

Light Measurement Report

Print date: 24-4-2025

Measurement date and time: 24-4-2025 13:41:58 – Measurement no. VFR-250424-0913-MS

Measurement tracking No. and Link: [VT250424-002111](#)

Operator:



Laboratory and Equipment

Laboratory Owner and Location

Goniospectrometer System and Type

Sensor Name, Calibr. Date and Serial No.

Spectrometer Manufacturer and Model

Viso Systems, Copenhagen V, Denmark

LabSpion – Type C, horizontal

LabSensor Model2 – 11-1-2024 – 3130191315

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

Warm-up Time and Variation

16 planes – 22,5°

5°

12,10 m

72,9 W – PF 0,97 – DPF 0,98

230 V – 0,326 A

50 Hz

Lamp stabilized in 15 min 1 sec – 2,0%

Tested Light Source

Product Name

Item No. and Manufacturer

Product Description (line 1)

90°

810733-4000K

810733-4000K – Dutchfulfillment

RETROFIT PLUTO | LED MODULE | 32W/40W/48W/55W | MET NOOD |

Main Light Measurement Results

Output – Total Lumen (Up% / Down%)

Efficiency

Peak Intensity and Beam Angle

Correlated Color Temperature, Target/Measured

Color Rendering Index

Color Rendering TM30-18

Color Shift, CIE duv and MacAdam Steps

Flicker

11489 lm – 6,2% / 93,8%

158 lm/W

4904 cd – 94,9°

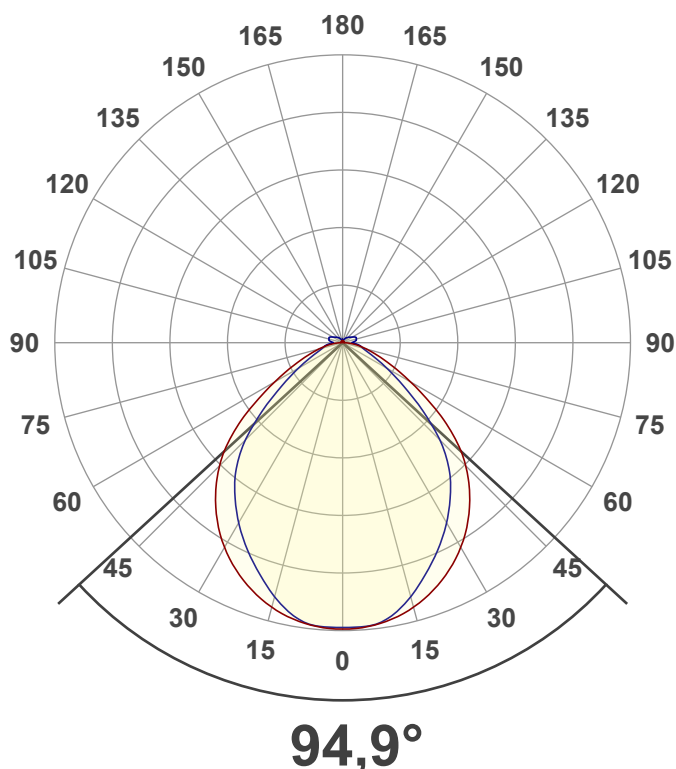
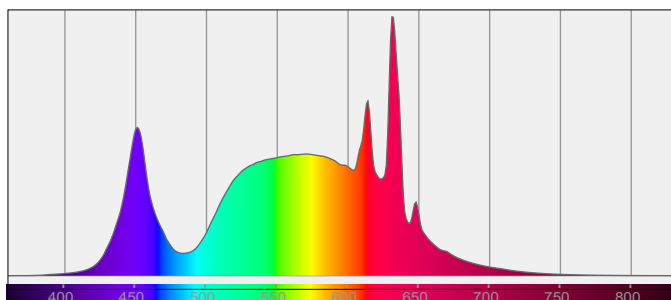
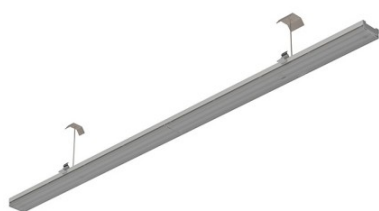
CCT = 4000 K / 3884 K

CRI 84,6

R_f 83,7 – R_g 100,4

Duv 0,0015 – SDCM 3,1

SVM 0,03 – PstLM 0,02



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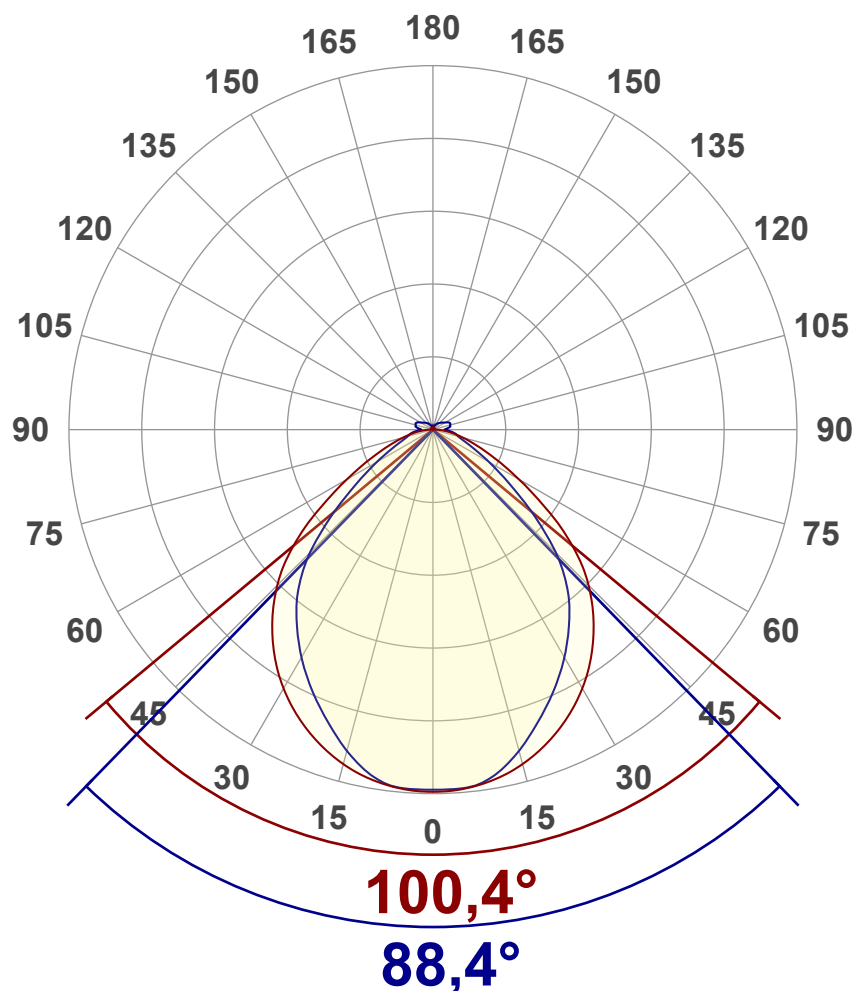
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Operator:



