Light Measurement Report

Print date: 5-11-2025
Measurement date and time: 4-11-2025 17:14:44 – Measurement no. VFR-251104-3917-MS
Measurement tracking No. and Link: VT251104-001466
Operator:

Laboratory and Equipment

Laboratory Owner and Location	Viso Systems, Copenhagen V, Denmark
Goniospectrometer System and Type	LabSpion – Type C, horizontal
Sensor Name, Calibr. Date and Serial No.	LabSensor Model2 – 11-1-2024 – 3130191315
Spectrometer Manufacturer and Model	Ibsen Photonics, Denmark – Freedom VIS (Custom Viso)

Measurement Conditions

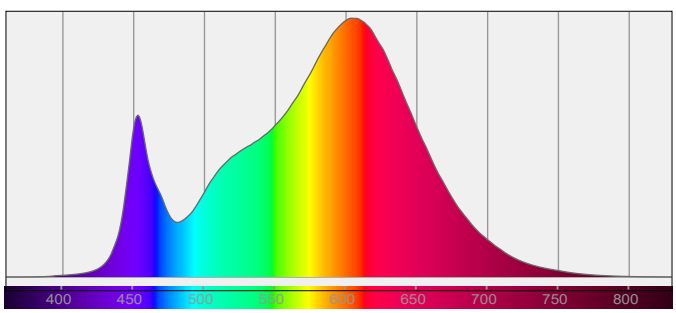
Number of C-planes and Resolution	32 planes – 11,25°
γ (gamma)-Resolution	5°
Test Distance	1,99 m
Input Power, Power and Displ. Factors	4,0 W – PF 0,79 – DPF 0,84
Input RMS Voltage and Current	230 V – 0,022 A
Frequency of Input Power	50 Hz
Warm-up Time and Variation	Lamp stabilized in 15 min 1 sec – 2,0%

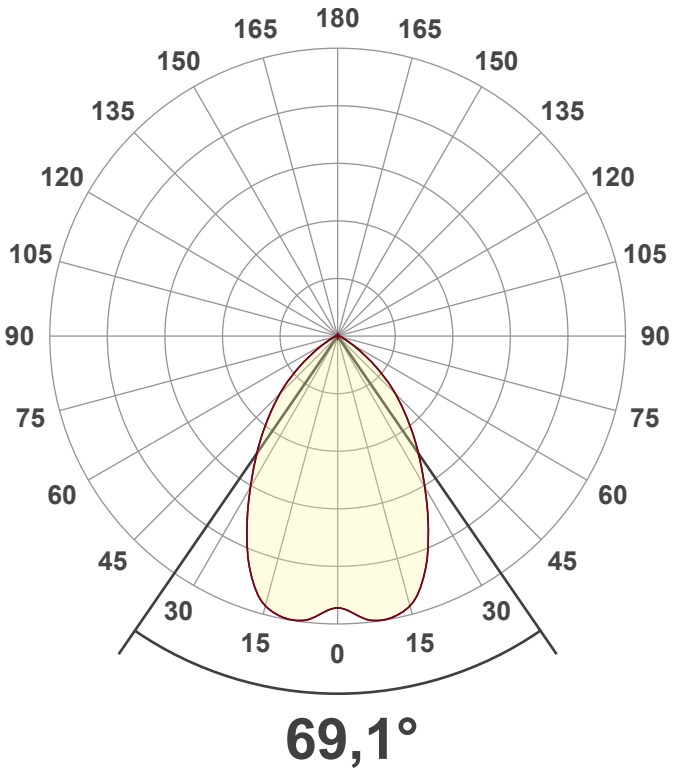
Tested Light Source

Product Name	813512-3000K
Item No. and Manufacturer	813512-3000K – Dutchfulfillment
Product Description (line 1)	LED INBOUWSPOT | MIMI | 4W | DIM | ZWART | CCT-SWITCH | IP65

Main Light Measurement Results

Output – Total Lumen (Up% / Down%)	519 lm – 0,52% / 99,48%
Efficiency	128 lm/W
Peak Intensity and Beam Angle	370 cd – 69,1°
Correlated Color Temperature, Target/Measured	CCT = 3000 K / 3035 K
Color Rendering Index	CRI 84,7
Color Rendering TM30-18	R_f 85,6 – R_g 96,4
Color Shift, CIE duv and MacAdam Steps	Duv -0,0027 – SDCM 3,2
Flicker	SVM 0,01 – PstLM 0,06





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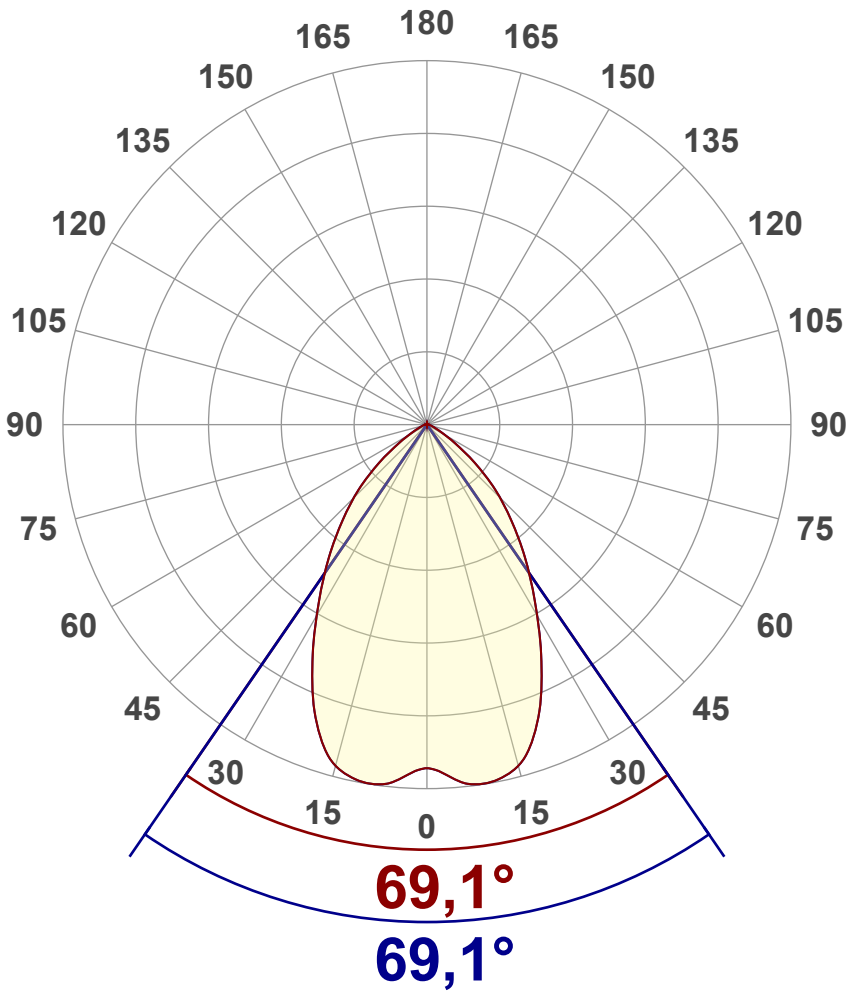
Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	519 lm
Lumen Up% / Down%	0,52% / 99,48%
Peak Intensity	370 cd
Beam Angle (50%)	69,1°
Beam Angle (90%)	69,1°
Beam Angle (10%)	69,1°

