

Goniophotometry Report

1_PHOT_REFLEKTER-XL-4050lmChip-2700K-38Deg_2303
www.factorylux.com



Tested Light Source - 1_PHOT_REFLEKTER-XL-4050lmChip-2700K-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

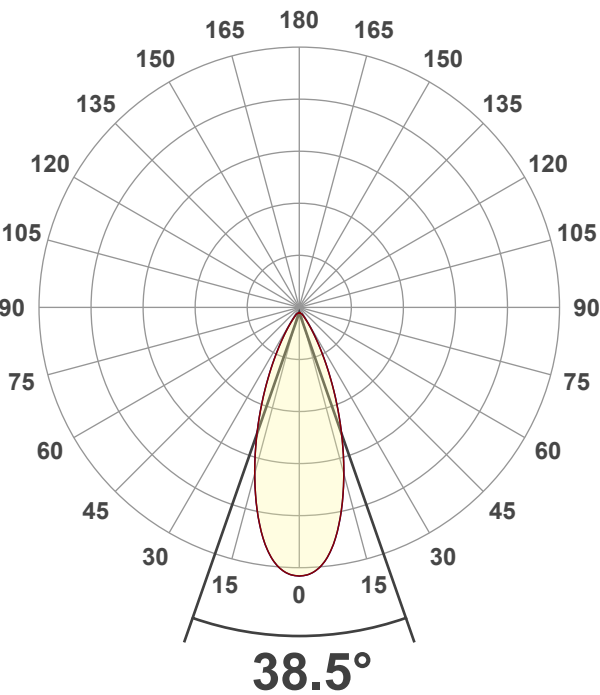
32 planes – 11.25°
1.5°
4.50 m
41.5 W – PF 0.97 – DPF 0.97
241 V – 0.178 A
50 Hz

Main Light Measurement Results

Output
Efficiency
Peak Intensity and Beam Angle
Color Rendering Index

3375 lm
81 lm/W
6430 cd – 38.5°
CRI 92.6

Light Intensity Distribution



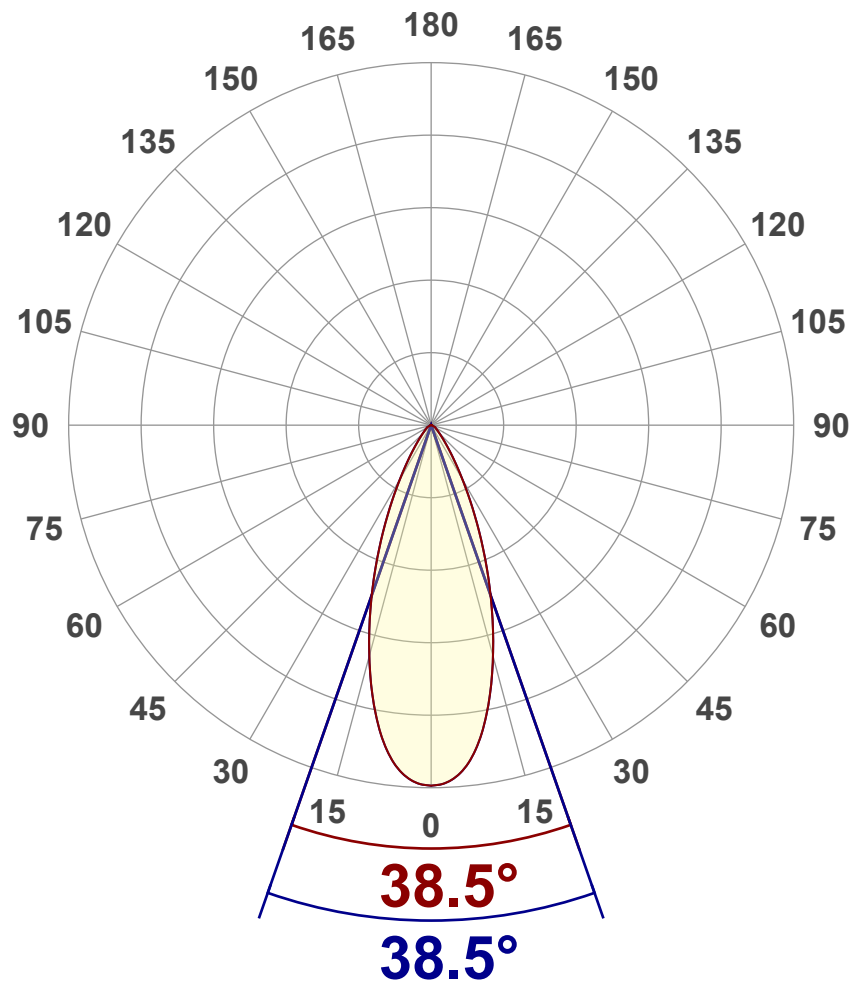
Goniophotometry Report

1_PHOT_REFLEKTER-XL-4050lmChip-2700K-38Deg_2303
www.factorylux.com



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	3375 lm
Peak Intensity	6430 cd
Beam Angle (50%)	38.5°
Beam Angle (90%)	38.5°
Beam Angle (10%)	38.5°

