

Goniophotometry Report

1_PHOT_REFLEKTER-L-4750lmChip-4000K-UGR_2303
www.factorylux.com



Tested Light Source - 1_PHOT_REFLEKTER-L-4750lmChip-4000K-UGR_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

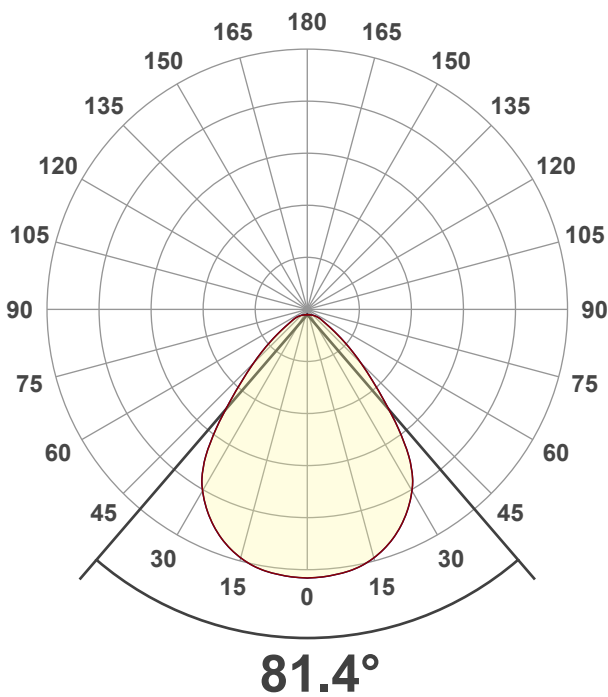
32 planes – 11.25°
3°
3.00 m
41.2 W – PF 0.97 – DPF 0.97
243 V – 0.176 A
49.9 Hz

Main Light Measurement Results

Output
Efficiency
Peak Intensity and Beam Angle
Color Rendering Index

3020 lm
73 lm/W
1693 cd – 81.4°
CRI 92.7

Light Intensity Distribution



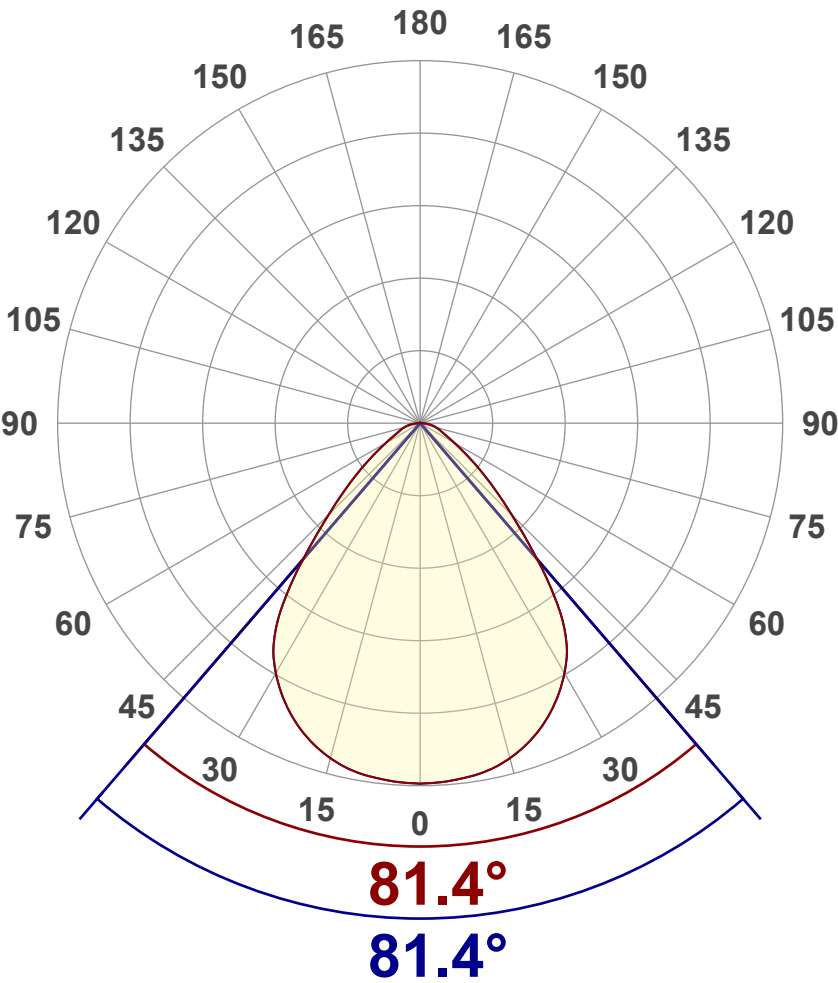
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	3020 lm
Peak Intensity	1693 cd
Beam Angle (50%)	81.4°
Beam Angle (90%)	81.4°
Beam Angle (10%)	81.4°