Cut-off Angle

Average 2,5%	134,3°

Field Angle

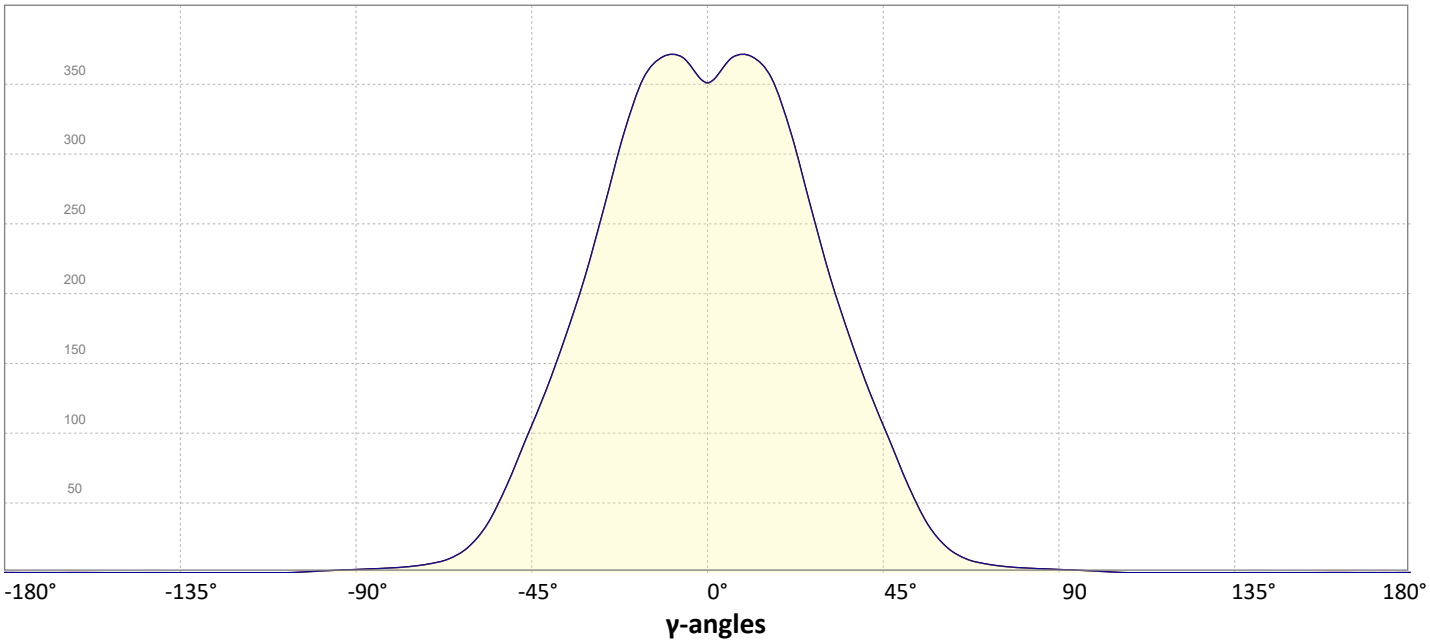
Average 10%	112°

Intensity Ratio

In 120° cone	95,4%
In 90° cone	81,1%

C000-C180
C090-C270

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



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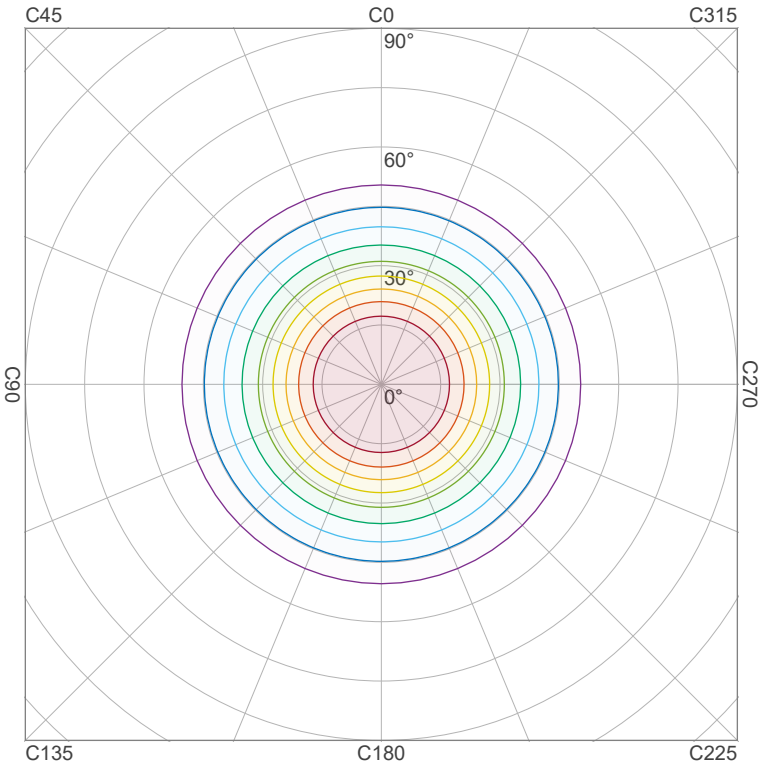
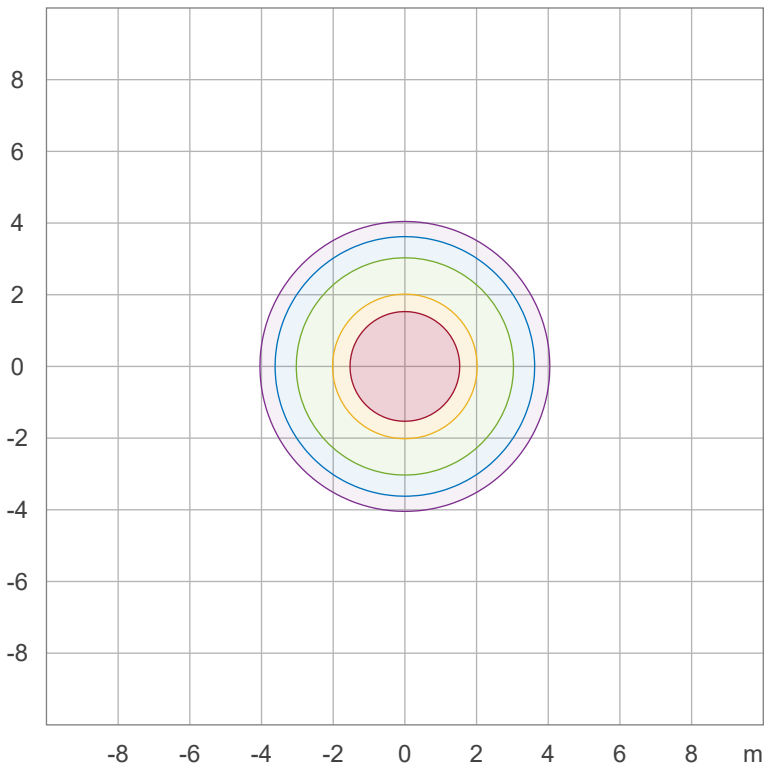
Iso-intensity Diagram (Iso-candela)



90 %	332,7 cd
80 %	295,7 cd
70 %	258,8 cd