Cut-off Angle

Average 2,5%	97.3°
--------------	-------

Field Angle

Average 10%	69.2°
-------------	-------

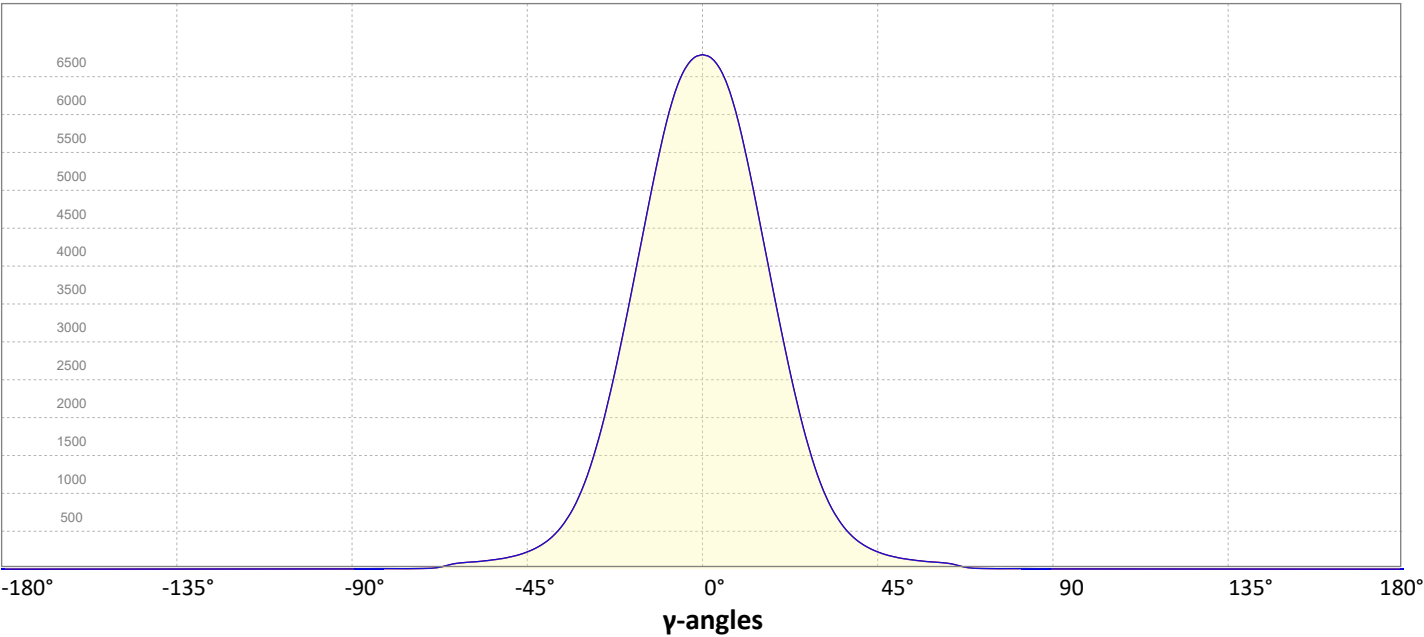
Intensity Ratio

In 120° cone	97.8%
In 90° cone	92.7%

C000-C180

C090-C270

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

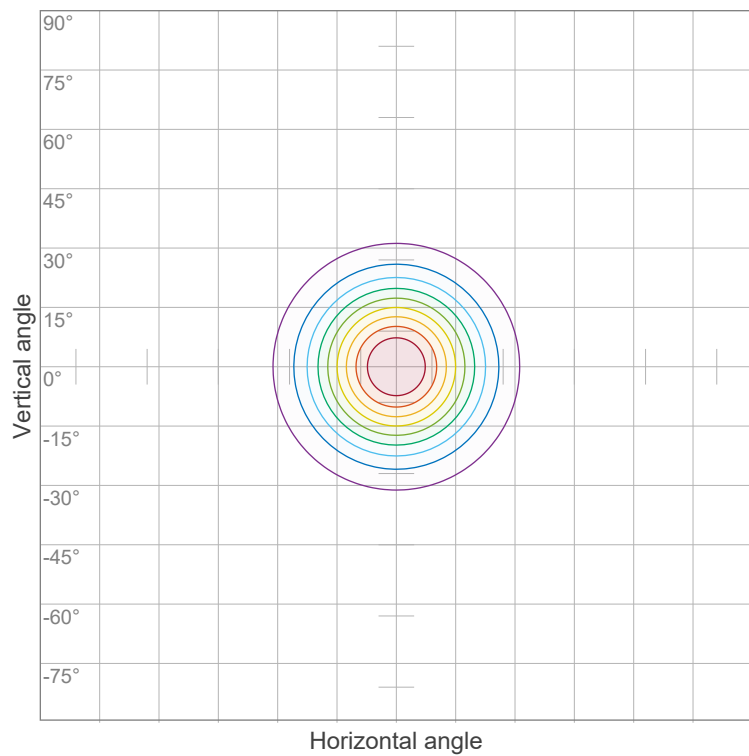


Goniophotometry Report