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	11489 lm
Lumen Up% / Down%	6,2% / 93,8%
Peak Intensity	4904 cd
Beam Angle (50%)	94,9°
Beam Angle (90%)	88,4°
Beam Angle (10%)	100,4°

Cut-off Angle

Average 2,5%	229°
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Field Angle

Average 10%	142,9°
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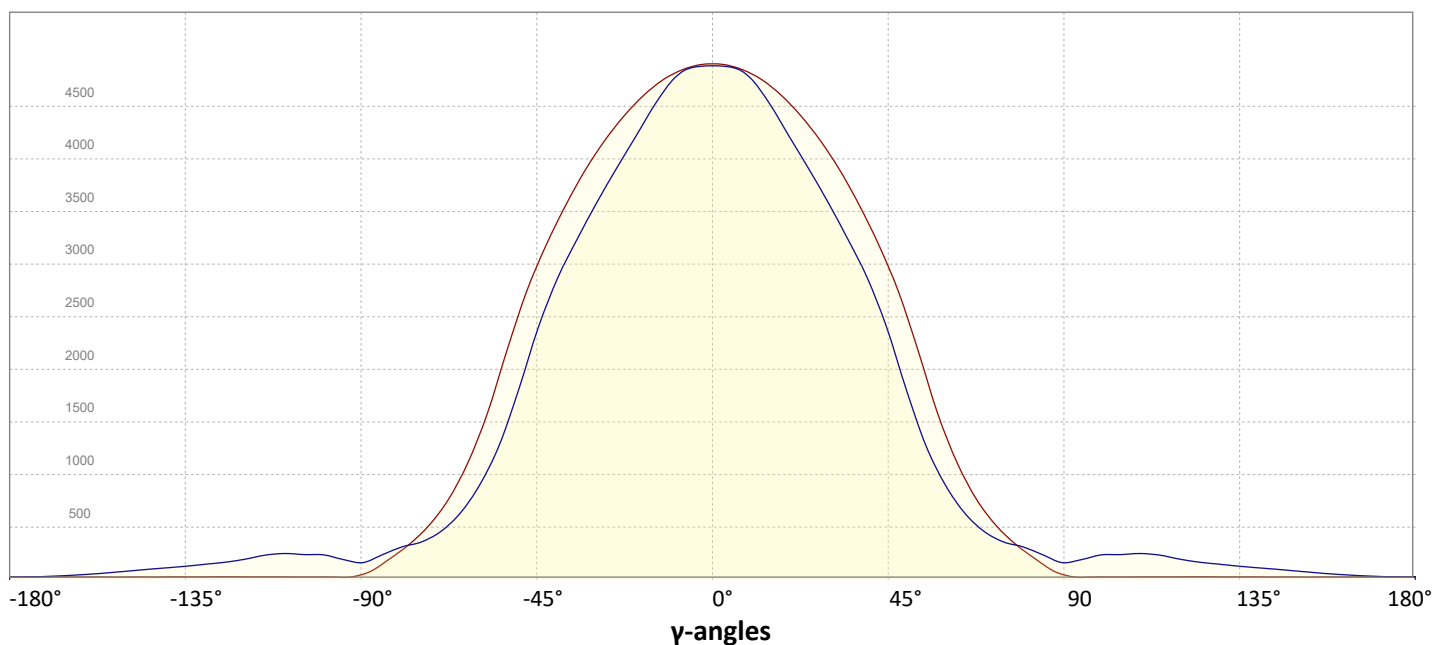
Intensity Ratio