Cut-off Angle

Average 2,5%	165.4°
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Field Angle

Average 10%	122.7°
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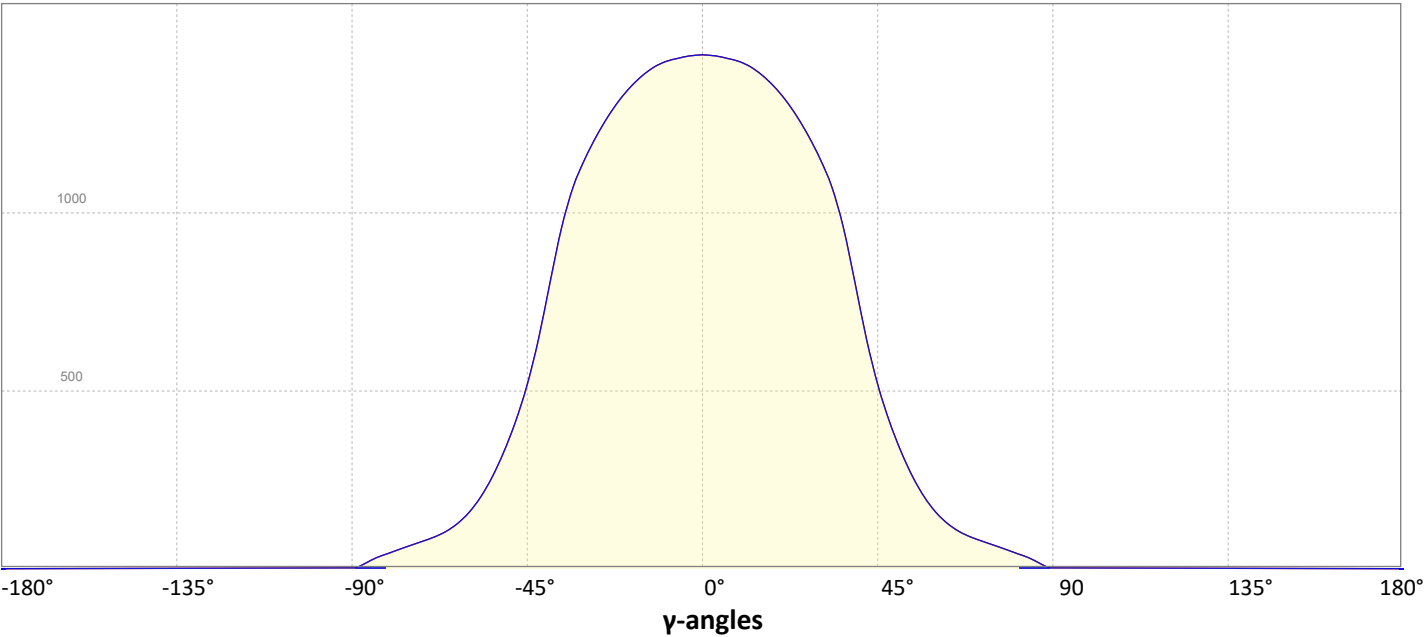
Intensity Ratio

