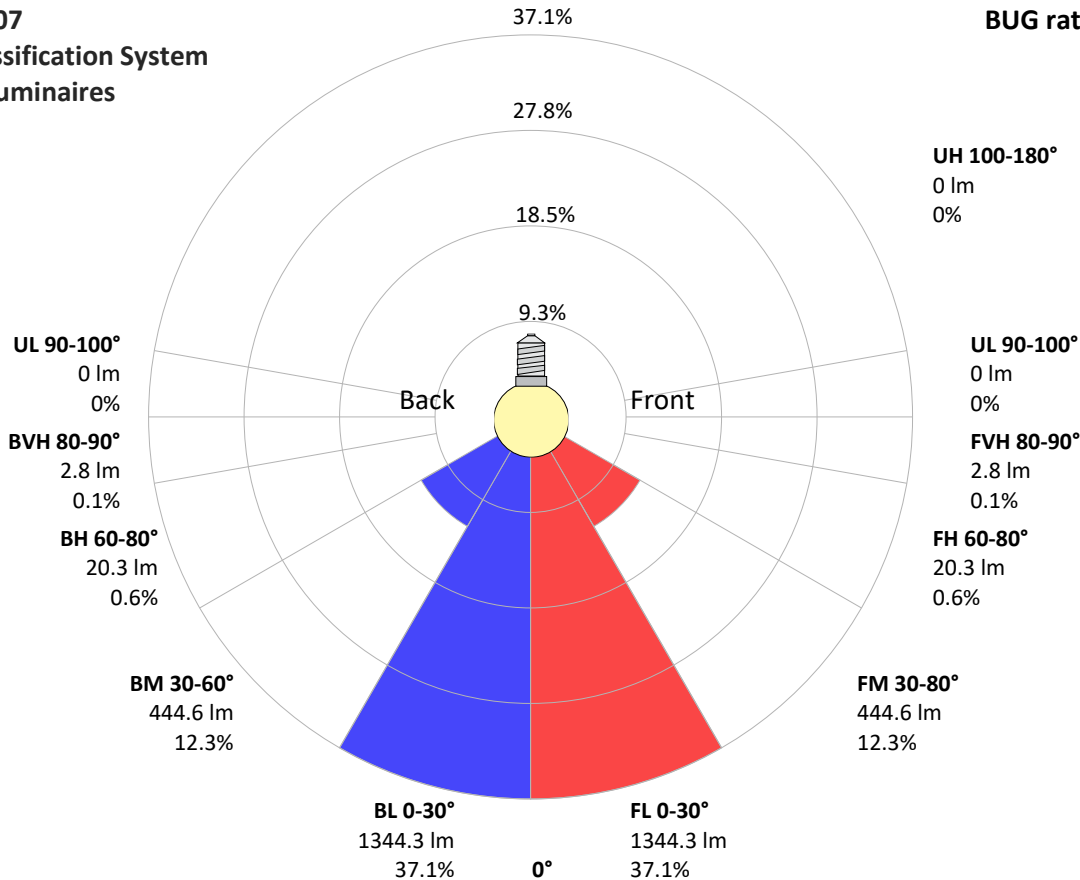
Zone (γ)	Lumen	% Total
0-30°	2676 lm	73.8%
0-40°	3349 lm	92.4%
0-60°	3559 lm	98.2%
60-90°	46 lm	1.3%
70-100°	16 lm	0.5%
90-120°	11 lm	0.3%
0-90°	3605 lm	99.5%
90-180°	19 lm	0.5%
0-180°	3624 lm	100.0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	1344 lm	37.1%
Medium(30-60°)	445 lm	12.3%
High(60-80°)	20 lm	0.6%
Very high(80-90°)	3 lm	0.1%
Back light		
Low(0-30°)	1344 lm	37.1%
Medium(30-60°)	445 lm	12.3%
High(60-80°)	20 lm	0.6%
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