In 120° cone	81,1%
In 90° cone	60,0%

C000-C180

C090-C270

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

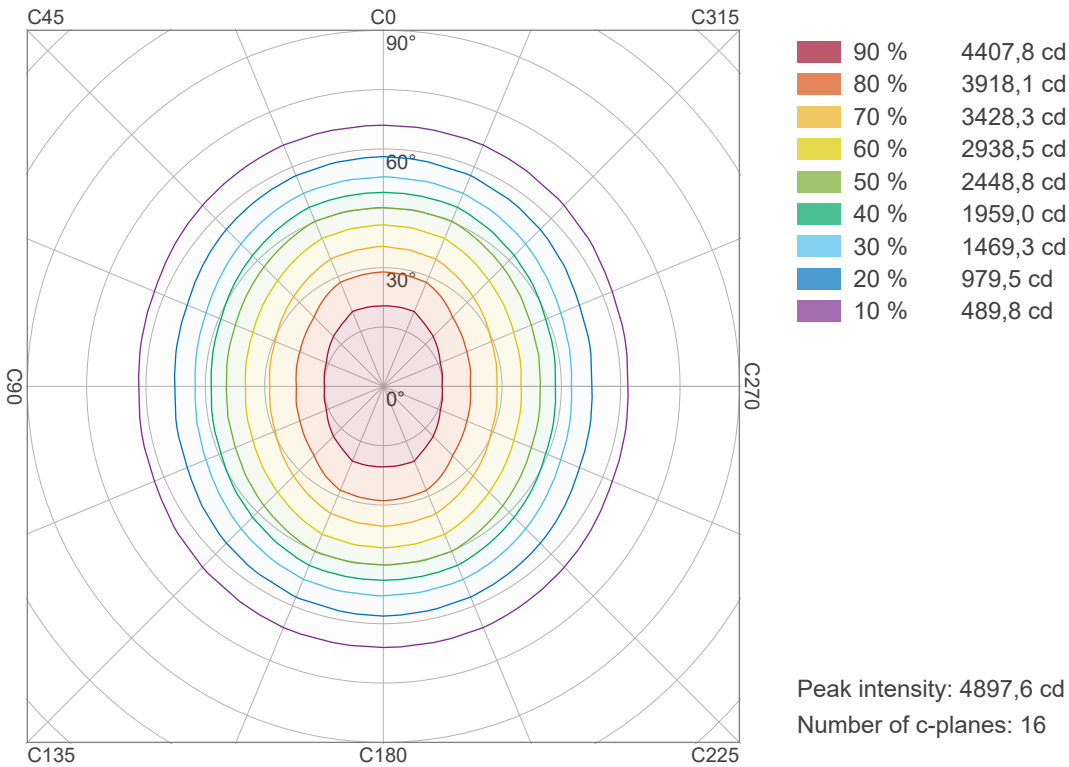


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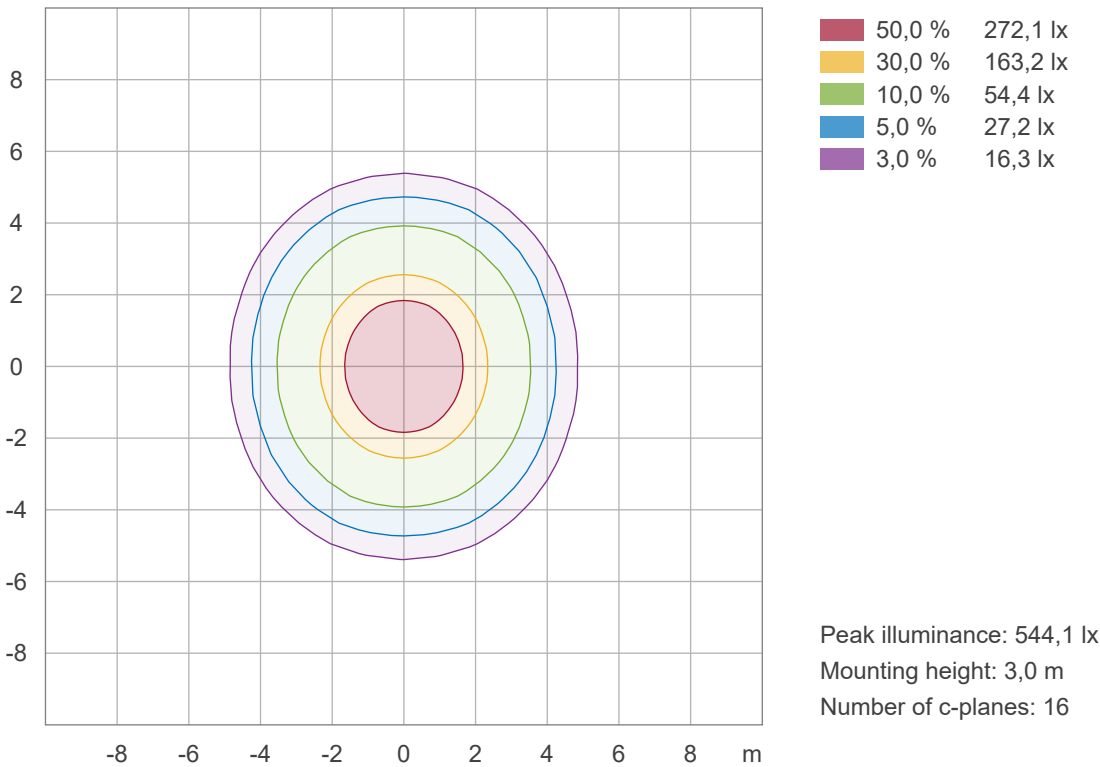
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Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



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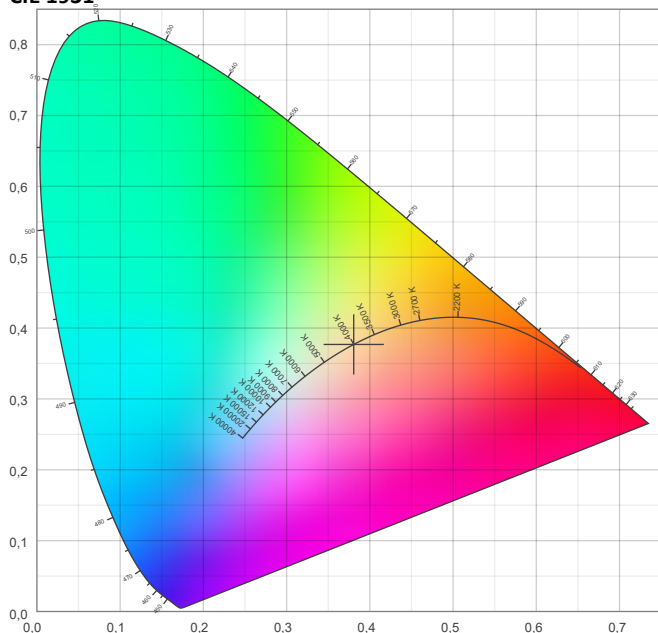