60 %	221,8 cd
50 %	184,8 cd
40 %	147,9 cd
30 %	110,9 cd
20 %	73,9 cd
10 %	37,0 cd

Peak intensity: 369,7 cd
Number of c-planes: 32

Iso-illuminance Diagram (Iso-lux)



50,0 %	20,1 lx
30,0 %	12,1 lx
10,0 %	4,0 lx
5,0 %	2,0 lx
3,0 %	1,2 lx

Peak illuminance: 40,2 lx
Mounting height: 3,0 m
Number of c-planes: 32

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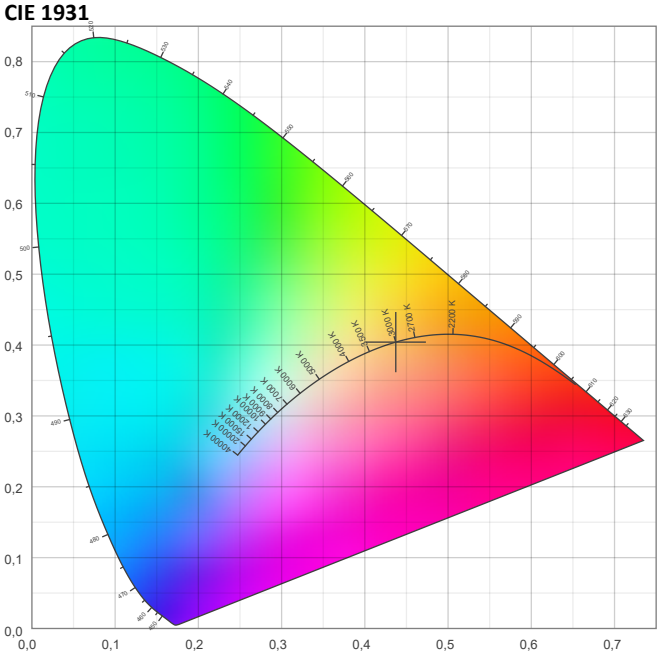
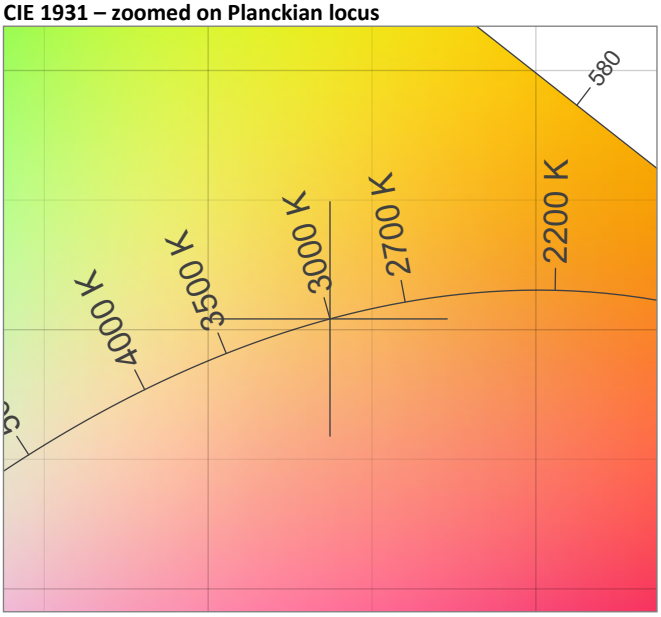
Color details