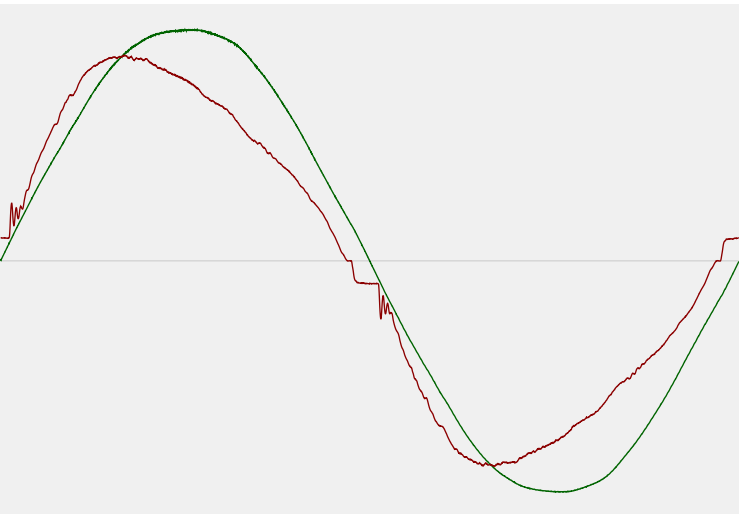
Input Power

Power feed to light source	41.5 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	239 V
RMS Input current feed, I_{RMS}	0.180 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	42.82 VA
Displacement factor of AC power feed	0.97
Power factor of AC current feed	0.97
Total harmonic distortion of the current	10.54%
Total harmonic distortion of the voltage	1.24%

Efficiency

Radiated power efficiency	31.8%
<div><div></div></div>	
Lumen efficiency	87 lm/W
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Input Power Curve



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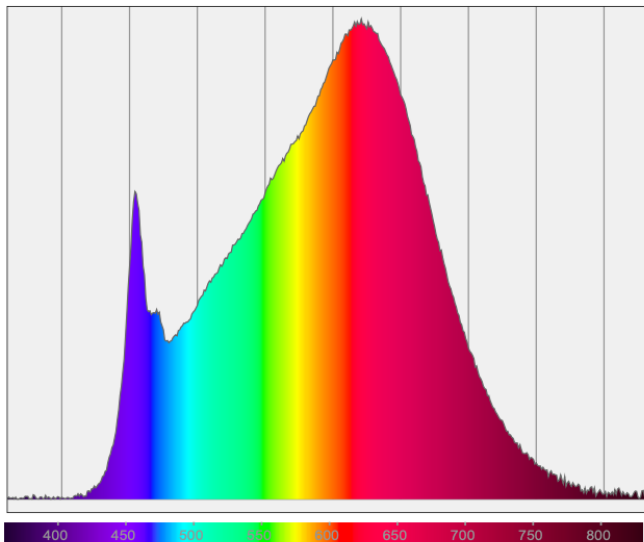
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Color Measurements

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

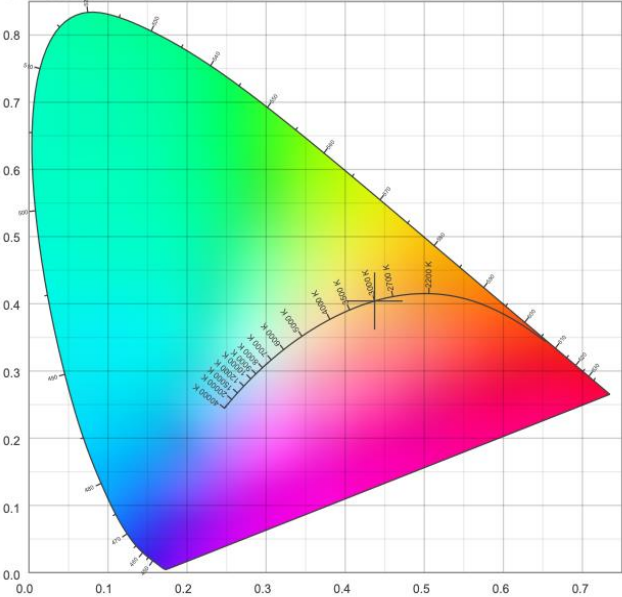
Correlated Color Temperature	CCT = 3000 K	Color coordinates CIE 1931	(x;y) = (0.437;0.404)
Color Rendering Index	CRI 94.1	Color coordinate CIEs 1960	(u;v) = (0.251;0.348)
Color Rendering Index, R9 (red component)	R9 = 68.6	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R _f 91.0 — R _g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