1_PHOT_REFLEKTER-XL-4050lmChip-2700K-38Deg_2303
www.factorylux.com



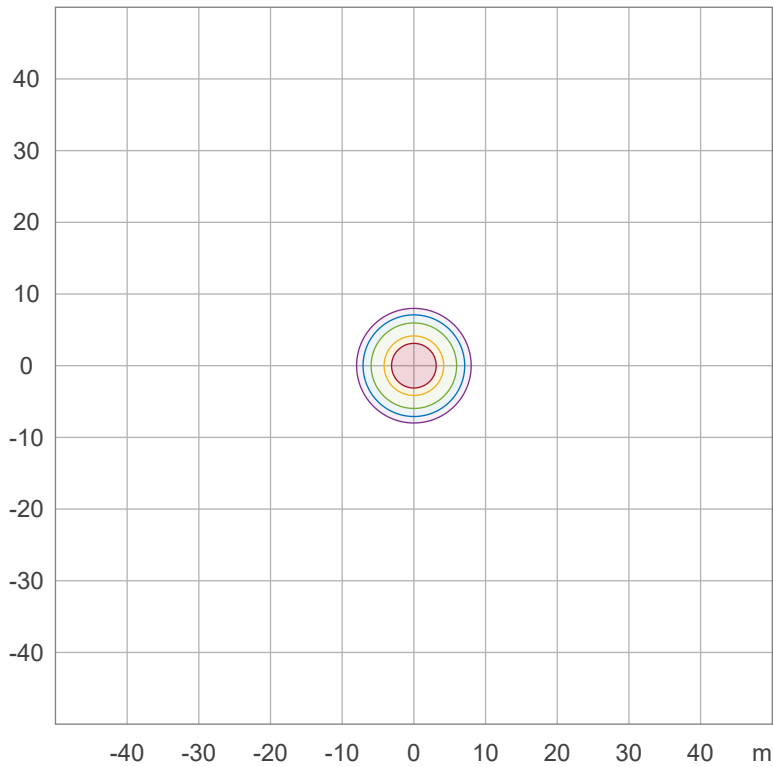
Iso-intensity Diagram (Iso-candela)



90 %	5786.7 cd
80 %	5143.7 cd
70 %	4500.7 cd
60 %	3857.8 cd
50 %	3214.8 cd
40 %	2571.9 cd
30 %	1928.9 cd
20 %	1285.9 cd
10 %	643.0 cd

Peak intensity: 6429.6 cd
Number of c-planes: 32

Iso-illuminance Diagram (Iso-lux)