In 120° cone	91.2%
In 90° cone	75.9%

C000-C180

C090-C270

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

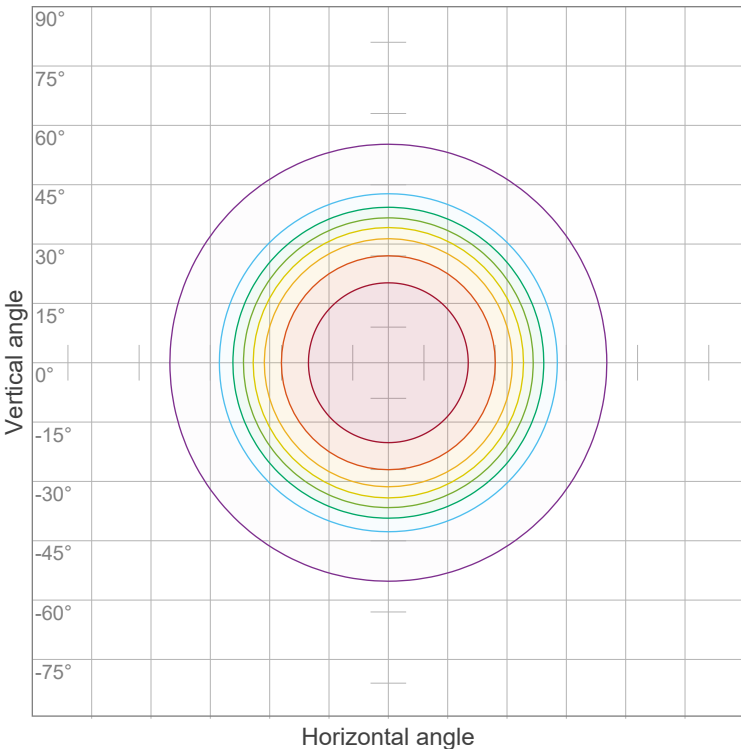


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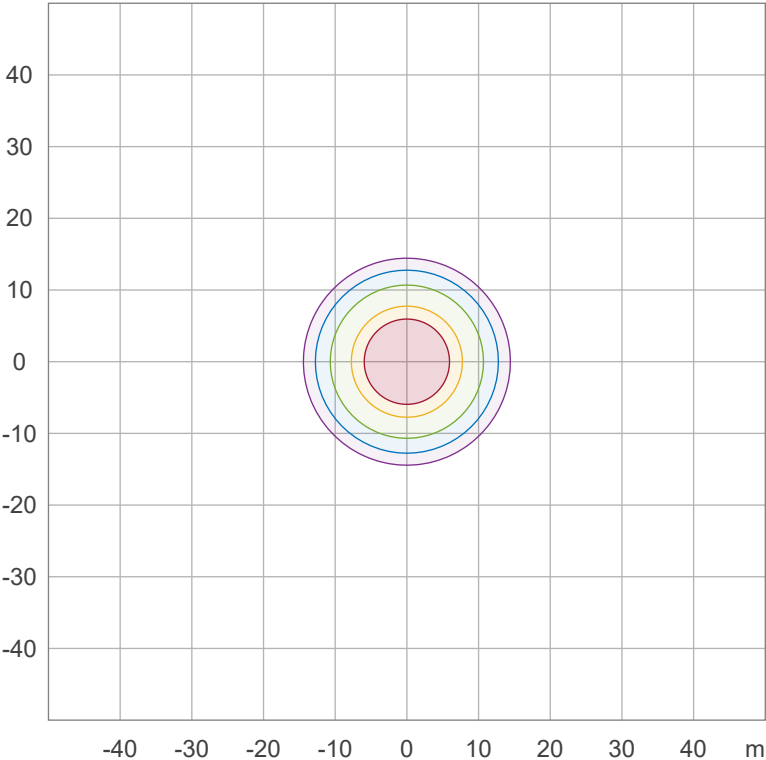
Iso-intensity Diagram (Iso-candela)



90 %	1523.5 cd
80 %	1354.3 cd
70 %	1185.0 cd
60 %	1015.7 cd
50 %	846.4 cd
40 %	677.1 cd
30 %	507.8 cd
20 %	338.6 cd
10 %	169.3 cd

Peak intensity: 1692.8 cd
Number of c-planes: 32

Iso-illuminance Diagram (Iso-lux)



50.0 %	8.5 lx
30.0 %	5.1 lx
10.0 %	1.7 lx
5.0 %	0.8 lx
3.0 %	0.5 lx

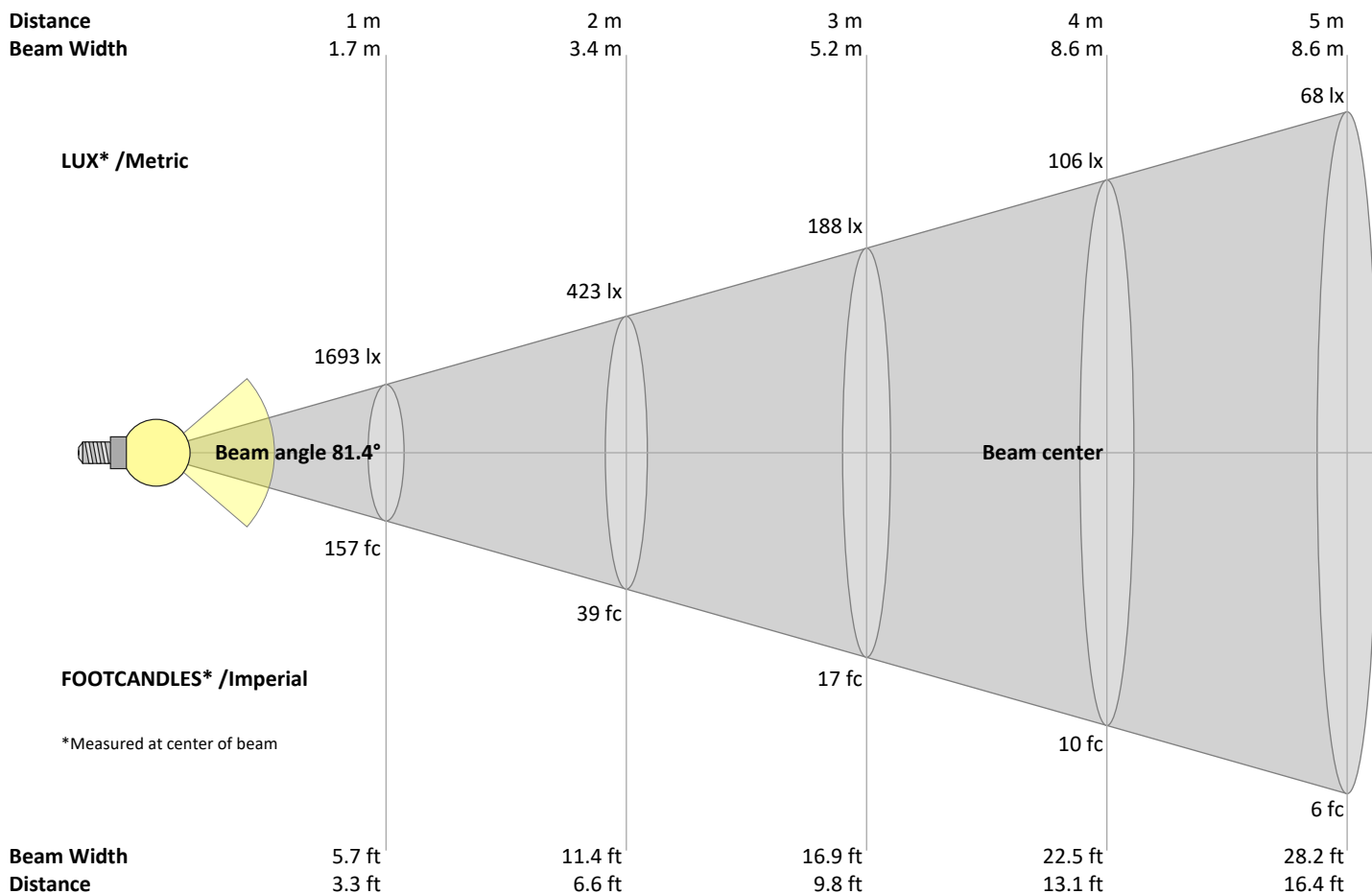
Peak illuminance: 16.9 lx
Mounting height: 10.0 m
Number of c-planes: 32