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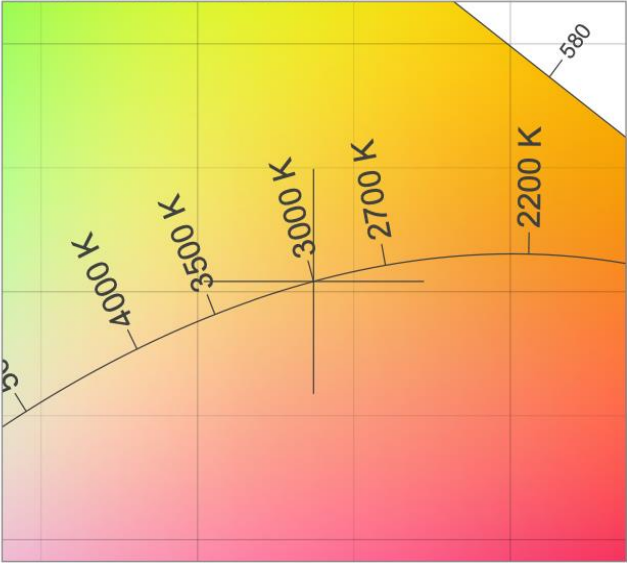
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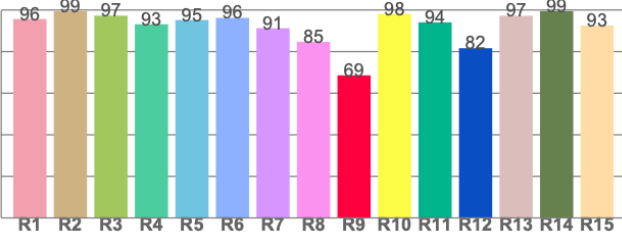
CIE 1931



CIE 1931 – zoomed on Planckian locus



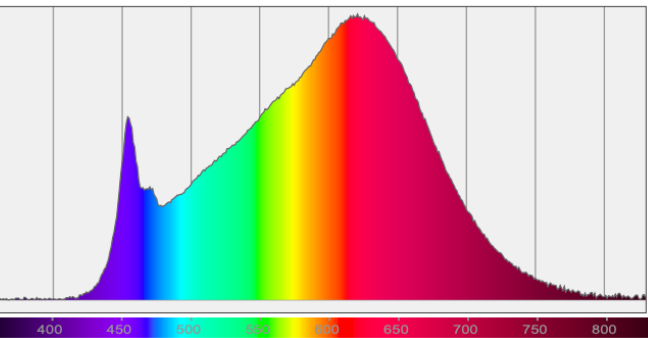
Color Rendering Index per reference color (CIE 1995)



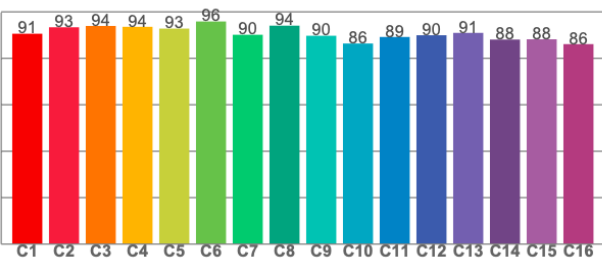
CRI R values, only R1-R8 are used to calculate final CRI value

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%



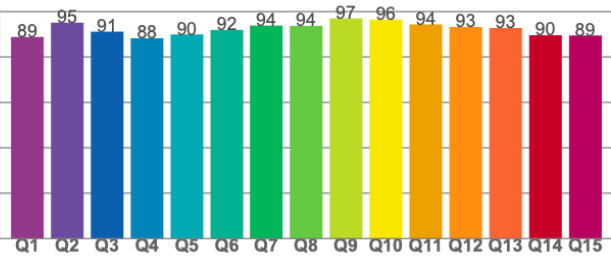
TM30-18 Rf-values per hue bin



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