Correlated Color Temperature, Target	CCT = 3000 K
Correlated Color Temperature, Measured	CCT = 3035 K
Color Rendering Index	CRI 84,7
Color Rendering Index, R9 (red component)	R9 = 14,9
Color Rendering TM30-18	R_f 85,6 – R_g 96,4
Color Quality Scale	CQS = 83,2
MacAdam Steps	SDCM = 3,2
Color coordinates CIE 1931	(x;y) = (0,437;0,404)
Color coordinate CIEs 1960	(u;v) = (0,251;0,348)
Color deviation from BBL	Duv = -0,0027
Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0,251;0,521)

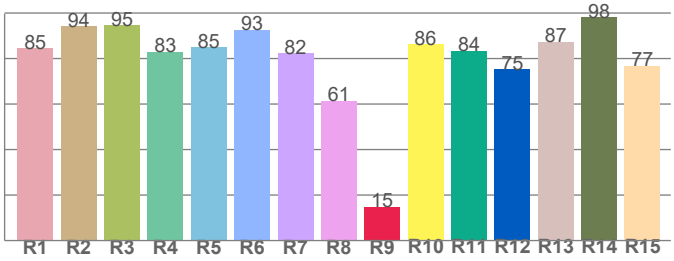
CIE 1931



CIE 1931 – zoomed on Planckian locus



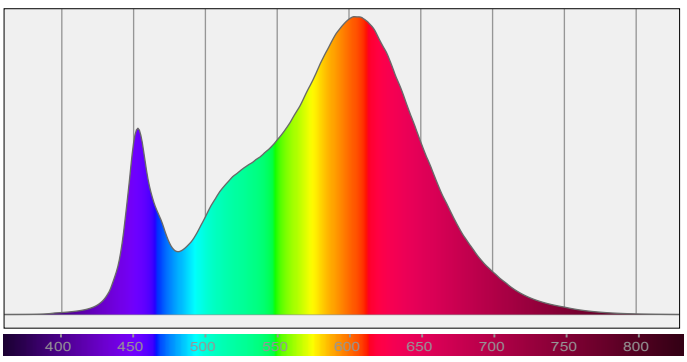
Color Rendering Index per reference color (CIE 1995)



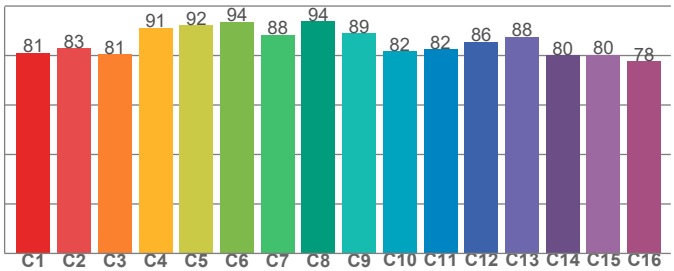
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
84,5	94,1	94,7	83,0	84,9	92,7	82,2	61,4	14,9	86,3	83,5	75,2	87,3	98,0	76,8

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



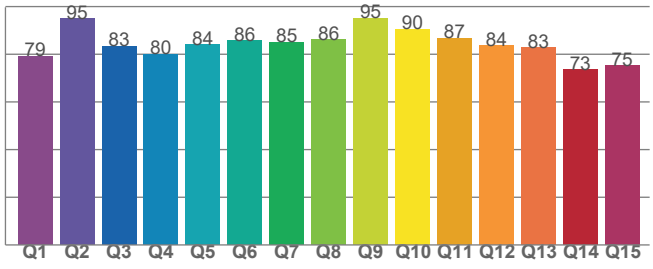
TM30-18 Rf-values per hue bin



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
81,1	82,8	80,5	91,2	92,1	93,7	88,4	93,8	89,0	81,7	82,5	85,6	87,5	80,2	80,4	77,7

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
79,2	94,9	83,3	80,1	83,9	85,7	85,0	86,1	95,2	90,5	86,7	83,6	82,7	73,5	75,2

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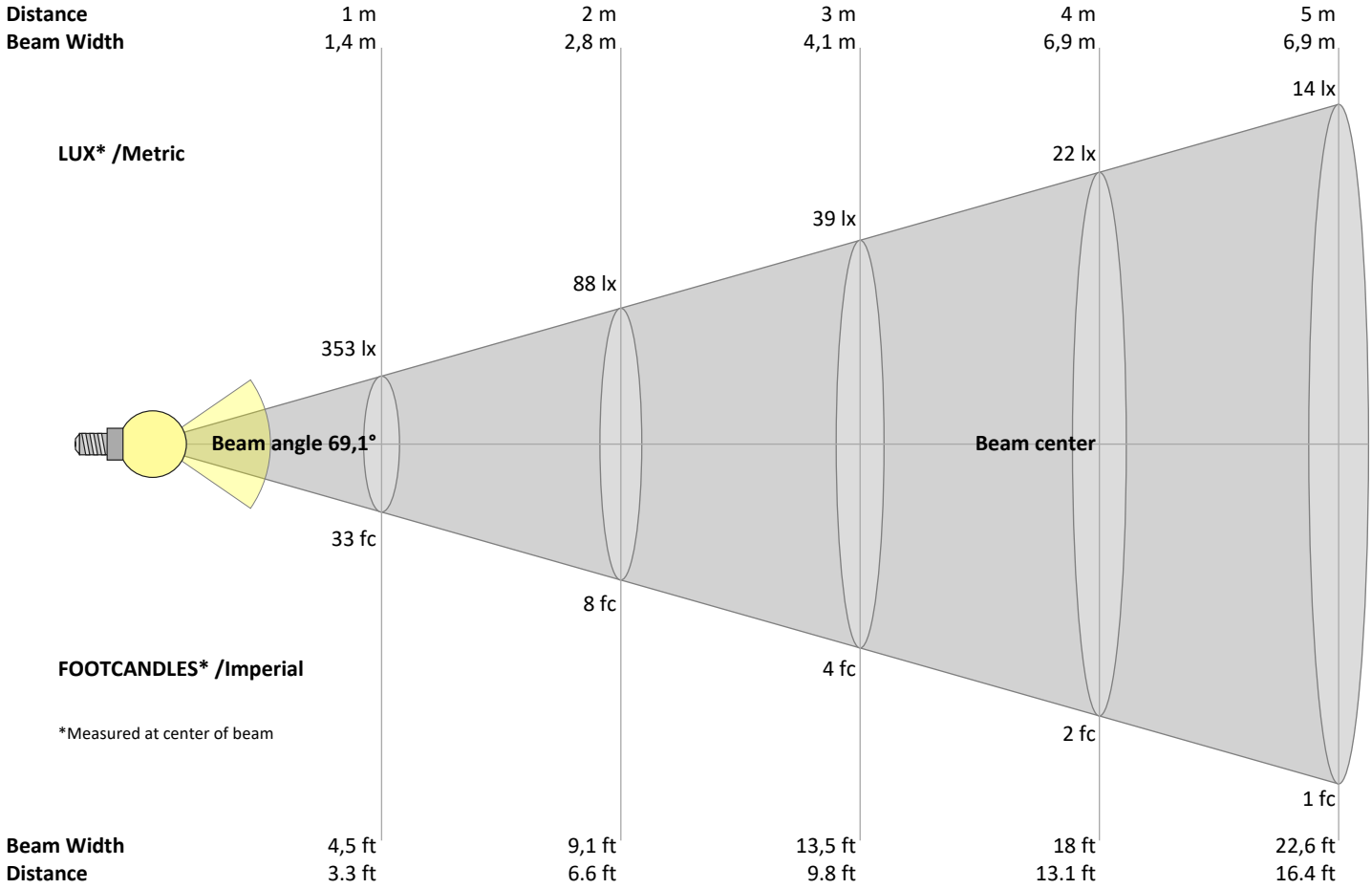
Beam Details