Color details

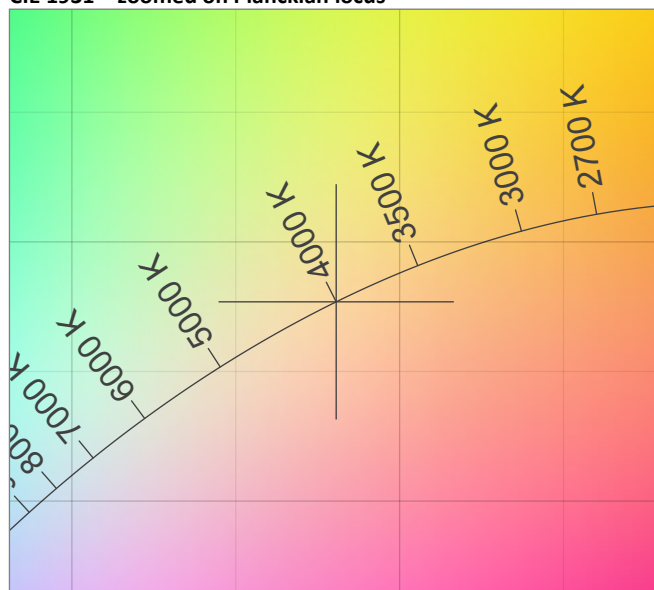
Correlated Color Temperature, Target CCT = 4000 K
Correlated Color Temperature, Measured CCT = 3884 K
Color Rendering Index CRI 84,6
Color Rendering Index, R9 (red component) R9 = 44,9
Color Rendering TM30-18 R_f 83,7 – R_g 100,4
Color Quality Scale CQS = 83,8

MacAdam Steps
Color coordinates CIE 1931 (x;y) = (0,381;0,377)
Color coordinate CIEs 1960 (u;v) = (0,225;0,334)
Color deviation from BBL Duv = 0,0015
Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,225;0,502)

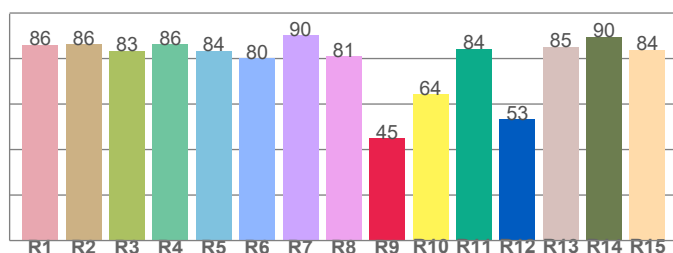
CIE 1931



CIE 1931 – zoomed on Planckian locus



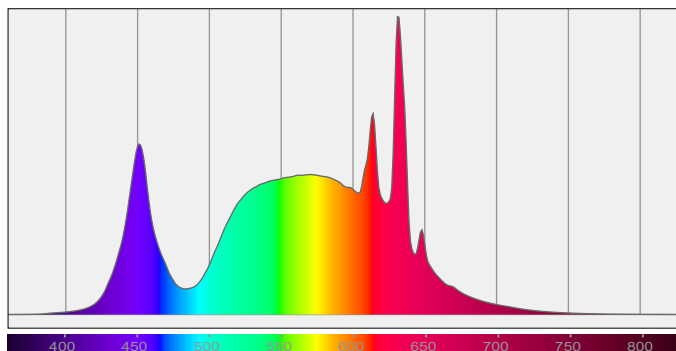
Color Rendering Index per reference color (CIE 1995)



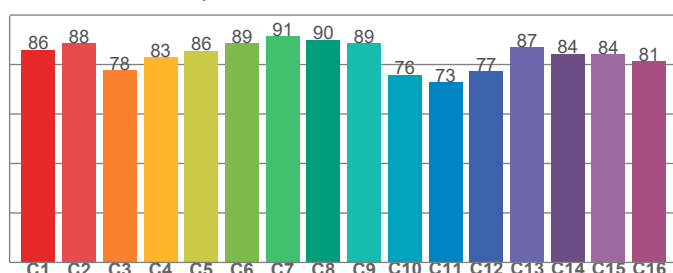
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
86,1	86,2	83,5	86,4	83,5	80,1	90,3	80,9	44,9	64,2	84,3	53,3	85,2	89,6	83,8

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



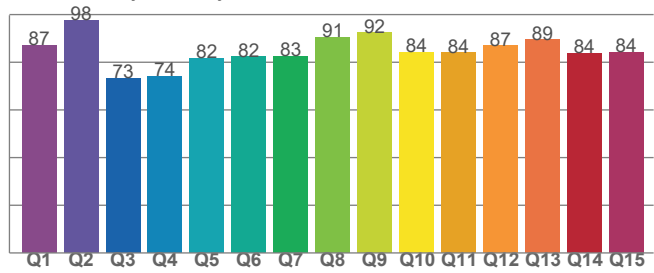
TM30-18 R_f -values per hue bin



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
86,0	88,5	77,7	82,9	85,5	88,6	91,3	90,0	88,7	75,8	73,0	77,4	86,9	84,4	84,1	81,4

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
87,2	97,5	73,4	74,0	81,7	82,4	82,5	90,6	92,3	84,2	84,1	86,9	89,4	83,8	84,3