50.0 %	32.1 lx
30.0 %	19.3 lx
10.0 %	6.4 lx
5.0 %	3.2 lx
3.0 %	1.9 lx

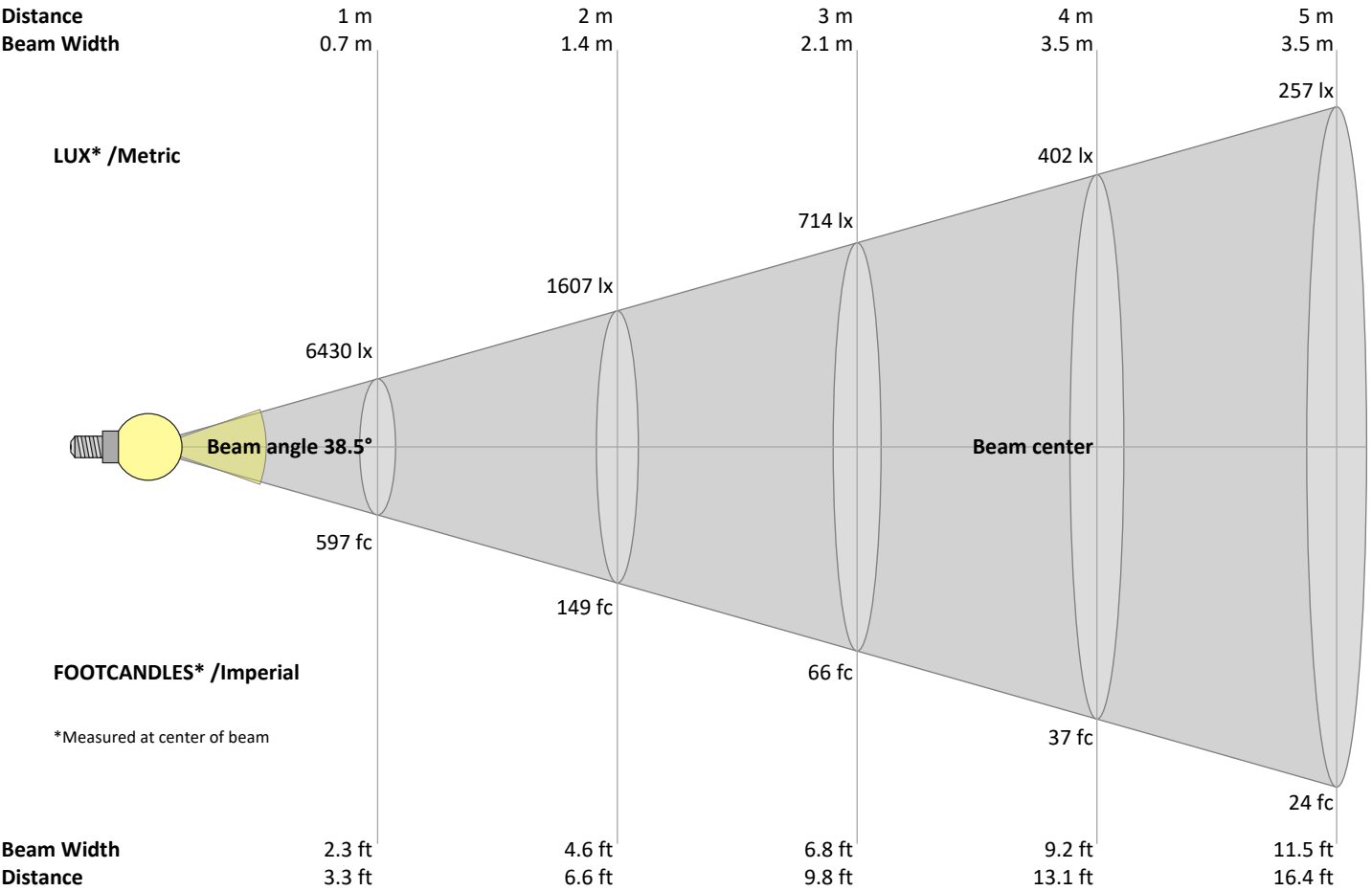
Peak illuminance: 64.3 lx
Mounting height: 10.0 m
Number of c-planes: 32

Goniophotometry Report

1_PHOT_REFLEKTER-XL-4050lmChip-2700K-38Deg_2303
www.factorylux.com



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
6430	1607	714	402	257	179	131	100	79	64	53	45	38	33	29	25	22	20	18	16	lux
597.3	149.3	66.4	37.3	23.9	16.6	12.2	9.3	7.4	6	4.9	4.1	3.5	3	2.7	2.3	2.1	1.8	1.7	1.5	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
6430	6398	6288	6097	5809	5430	4991	4512	4016	3521	3037	2574	2142	1748	1409	1115	879	693	546	434	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
6430	6398	6288	6097	5809	5430	4991	4512	4016	3521	3037	2574	2142	1748	1409	1115	879	693	546	434	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
6430	6398	6288	6097	5809	5430	4991	4512	4016	3521	3037	2574	2142	1748	1409	1115	879	693	546	434	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
6430	6398	6288	6097	5809	5430	4991	4512	4016	3521	3037	2574	2142	1748	1409	1115	879	693	546	434	cd
100%	100%	98%	95%	90%	84%	78%	70%	62%	55%	47%	40%	33%	27%	22%	17%	14%	11%	8%	7%	of 0°val