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
353	88	39	22	14	10	7	6	4	4	3	2	2	2	2	1	1	1	1	1	lux
32,8	8,2	3,6	2	1,3	0,9	0,7	0,5	0,4	0,3	0,3	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	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
353	365	370	359	326	277	226	181	141	106	72	43	23	12	7	5	4	3	2	2	cd
100%	103%	105%	102%	92%	79%	64%	51%	40%	30%	20%	12%	6%	3%	2%	1%	1%	1%	1%	1%	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
353	365	370	359	326	277	226	181	141	106	72	43	23	12	7	5	4	3	2	2	cd
100%	103%	105%	102%	92%	79%	64%	51%	40%	30%	20%	12%	6%	3%	2%	1%	1%	1%	1%	1%	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
353	365	370	359	326	277	226	181	141	106	72	43	23	12	7	5	4	3	2	2	cd
100%	103%	105%	102%	92%	79%	64%	51%	40%	30%	20%	12%	6%	3%	2%	1%	1%	1%	1%	1%	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
353	365	370	359	326	277	226	181	141	106	72	43	23	12	7	5	4	3	2	2	cd
100%	103%	105%	102%	92%	79%	64%	51%	40%	30%	20%	12%	6%	3%	2%	1%	1%	1%	1%	1%	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		**Viewed Crosswise** (Viewing direction orthogonal to lamp length axis)					**Viewed Endwise** (Viewing direction parallel to lamp length axis)				
X	**Y**										
2H	2H	27,0	27,9	27,2	28,2	28,4	27,0	27,9	27,2	28,2	28,4
	3H	26,9	27,9	27,3	28,1	28,3	26,9	27,9	27,3	28,1	28,3
	4H	26,9	27,8	27,3	28,0	28,3	26,9	27,8	27,3	28,0	28,3
	6H	26,9	27,7	27,2	28,0	28,4	26,9	27,7	27,2	28,0	28,4
	8H	26,9	27,7	27,3	28,0	28,4	26,9	27,7	27,3	28,0	28,4
	12H	26,9	27,6	27,3	28,0	28,4	26,9	27,6	27,3	28,0	28,4
4H	2H	26,9	27,8	27,3	28,0	28,3	26,9	27,8	27,3	28,0	28,3
	3H	27,0	27,7	27,3	28,0	28,5	27,0	27,7	27,3	28,0	28,5
	4H	26,9	27,6	27,3	28,0	28,5	26,9	27,6	27,3	28,0	28,5
	6H	26,9	27,6	27,4	27,9	28,3	26,9	27,6	27,4	27,9	28,3
	8H	26,9	27,5	27,4	27,9	28,3	26,9	27,5	27,4	27,9	28,3
	12H	26,9	27,4	27,4	27,8	28,3	26,9	27,4	27,4	27,8	28,3
8H	4H	26,8	27,4	27,3	27,8	28,2	26,8	27,4	27,3	27,8	28,2
	6H	26,9	27,3	27,4	27,8	28,3	26,9	27,3	27,4	27,8	28,3
	8H	27,0	27,3	27,5	27,8	28,5	27,0	27,3	27,5	27,8	28,5
	12H	27,0	27,3	27,6	27,8	28,4	27,0	27,3	27,6	27,8	28,4
12H	4H	26,8	27,3	27,3	27,7	28,2	26,8	27,3	27,3	27,7	28,2
	6H	26,9	27,3	27,4	27,8	28,4	26,9	27,3	27,4	27,8	28,4
	8H	26,9	27,2	27,5	27,7	28,4	26,9	27,2	27,5	27,7	28,4

Variations with the observer position for the luminaire spacings, S:		
S = 1.0H	1,0 / -1,9	1,0 / -1,9
S = 1.5H	2,4 / -4,1	2,4 / -4,1
S = 2.0H	4,0 / -5,4	4,0 / -5,4

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	112	109	105	103	109	106	104	101	102	100	98	98	96	95	95	93	92	90
2	105	99	94	90	102	97	93	89	94	90	87	90	87	85	88	85	83	81
3	98	90	84	79	96	89	83	79	86	81	77	83	79	76	81	78	75	73
4	92	83	76	71	90	81	75	70	79	74	69	77	72	68	75	71	68	66
5	86	76	69	64	84	75	68	63	73	67	63	71	66	62	69	65	61	60
6	81	70	63	58	79	69	62	58	67	62	57	66	61	57	64	60	56	54
7	76	65	58	53	74	64	57	53	63	57	52	61	56	52	60	55	52	50
8	71	60	53	48	70	60	53	48	58	52	48	57	52	48	56	51	47	46
9	67	56	49	45	66	56	49	44	55	48	44	53	48	44	53	48	44	42
10	64	52	46	41	63	52	46	41	51	45	41	50	45	41	49	44	41	39