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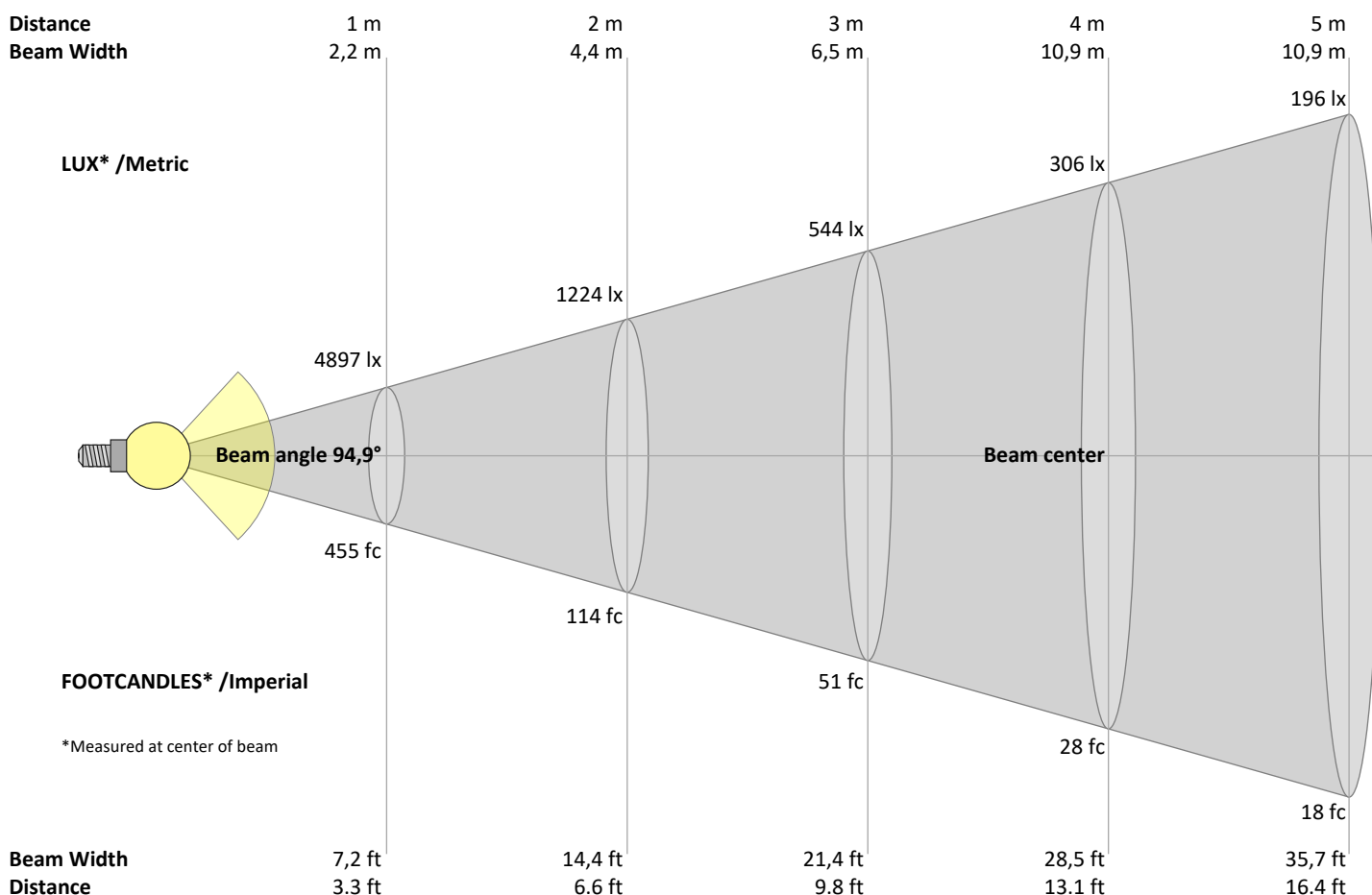
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Beam Details



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
4897	1224	544	306	196	136	100	77	60	49	40	34	29	25	22	19	17	15	14	12	lux
455	113,7	50,6	28,4	18,2	12,6	9,3	7,1	5,6	4,5	3,8	3,2	2,7	2,3	2	1,8	1,6	1,4	1,3	1,1	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
4897	4874	4803	4682	4511	4297	4039	3732	3377	2969	2473	1897	1360	947	645	431	272	142	54	26	cd
100%	100%	98%	96%	92%	88%	82%	76%	69%	61%	50%	39%	28%	19%	13%	9%	6%	3%	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
4897	4864	4752	4500	4191	3882	3559	3211	2833	2351	1768	1249	881	619	450	355	305	231	165	196	cd
100%	99%	97%	92%	86%	79%	73%	66%	58%	48%	36%	26%	18%	13%	9%	7%	6%	5%	3%	4%	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
4897	4874	4803	4682	4511	4297	4039	3732	3377	2969	2473	1897	1360	947	645	431	272	142	54	26	cd
100%	100%	98%	96%	92%	88%	82%	76%	69%	61%	50%	39%	28%	19%	13%	9%	6%	3%	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
4897	4864	4752	4500	4191	3882	3559	3211	2833	2351	1768	1249	881	619	450	355	305	231	165	196	cd
100%	99%	97%	92%	86%	79%	73%	66%	58%	48%	36%	26%	18%	13%	9%	7%	6%	5%	3%	4%	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		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	25,8	26,8	26,1	27,2	27,5	25,2	26,3	25,6	26,7	27,0
	3H	26,2	27,3	26,7	27,6	27,9	25,7	26,8	26,2	27,2	27,5
	4H	26,3	27,4	26,8	27,7	28,1	26,1	27,1	26,6	27,5	27,8
	6H	26,5	27,4	26,9	27,8	28,2	26,6	27,4	27,0	27,8	28,3
	8H	26,5	27,4	26,9	27,8	28,3	26,8	27,7	27,2	28,1	28,6
	12H	26,5	27,3	26,9	27,8	28,3	27,1	28,0	27,5	28,4	28,9
4H	2H	25,9	26,9	26,4	27,3	27,6	25,4	26,4	25,9	26,8	27,2
	3H	26,6	27,4	27,0	27,8	28,4	26,2	27,0	26,6	27,5	28,0
	4H	26,7	27,6	27,2	28,0	28,6	26,5	27,4	27,0	27,8	28,4
	6H	26,9	27,6	27,5	28,1	28,6	27,1	27,8	27,6	28,3	28,7
	8H	26,9	27,6	27,5	28,1	28,6	27,4	28,1	28,0	28,5	29,0
	12H	26,9	27,5	27,5	28,0	28,6	27,8	28,3	28,3	28,8	29,4
8H	4H	26,8	27,4	27,4	27,9	28,4	26,6	27,2	27,2	27,7	28,2
	6H	27,0	27,5	27,6	28,1	28,7	27,3	27,7	27,8	28,3	29,0
	8H	27,2	27,6	27,8	28,2	28,9	27,7	28,1	28,3	28,7	29,5
	12H	27,2	27,6	27,9	28,2	28,9	28,2	28,5	28,8	29,1	29,8
12H	4H	26,7	27,3	27,3	27,8	28,4	26,6	27,1	27,1	27,6	28,2
	6H	27,1	27,5	27,7	28,1	28,8	27,3	27,7	27,9	28,3	29,1
	8H	27,2	27,6	27,9	28,2	28,9	27,7	28,1	28,4	28,7	29,4
Variations with the observer position for the luminaire spacings, S:											
S = 1.0H		0,3 / -0,4					0,2 / -0,3				
S = 1.5H		0,8 / -1,2					0,7 / -0,8				
S = 2.0H		1,8 / -2,1					1,4 / -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	118	118	118	118	114	114	114	114	108	108	108	102	102	102	96	96	96	94
1	108	104	100	97	105	101	98	95	96	93	90	91	89	87	86	85	83	81
2	100	92	86	81	97	90	84	79	85	81	77	81	77	74	77	74	72	69
3	92	82	75	69	89	80	73	68	76	71	66	73	68	64	70	66	62	60
4	85	74	66	59	82	72	64	59	69	62	57	66	60	56	63	58	54	52
5	78	66	58	52	76	65	57	51	62	55	50	60	54	49	57	52	48	46
6	72	60	52	46	70	59	51	45	56	50	45	54	48	44	52	47	43	41
7	67	55	47	41	65	54	46	41	52	45	40	50	44	39	48	43	38	36
8	63	50	42	37	61	49	42	36	47	41	36	46	40	35	44	39	35	33
9	59	46	38	33	57	45	38	33	44	37	33	42	36	32	41	36	32	30
10	55	43	35	30	54	42	35	30	41	34	30	39	33	29	38	33	29	27