Goniophotometry Report

1_PHOT_REFLEKTER-XL-4050lmChip-2700K-38Deg_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	21.9	22.5	22.0	22.7	22.9	21.9	22.5	22.0	22.7	22.9
	3H	21.8	22.5	22.2	22.7	22.9	21.8	22.5	22.2	22.7	22.9
	4H	21.7	22.4	22.1	22.7	22.9	21.7	22.4	22.1	22.7	22.9
	6H	21.8	22.3	22.0	22.6	23.0	21.8	22.3	22.0	22.6	23.0
	8H	21.7	22.3	22.0	22.6	23.0	21.7	22.3	22.0	22.6	23.0
	12H	21.7	22.2	22.0	22.6	23.0	21.7	22.2	22.0	22.6	23.0
4H	2H	21.8	22.5	22.2	22.8	23.0	21.8	22.5	22.2	22.8	23.0
	3H	21.9	22.5	22.3	22.8	23.2	21.9	22.5	22.3	22.8	23.2
	4H	21.8	22.3	22.2	22.7	23.2	21.8	22.3	22.2	22.7	23.2
	6H	21.7	22.3	22.2	22.6	23.0	21.7	22.3	22.2	22.6	23.0
	8H	21.7	22.2	22.2	22.6	22.9	21.7	22.2	22.2	22.6	22.9
	12H	21.7	22.1	22.2	22.5	22.9	21.7	22.1	22.2	22.5	22.9
8H	4H	21.7	22.2	22.2	22.5	22.9	21.7	22.2	22.2	22.5	22.9
	6H	21.7	22.0	22.2	22.5	23.0	21.7	22.0	22.2	22.5	23.0
	8H	21.7	22.0	22.2	22.5	23.1	21.7	22.0	22.2	22.5	23.1
	12H	21.7	21.9	22.3	22.4	23.0	21.7	21.9	22.3	22.4	23.0
12H	4H	21.6	22.0	22.1	22.4	22.9	21.6	22.0	22.1	22.4	22.9
	6H	21.7	21.9	22.2	22.4	23.1	21.7	21.9	22.2	22.4	23.1
	8H	21.6	21.9	22.2	22.4	23.0	21.6	21.9	22.2	22.4	23.0

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

Goniophotometry Report

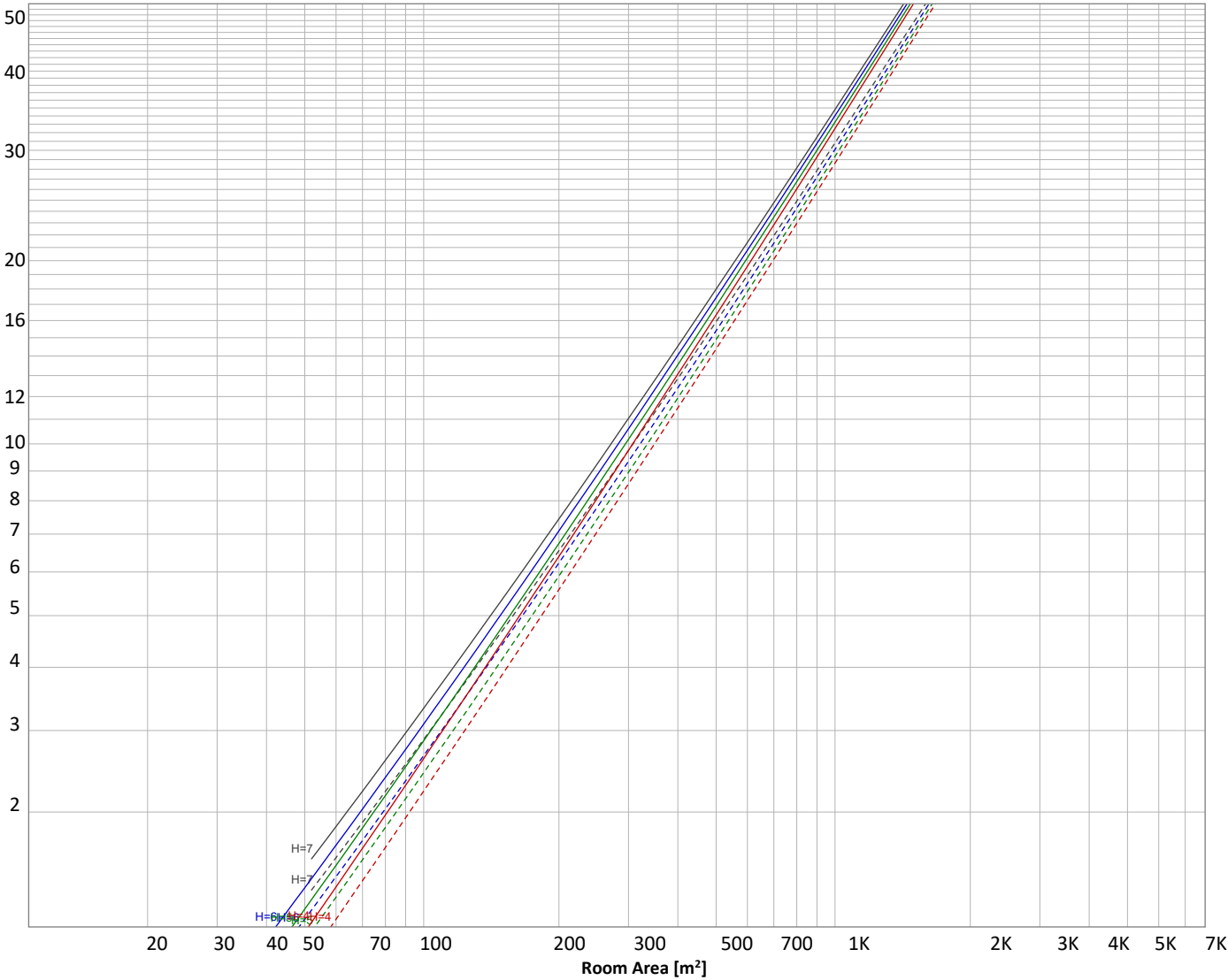
1_PHOT_REFLEKTER-XL-4050lmChip-2700K-38Deg_2303
www.factorylux.com



Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 3375 lm	ρ(%)		
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°
569 lm	1168 lm	891 lm	401 lm	172 lm	99.2 lm	49.4 lm	8.08 lm	6.11 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
2.96 lm	2.87 lm	2.69 lm	2.43 lm	0.959 lm	0.000 lm	0.000 lm	0.000 lm	0.000 lm

Goniophotometry Report

1_PHOT_REFLEKTER-XL-4050lmChip-2700K-38Deg_2303
www.factorylux.com



Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	569 lm	16.8%
10-20°	1168 lm	34.6%
20-30°	891 lm	26.4%
30-40°	401 lm	11.9%
40-50°	172 lm	5.1%
50-60°	99 lm	2.9%
60-70°	49 lm	1.5%
70-80°	8 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°	2 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	3375 lm	100.0%

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	2627 lm	77.8%
0-40°	3028 lm	89.7%
0-60°	3299 lm	97.8%
60-90°	64 lm	1.9%
70-100°	17 lm	0.5%
90-120°	9 lm	0.3%
0-90°	3363 lm	99.6%
90-180°	12 lm	0.4%
0-180°	3375 lm	100.0%

BUG rating

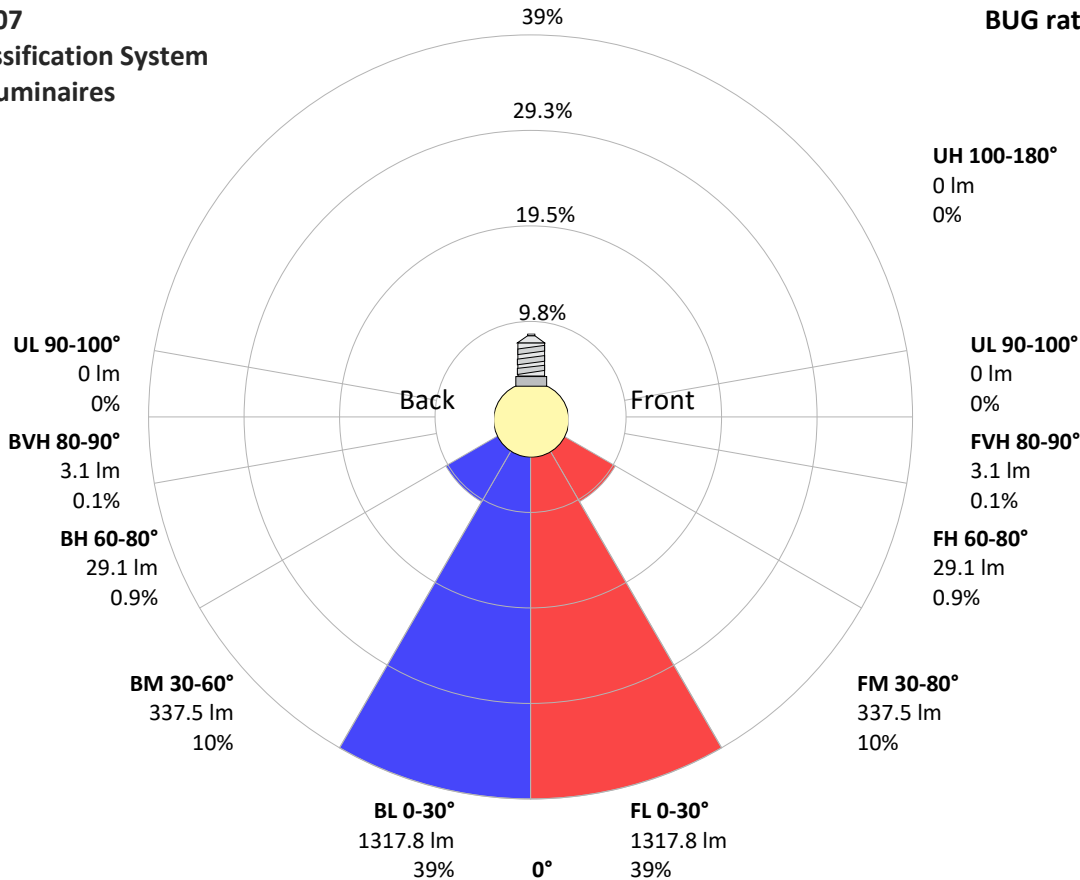
	Lumen	% Total
Forward light		
Low(0-30°)	1318 lm	39.0%
Medium(30-60°)	338 lm	10.0%
High(60-80°)	29 lm	0.9%
Very high(80-90°)	3 lm	0.1%
Back light		
Low(0-30°)	1318 lm	39.0%
Medium(30-60°)	338 lm	10.0%
High(60-80°)	29 lm	0.9%
Very high(80-90°)	3 lm	0.1%
Uplight		
Low(90-100°)	0 lm	0.0%
High(100-180°)	0 lm	0.0%

Intensity peaks

Max intensity	6430 cd
Intensity, 90°	3 cd
Intensity, 0°	6430 cd

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

BUG rating B3 U1 G0



Goniophotometry Report

1_PHOT_REFLEKTER-XL-4050lmChip-2700K-38Deg_2303
www.factorylux.com



Power Details

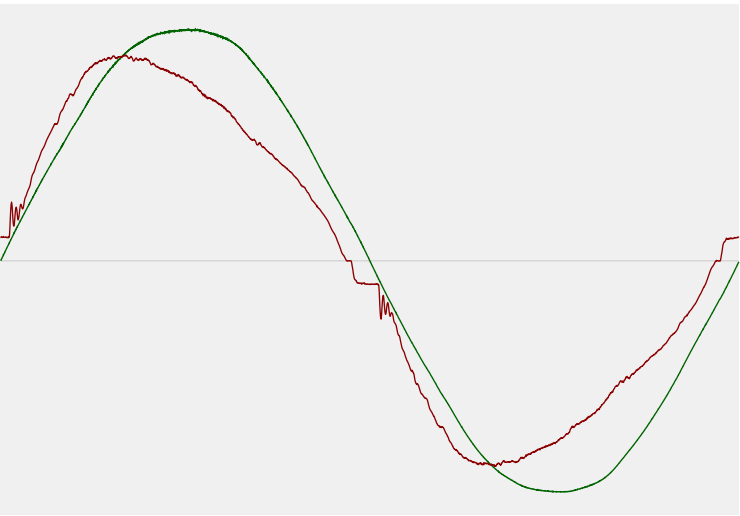
Input Power

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	29.5%
<div><div></div></div>	
Lumen efficiency	81 lm/W
<div><div></div></div>	

Input Power Curve



Goniophotometry Report

1_PHOT_REFLEKTER-XL-4050lmChip-2700K-38Deg_2303
www.factorylux.com



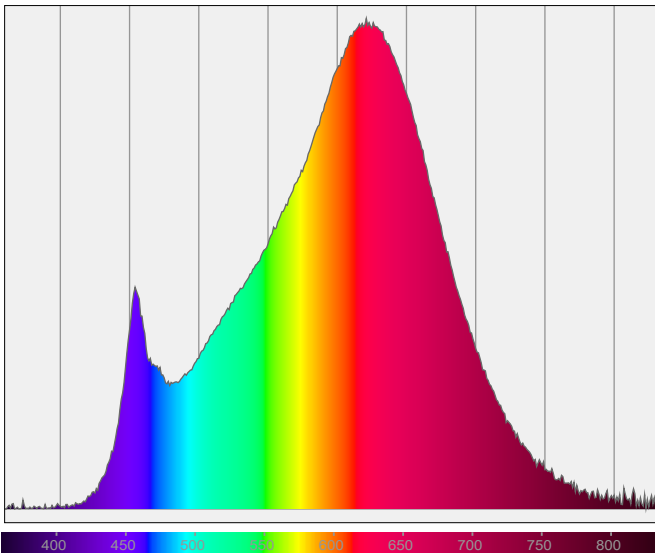
Color Measurements

Correlated Color Temperature CCT = 2700 K

Color Rendering TM30-18 R_f 91.5 — R_g 99.6

Color Shift, CIE duv Duv ±0.0003

Spectral distribution



Color details

Correlated Color Temperature	CCT = 2700 K	Color coordinates CIE 1931	(x;y) = (0.460;0.411)
Color Rendering Index	CRI 92.6	Color coordinate CIEs 1960	(u;v) = (0.263;0.352)
Color Rendering Index, R9 (red component)	R9 = 61.7	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R _f 91.5 — R _g 99.6	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.263;0.263)
Color Quality Scale	CQS = 89.9		

Goniophotometry Report

1_PHOT_REFLEKTER-XL-4050lmChip-2700K-38Deg_2303
www.factorylux.com



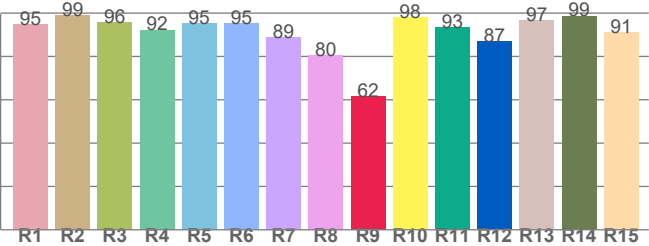
CIE 1931



CIE 1931 – zoomed on Planckian locus



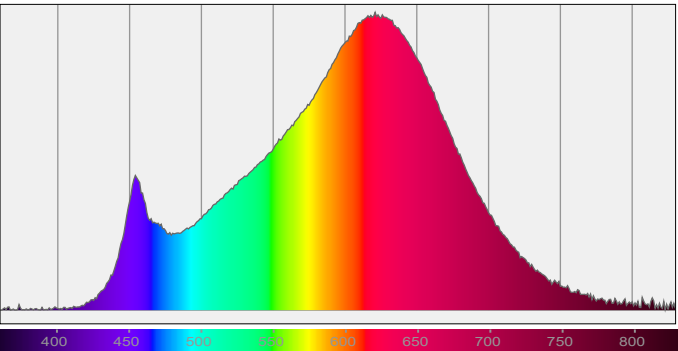
Color Rendering Index per reference color (CIE 1995)



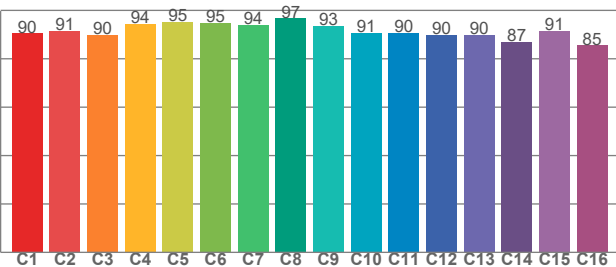
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
94.7	98.8	95.6	92.3	95.2	95.3	88.7	80.4	61.7	98.1	93.3	87.0	96.6	98.7	91.0

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



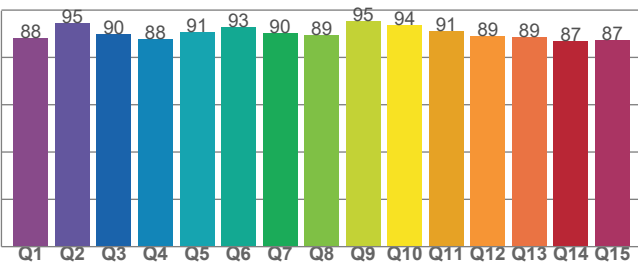
TM30-18 Rf-values per hue bin



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
90.4	91.5	89.7	94.4	95.3	94.9	93.8	96.7	93.5	90.6	90.5	89.7	89.7	87.0	91.4	85.5

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
88.0	94.5	89.7	87.8	90.8	92.9	90.1	89.3	95.2	93.7	90.9	89.0	88.6	87.0	87.1