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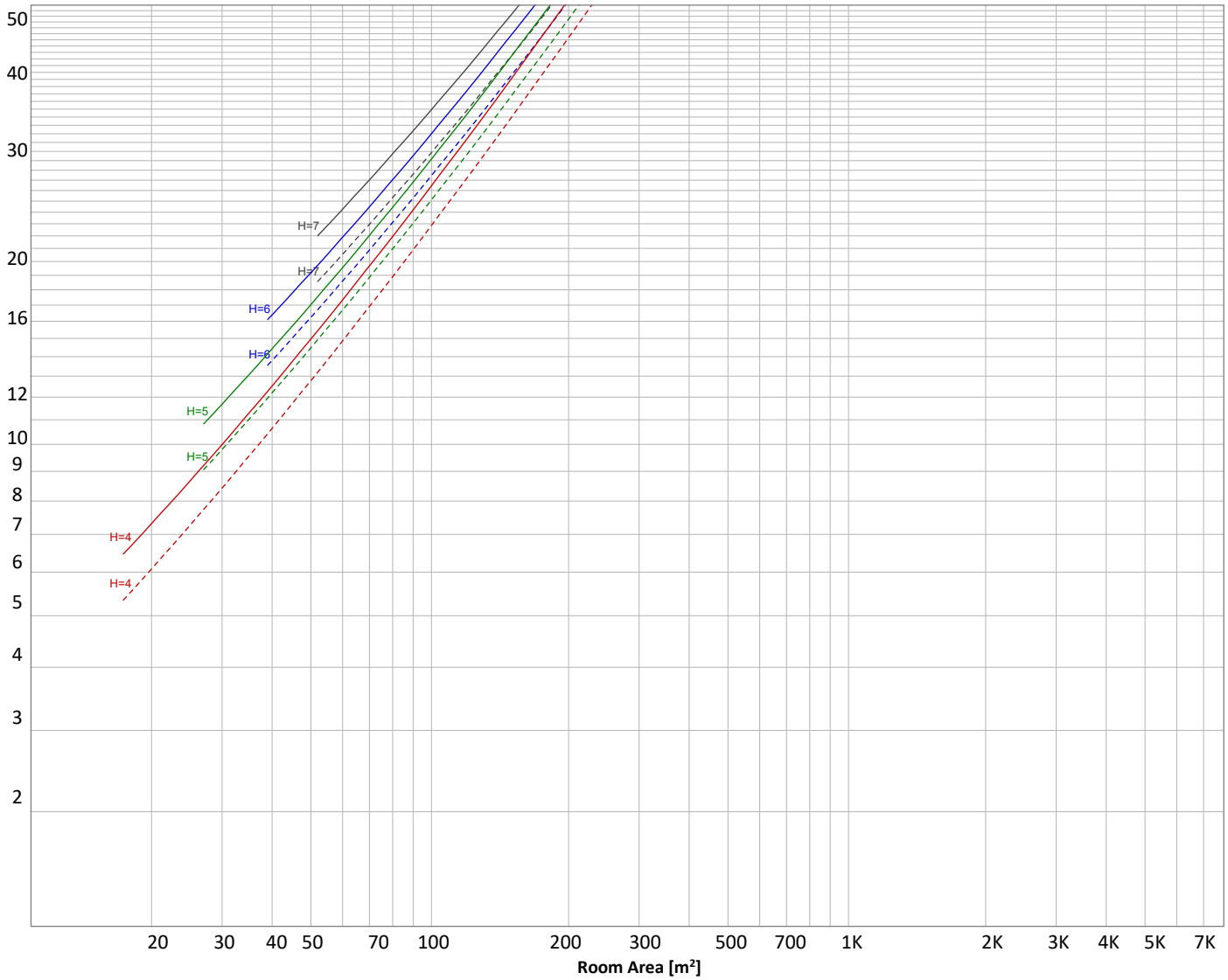
Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 519 lm		ρ(%)		
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°
35,0 lm	100 lm	127 lm	113 lm	81,2 lm	38,8 lm	12,4 lm	5,30 lm	3,22 lm

90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
1,92 lm	0,458 lm	0,037 lm	0,045 lm	0,066 lm	0,071 lm	0,060 lm	0,045 lm	0,014 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen		% Total
0-10°	{LUM00-10}	lm	#VALUE!
10-20°	{LUM10-20}	lm	#VALUE!
20-30°	{LUM20-30}	lm	#VALUE!
30-40°	{LUM30-40}	lm	#VALUE!
40-50°	{LUM40-50}	lm	#VALUE!
50-60°	{LUM50-60}	lm	#VALUE!
60-70°	{LUM60-70}	lm	#VALUE!
70-80°	{LUM70-80}	lm	#VALUE!
80-90°	{LUM80-90}	lm	#VALUE!
90-100°	{LUM90-100}	lm	#VALUE!
100-110°	{LUM100-110}	lm	#VALUE!
110-120°	{LUM110-120}	lm	#VALUE!
120-130°	{LUM120-130}	lm	#VALUE!
130-140°	{LUM130-140}	lm	#VALUE!
140-150°	{LUM140-150}	lm	#VALUE!
150-160°	{LUM150-160}	lm	#VALUE!
160-170°	{LUM160-170}	lm	#VALUE!
170-180°	{LUM170-180}	lm	#VALUE!
Total	0	lm	#VALUE!

Zonal Lumen summary

Zone (γ)	Lumen		% Total
0-30°	{LUM00-30}	lm	#VALUE!
0-40°	{LUM00-40}	lm	#VALUE!
0-60°	{LUM00-60}	lm	#VALUE!
60-90°	{LUM60-90}	lm	#VALUE!
70-100°	{LUM70-100}	lm	#VALUE!
90-120°	{LUM90-120}	lm	#VALUE!
0-90°	{LUM00-90}	lm	#VALUE!
90-180°	{LUM90-180}	lm	#VALUE!
0-180°	{LUM00-180}	lm	#VALUE!