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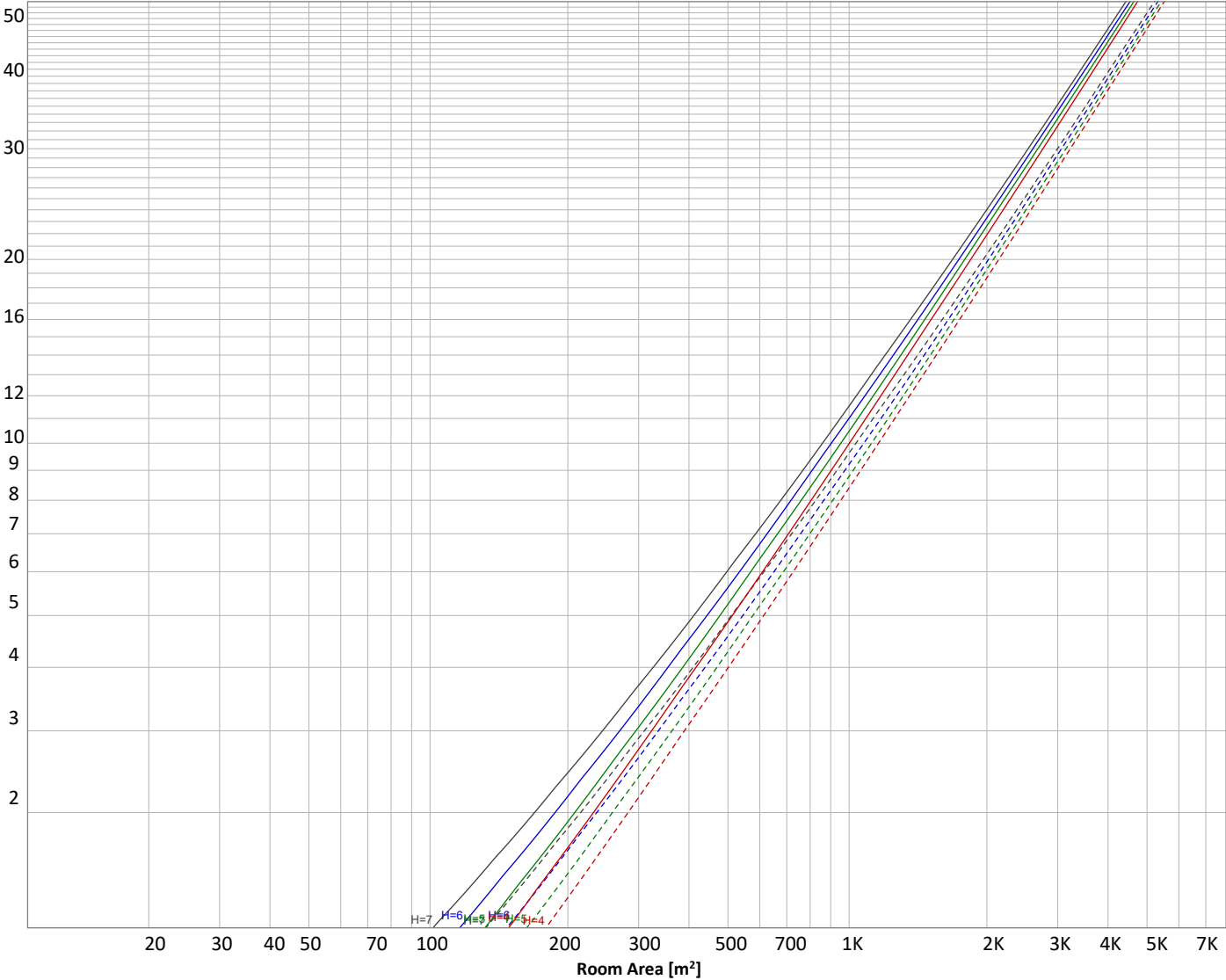
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 11489 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°
462 lm	1299 lm	1889 lm	2171 lm	2053 lm	1449 lm	799 lm	427 lm	229 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
164 lm	173 lm	140 lm	97,0 lm	65,3 lm	39,9 lm	21,4 lm	9,53 lm	2,62 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	462 lm	4,0%
10-20°	1299 lm	11,3%
20-30°	1889 lm	16,4%
30-40°	2171 lm	18,9%
40-50°	2053 lm	17,9%
50-60°	1449 lm	12,6%
60-70°	799 lm	7,0%
70-80°	427 lm	3,7%
80-90°	229 lm	2,0%
90-100°	164 lm	1,4%
100-110°	173 lm	1,5%
110-120°	140 lm	1,2%
120-130°	97 lm	0,8%
130-140°	65 lm	0,6%
140-150°	40 lm	0,3%
150-160°	21 lm	0,2%
160-170°	10 lm	0,1%
170-180°	3 lm	0,0%
Total	11489 lm	100,0%