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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
1693	423	188	106	68	47	35	26	21	17	14	12	10	9	8	7	6	5	5	4	lux
157.3	39.3	17.5	9.8	6.3	4.4	3.2	2.5	1.9	1.6	1.3	1.1	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	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
1693	1685	1668	1629	1564	1474	1355	1177	890	608	420	281	186	132	100	78	55	29	4	4	cd
100%	100%	99%	96%	92%	87%	80%	70%	53%	36%	25%	17%	11%	8%	6%	5%	3%	2%	0%	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
1693	1685	1668	1629	1564	1474	1355	1177	890	608	420	281	186	132	100	78	55	29	4	4	cd
100%	100%	99%	96%	92%	87%	80%	70%	53%	36%	25%	17%	11%	8%	6%	5%	3%	2%	0%	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
1693	1685	1668	1629	1564	1474	1355	1177	890	608	420	281	186	132	100	78	55	29	4	4	cd
100%	100%	99%	96%	92%	87%	80%	70%	53%	36%	25%	17%	11%	8%	6%	5%	3%	2%	0%	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
1693	1685	1668	1629	1564	1474	1355	1177	890	608	420	281	186	132	100	78	55	29	4	4	cd
100%	100%	99%	96%	92%	87%	80%	70%	53%	36%	25%	17%	11%	8%	6%	5%	3%	2%	0%	0%	of 0°val



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		Viewed Crosswise					Viewed Endwise				
X	Y	(Viewing direction orthogonal to lamp length axis)					(Viewing direction parallel to lamp length axis)				
2H	2H	17.2	18.2	17.4	18.4	18.7	17.2	18.2	17.4	18.4	18.7
	3H	17.6	18.6	18.0	18.9	19.0	17.6	18.6	18.0	18.9	19.0
	4H	17.9	18.9	18.3	19.1	19.4	17.9	18.9	18.3	19.1	19.4
	6H	18.3	19.1	18.6	19.4	19.8	18.3	19.1	18.6	19.4	19.8
	8H	18.4	19.2	18.7	19.5	19.9	18.4	19.2	18.7	19.5	19.9
	12H	18.5	19.3	18.9	19.6	20.1	18.5	19.3	18.9	19.6	20.1
4H	2H	17.3	18.2	17.7	18.5	18.7	17.3	18.2	17.7	18.5	18.7
	3H	18.0	18.8	18.4	19.1	19.6	18.0	18.8	18.4	19.1	19.6
	4H	18.4	19.1	18.8	19.5	20.0	18.4	19.1	18.8	19.5	20.0
	6H	18.8	19.6	19.3	19.9	20.3	18.8	19.6	19.3	19.9	20.3
	8H	19.1	19.7	19.6	20.1	20.4	19.1	19.7	19.6	20.1	20.4
	12H	19.2	19.8	19.7	20.2	20.6	19.2	19.8	19.7	20.2	20.6
8H	4H	18.5	19.2	19.0	19.5	19.9	18.5	19.2	19.0	19.5	19.9
	6H	19.2	19.7	19.7	20.1	20.6	19.2	19.7	19.7	20.1	20.6
	8H	19.5	19.9	20.0	20.4	21.1	19.5	19.9	20.0	20.4	21.1
	12H	19.8	20.2	20.4	20.7	21.3	19.8	20.2	20.4	20.7	21.3
12H	4H	18.5	19.1	19.0	19.5	19.9	18.5	19.1	19.0	19.5	19.9
	6H	19.3	19.7	19.8	20.2	20.8	19.3	19.7	19.8	20.2	20.8
	8H	19.6	20.0	20.2	20.5	21.1	19.6	20.0	20.2	20.5	21.1

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

S = 1.0H	0.4 / -0.6	0.4 / -0.6
S = 1.5H	1.2 / -1.0	1.2 / -1.0
S = 2.0H	2.1 / -1.4	2.1 / -1.4

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	101	101	101	99
1	111	107	104	101	108	105	102	99	101	98	96	97	95	93	93	92	90	88
2	103	97	91	87	101	95	90	86	91	87	84	88	85	82	85	82	80	78
3	96	87	81	75	94	86	80	75	83	78	73	80	76	72	78	74	71	69
4	89	79	72	67	87	78	71	66	76	70	65	73	68	64	71	67	63	62
5	83	72	65	59	81	71	64	59	69	63	58	67	62	58	66	61	57	55
6	78	66	59	53	76	65	58	53	64	57	53	62	56	52	61	56	52	50
7	73	61	53	48	71	60	53	48	59	52	48	57	52	47	56	51	47	45
8	68	56	49	44	67	56	49	44	54	48	43	53	47	43	52	47	43	41
9	64	52	45	40	63	52	45	40	51	44	40	50	44	40	49	43	39	38
10	60	49	42	37	59	48	41	37	47	41	37	46	41	36	45	40	36	35

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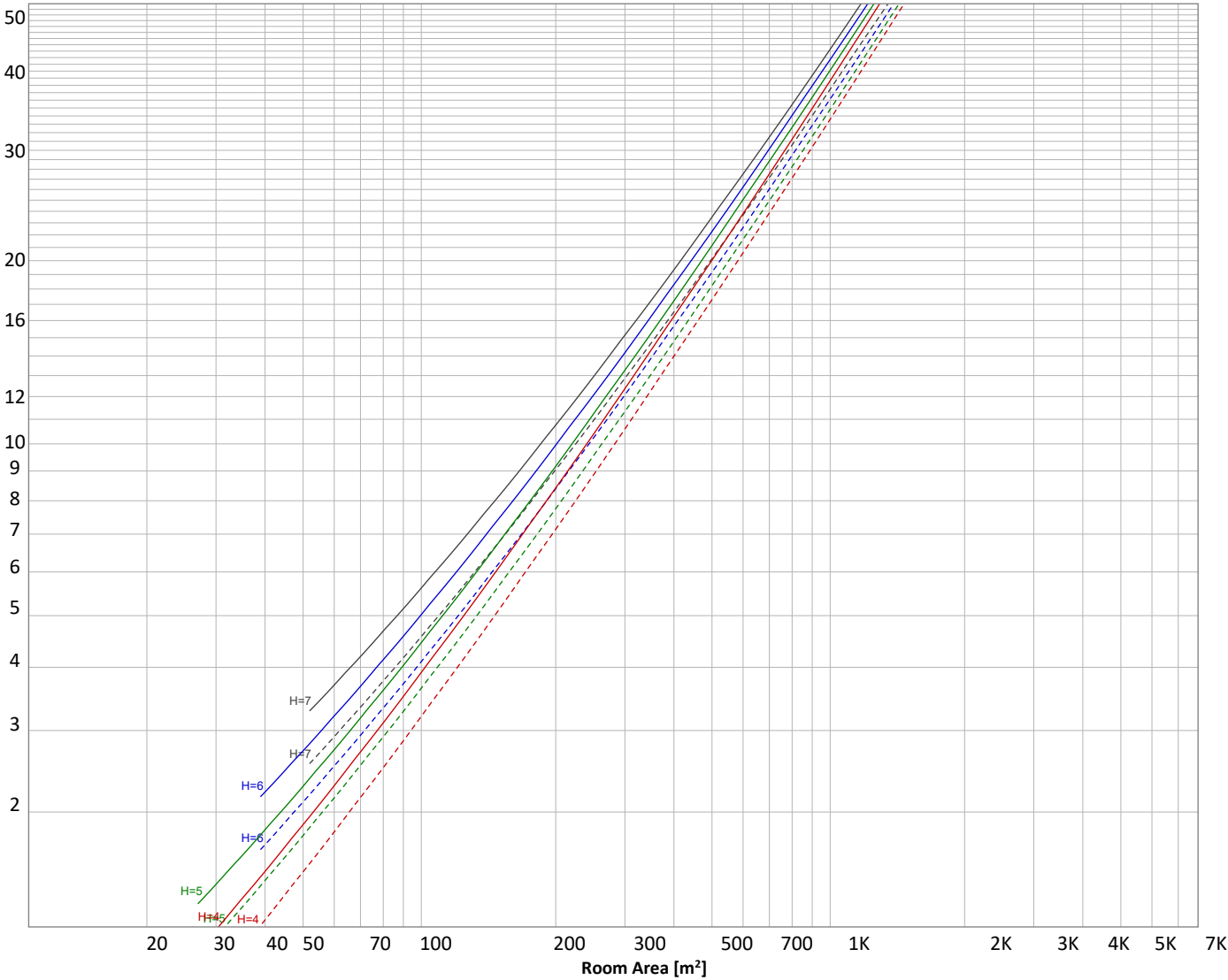
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 3020 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°
160 lm	459 lm	676 lm	723 lm	479 lm	255 lm	134 lm	81.9 lm	30.8 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
4.30 lm	4.17 lm	3.91 lm	3.53 lm	1.94 lm	0.963 lm	0.709 lm	0.434 lm	0.146 lm

Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	160 lm	5.3%
10-20°	459 lm	15.2%
20-30°	676 lm	22.4%
30-40°	723 lm	23.9%
40-50°	479 lm	15.9%
50-60°	255 lm	8.4%
60-70°	134 lm	4.4%
70-80°	82 lm	2.7%
80-90°	31 lm	1.0%
90-100°	4 lm	0.1%
100-110°	4 lm	0.1%
110-120°	4 lm	0.1%
120-130°	4 lm	0.1%
130-140°	2 lm	0.1%
140-150°	1 lm	0.0%
150-160°	1 lm	0.0%
160-170°	0 lm	0.0%
170-180°	0 lm	0.0%
Total	3020 lm	100.0%

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	1296 lm	42.9%
0-40°	2019 lm	66.9%
0-60°	2753 lm	91.2%
60-90°	247 lm	8.2%
70-100°	117 lm	3.9%
90-120°	12 lm	0.4%
0-90°	3000 lm	99.3%
90-180°	20 lm	0.7%
0-180°	3020 lm	100.0%

BUG rating

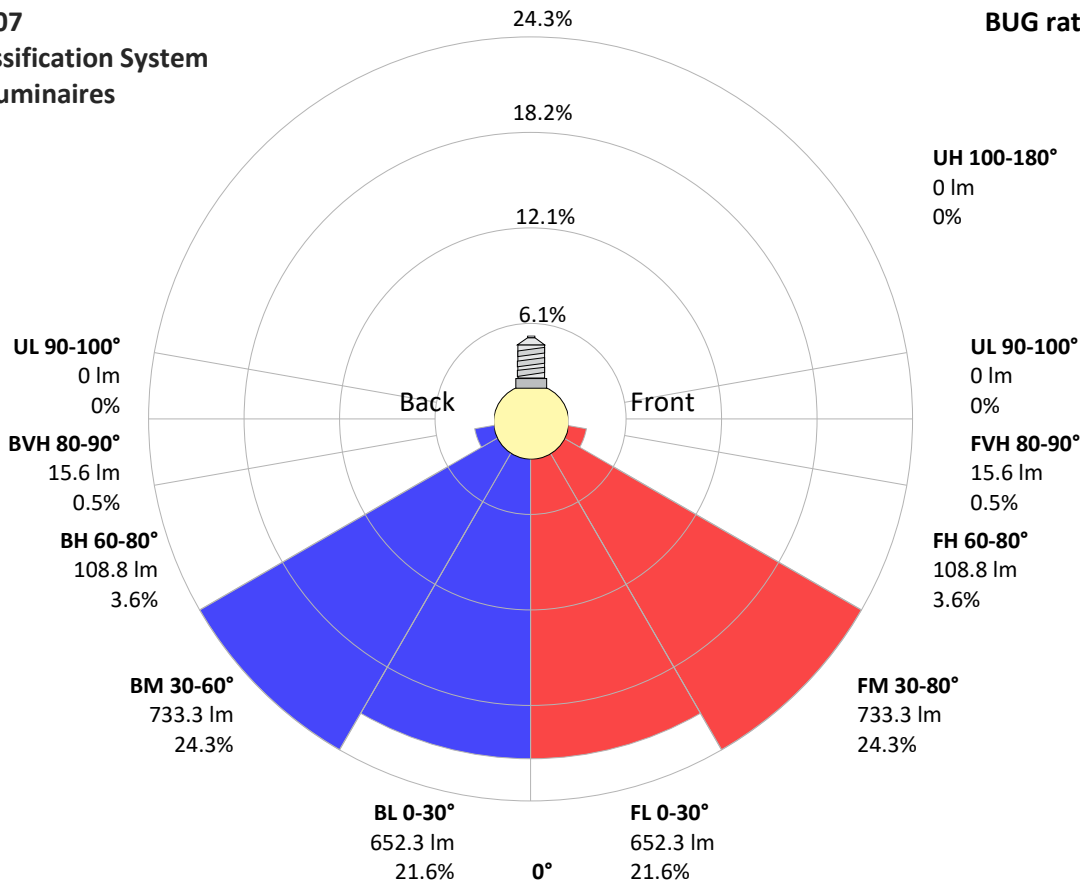
	Lumen	% Total
Forward light		
Low(0-30°)	652 lm	21.6%
Medium(30-60°)	733 lm	24.3%
High(60-80°)	109 lm	3.6%
Very high(80-90°)	16 lm	0.5%
Back light		
Low(0-30°)	652 lm	21.6%
Medium(30-60°)	733 lm	24.3%
High(60-80°)	109 lm	3.6%
Very high(80-90°)	16 lm	0.5%
Uplight		
Low(90-100°)	0 lm	0.0%
High(100-180°)	0 lm	0.0%

Intensity peaks

Max intensity	1693 cd
Intensity, 90°	4 cd
Intensity, 0°	1693 cd

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

BUG rating B2 U1 G1



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Power Details

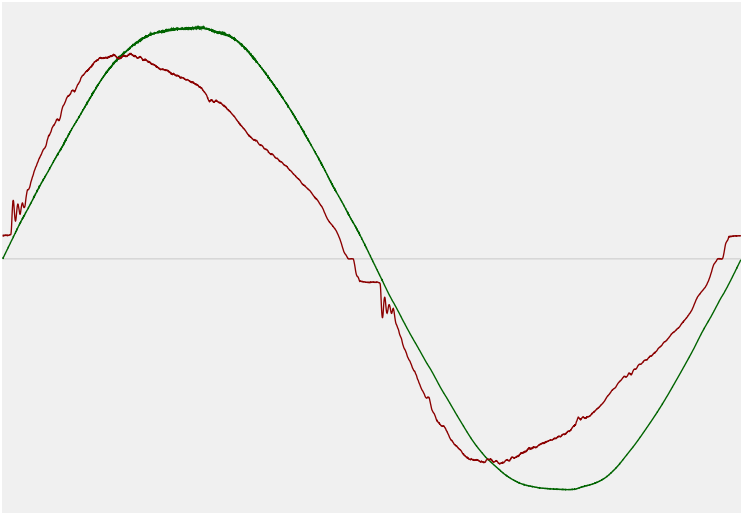
Input Power

Power feed to light source	41.2 W
Frequency of input power	49.9 Hz
RMS Input voltage feed, V_{RMS}	243 V
RMS Input current feed, I_{RMS}	0.176 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	42.7 VA
Displacement factor of AC power feed	0.97
Power factor of AC current feed	0.97
Total harmonic distortion of the current	11.14%
Total harmonic distortion of the voltage	1.4%

Efficiency

Radiated power efficiency	27.0%
<div><div></div></div>	
Lumen efficiency	73 lm/W
<div><div></div></div>	

Input Power Curve



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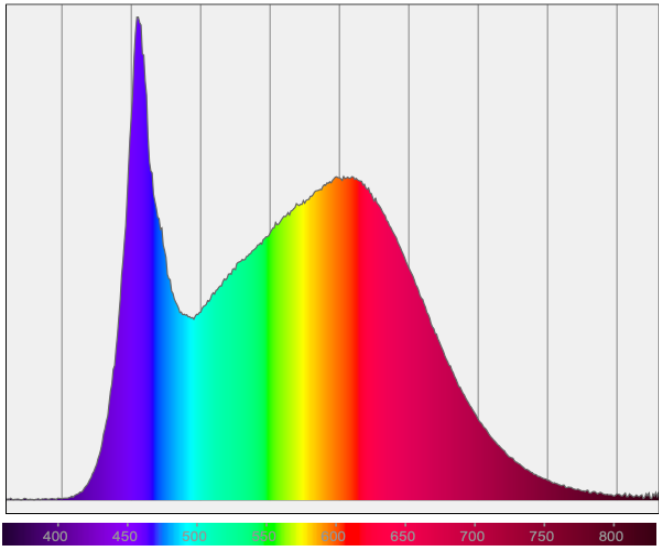
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Color Measurements

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

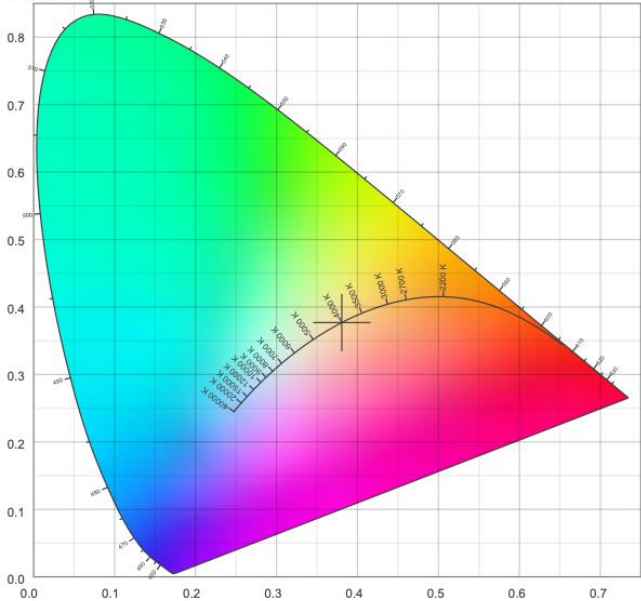
Correlated Color Temperature	CCT = 4000 K	Color coordinates CIE 1931	(x;y) = (0.381;0.377)
Color Rendering Index	CRI 92.6	Color coordinate CIEs 1960	(u;v) = (0.225;0.334)
Color Rendering Index, R9 (red component)	R9 = 72.2	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R _f 88.9 – R _g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

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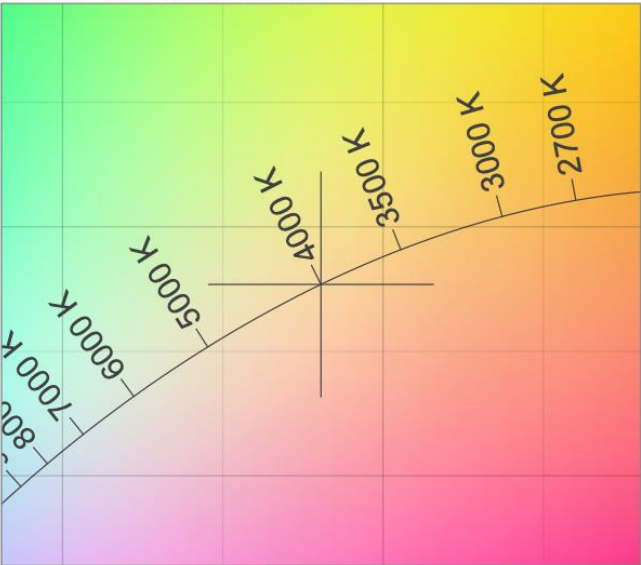
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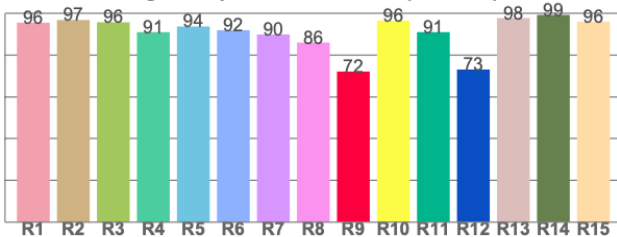
CIE 1931



CIE 1931 – zoomed on Planckian locus



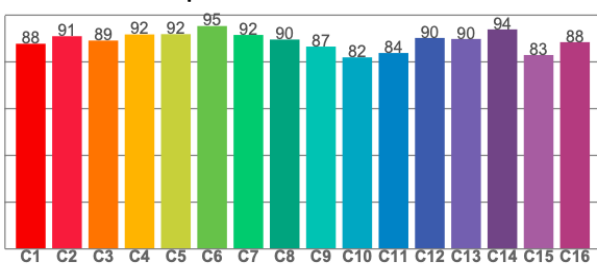
Color Rendering Index per reference color (CIE 1995)



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
95.5	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

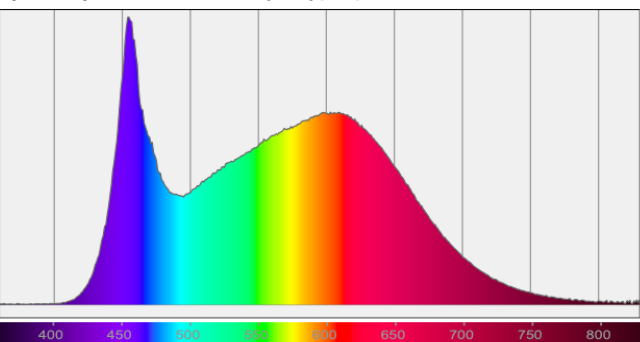
TM30-18 Rf-values per hue bin



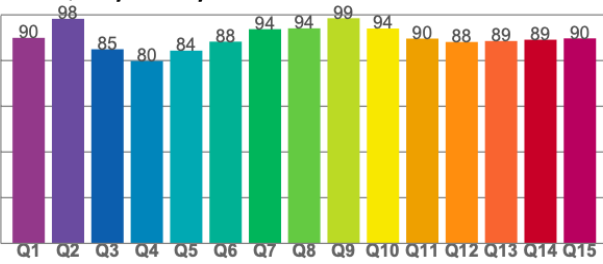
TM30 C values, 16 binned values out of total of 99 C values

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