Intensity peaks

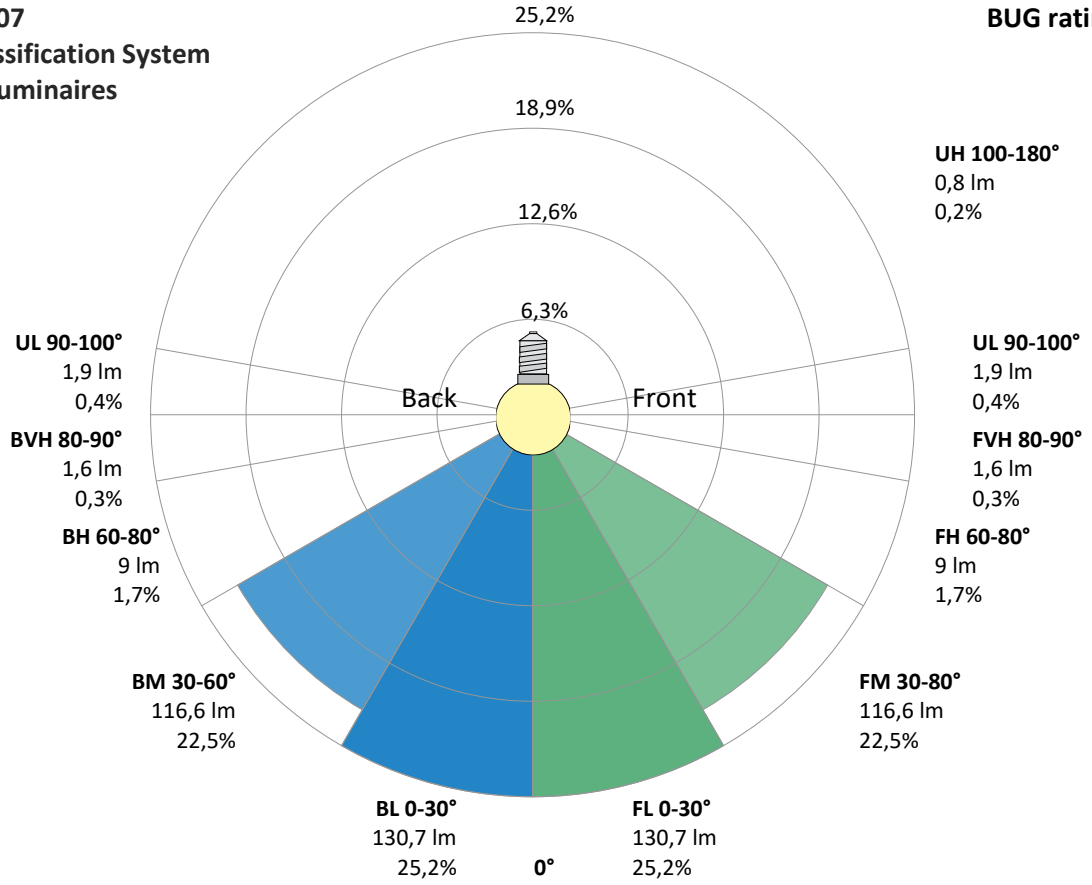
Max intensity	{PEAK}	cd
Intensity, 90°	{INT90}	cd
Intensity, 0°	{INT0}	cd

BUG rating

	Lumen		% Total
Forward light			
Low(0-30°)	{BUG0}	lm	#VALUE!
Medium(30-60°)	{BUG1}	lm	#VALUE!
High(60-80°)	{BUG2}	lm	#VALUE!
Very high(80-90°)	{BUG3}	lm	#VALUE!
Back light			
Low(0-30°)	{BUG4}	lm	#VALUE!
Medium(30-60°)	{BUG5}	lm	#VALUE!
High(60-80°)	{BUG6}	lm	#VALUE!
Very high(80-90°)	{BUG7}	lm	#VALUE!
Uplight			
Low(90-100°)	{BUG8}	lm	#VALUE!
High(100-180°)	{BUG9}	lm	#VALUE!

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

BUG rating B1 U1 G0



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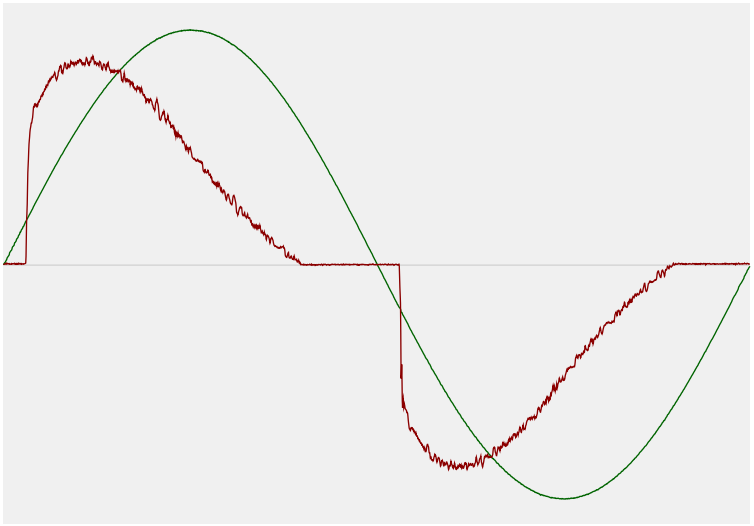
Power Details

Input Power

Power feed to light source	4,0 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,022 A
Volt-Ampere or apparent power = V_{RMS}*I_{RMS}	5,13 VA
Displacement factor of AC power feed	0,84
Power factor of AC current feed	0,79
Total harmonic distortion of the current	38,21%
Total harmonic distortion of the voltage	0,07%