Intensity peaks

Max intensity	4904 cd
Intensity, 90°	54 cd
Intensity, 0°	4897 cd

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	3649 lm	31,8%
0-40°	5820 lm	50,7%
0-60°	9322 lm	81,1%
60-90°	1455 lm	12,7%
70-100°	820 lm	7,1%
90-120°	476 lm	4,1%
0-90°	10777 lm	93,8%
90-180°	712 lm	6,2%
0-180°	11489 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	1824 lm	15,9%
Medium(30-60°)	2836 lm	24,7%
High(60-80°)	614 lm	5,3%
Very high(80-90°)	115 lm	1,0%
Back light		
Low(0-30°)	1824 lm	15,9%
Medium(30-60°)	2836 lm	24,7%
High(60-80°)	614 lm	5,3%
Very high(80-90°)	115 lm	1,0%

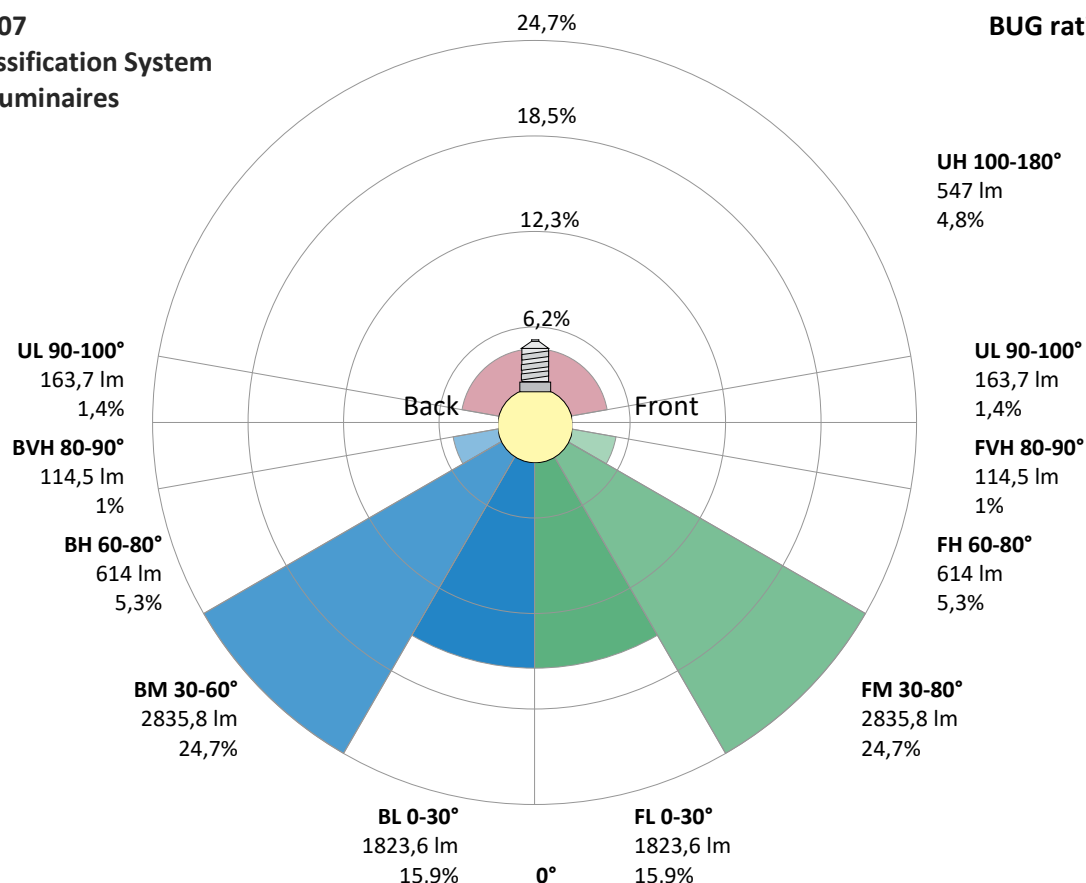
Uplight

Low(90-100°)	164 lm	1,4%
High(100-180°)	547 lm	4,8%

IESNA TM-15-07

Luminaire Classification System For Outdoor Luminaires

BUG rating B3 U4 G2



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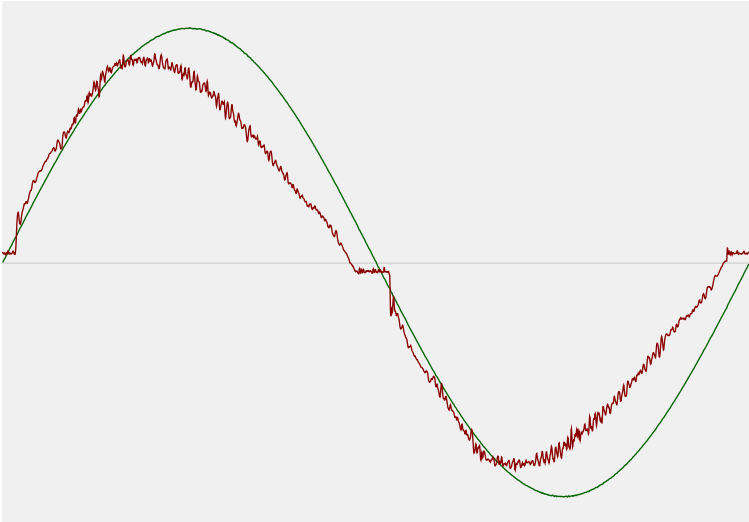


Power Details

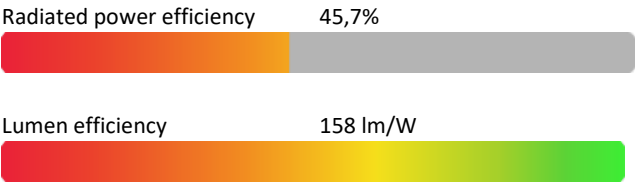
Input Power

Power feed to light source	72,9 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,326 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	74,96 VA
Displacement factor of AC power feed	0,98
Power factor of AC current feed	0,97
Total harmonic distortion of the current	10,37%
Total harmonic distortion of the voltage	0,13%

Input Power Curve



Efficiency



Stabilization Details

Warmup Conditions

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

Color Temperature Change

CCT start	4002 K
CCT shift	-2 K
CCT end	4000 K

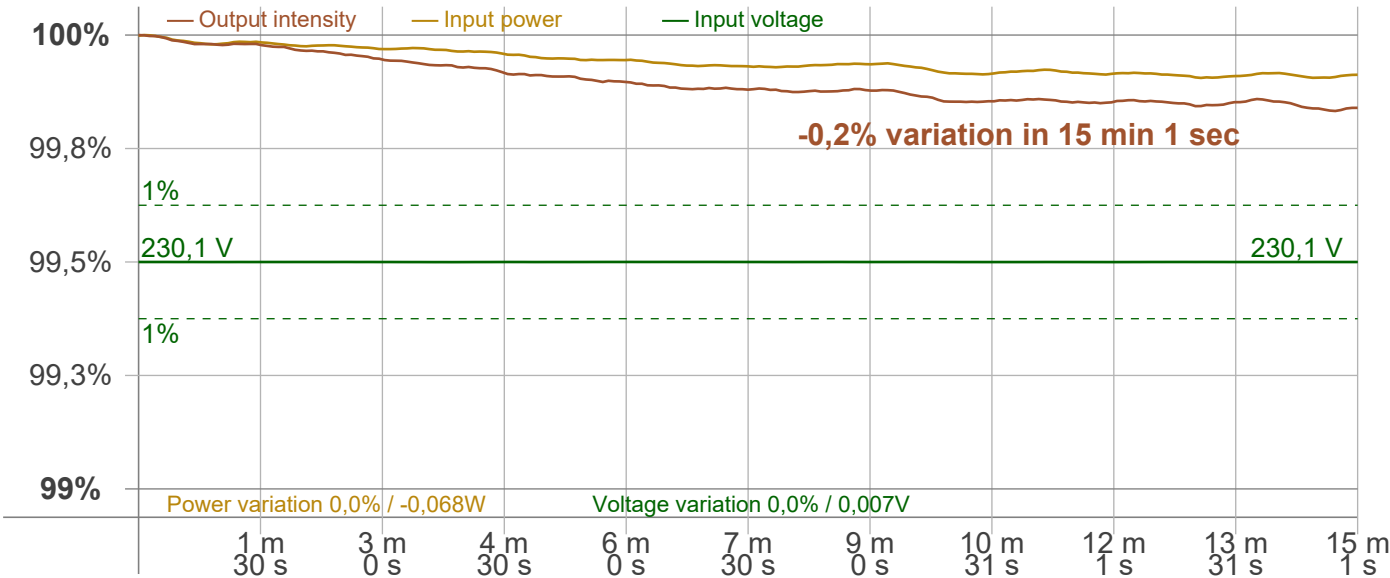
Warmup Result

Total warmup time	Lamp stabilized in 15 min 1 sec
Warmup variation	-0,2%

Output Change

Output start	11507 lm
Output change	-18 lm
Output end	11489 lm

Stabilization Curve



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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

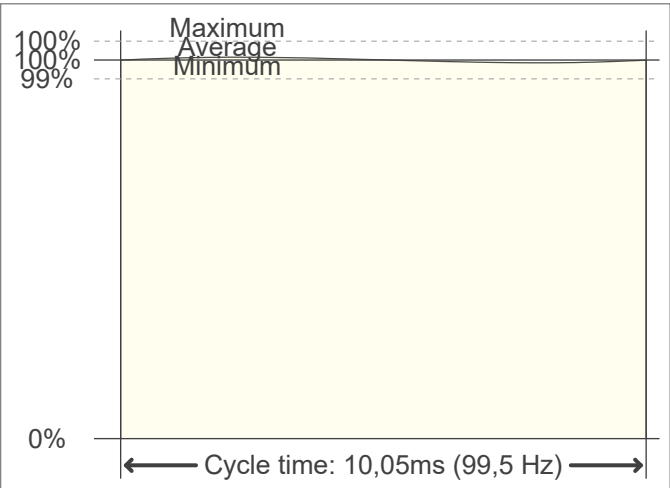
Flicker indices according to Illuminating Engineering Society (IES)
Flicker frequency 99,5 Hz
Percent Flicker 0,78 %
Flicker index 0

Flicker indices according to California Energy Commission (CEC) 2016b
JA8/10 40 Hz 0,02 %
JA8/10 90 Hz 0,03 %
JA8/10 200 Hz 0,76 %
JA8/10 400 Hz 0,77 %
JA8/10 1000 Hz 0,78 %

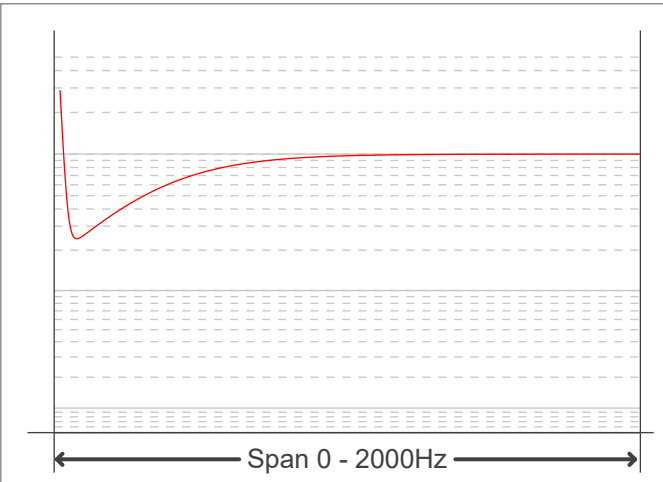
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)
PstLM value (F < 80 Hz) 0,02
SVM value (80 < F < 2000 Hz) 0,03

Flicker indices according to Lighting Research Center (2015)
Perception metric, Assist Mp 0,01

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot