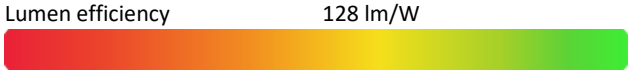
Input Power Curve



Efficiency

Radiated power efficiency 39,5%

Lumen efficiency 128 lm/W



Stabilization Details

Warmup Conditions

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

Color Temperature Change

CCT start	3000 K
CCT shift	+0 K
CCT end	3000 K

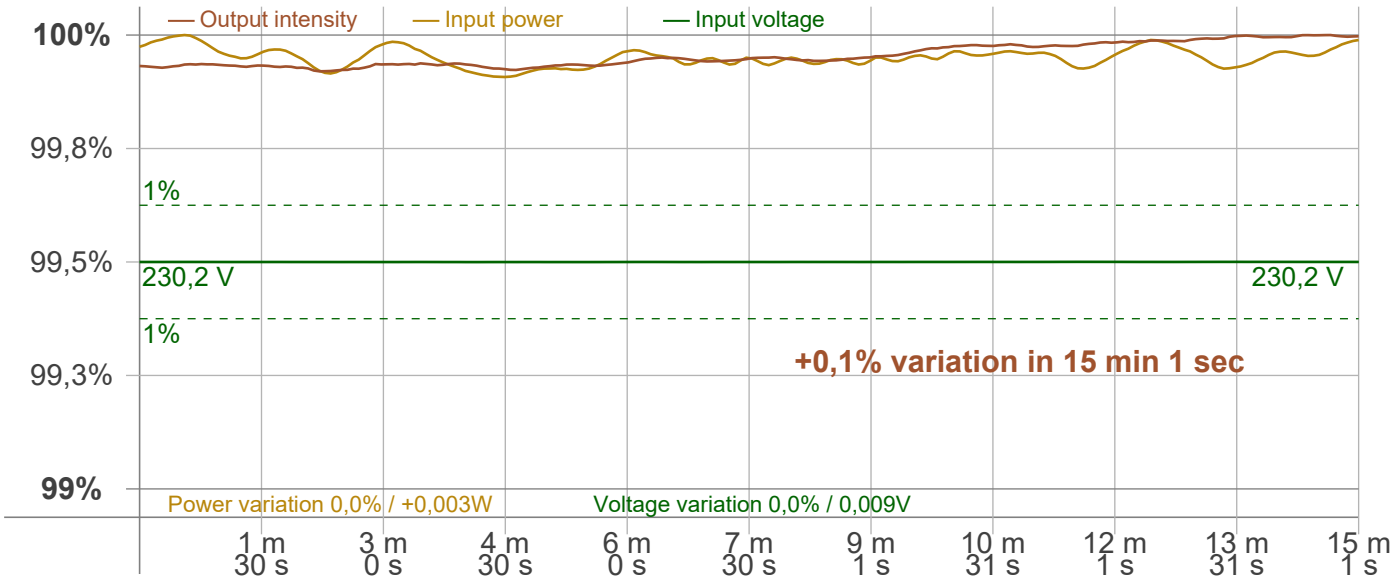
Warmup Result

Total warmup time	Lamp stabilized in 15 min 1 sec
Warmup variation	+0,1%

Output Change

Output start	518 lm
Output change	+ lm
Output end	519 lm

Stabilization Curve



Light Measurement Report

Print date: 5-11-2025
Measurement date and time: 4-11-2025 17:14:44 – Measurement no. VFR-251104-3917-MS
Measurement tracking No. and Link: VT251104-001466
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	101,52 Hz
Percent Flicker	0,43 %
Flicker index	0

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

PstLM value (F < 80 Hz)	0,06
SVM value (80 < F < 2000 Hz)	0,01

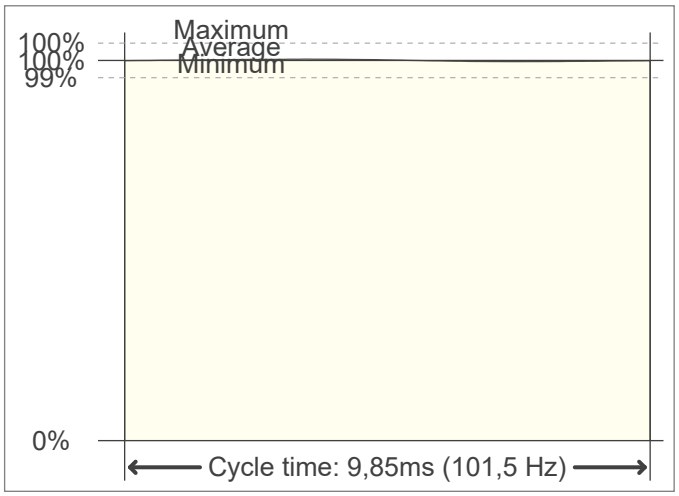
Flicker indices according to California Energy Commission (CEC) 2016b

JA8/10 40 Hz	0,1 %
JA8/10 90 Hz	0,11 %
JA8/10 200 Hz	0,42 %
JA8/10 400 Hz	0,42 %
JA8/10 1000 Hz	0,43 %

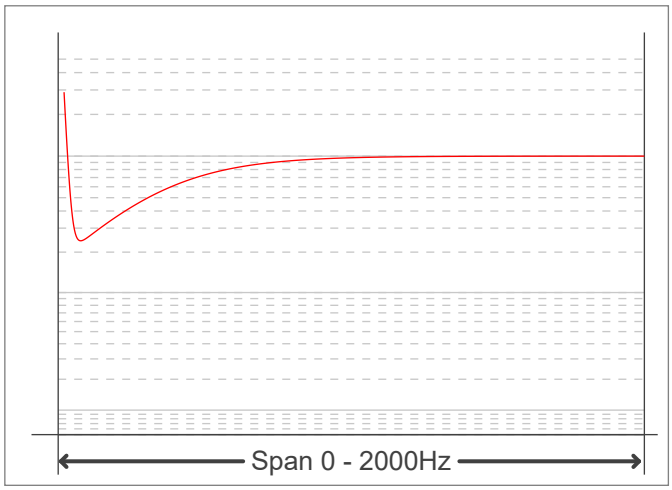
Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp	0,03

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot