

Light Measurement Report

Print date: 18-11-2024

Measurement date and time: 18-11-2024 09:54:50 – Measurement no. VFR-241118-2037-MS

Measurement tracking No. and Link: [VT241118-005938](#)

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

12 planes – 30°

5°

12,13 m

72,4 W – PF 0,98 – DPF 0,98

230 V – 0,321 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)

270978-4000K

270978-4000K – Dutchfulfillment

RETROFIT TITAN | LED MODULE | 32W/40W/48W/56W | 120

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

10808 lm – 9,51% / 90,49%

149 lm/W

3038 cd – 120,3°

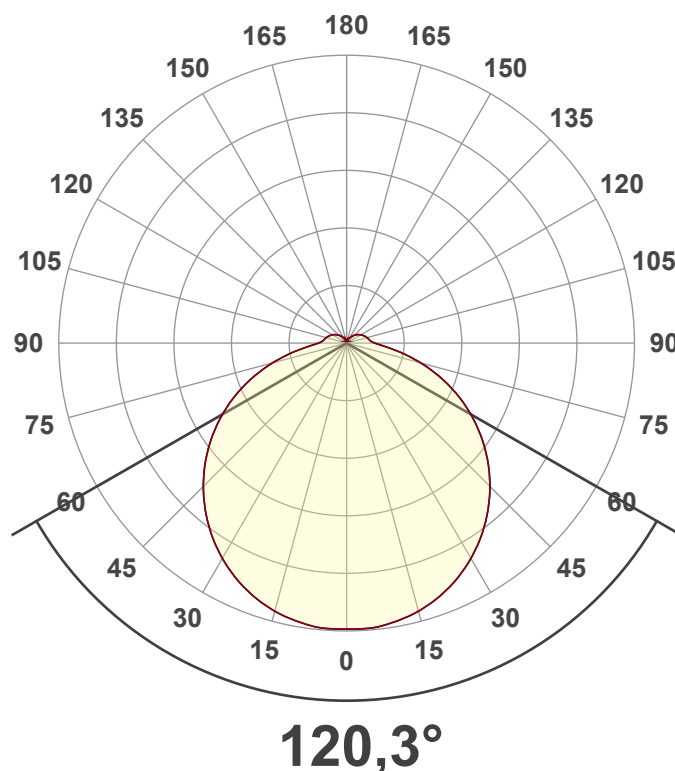
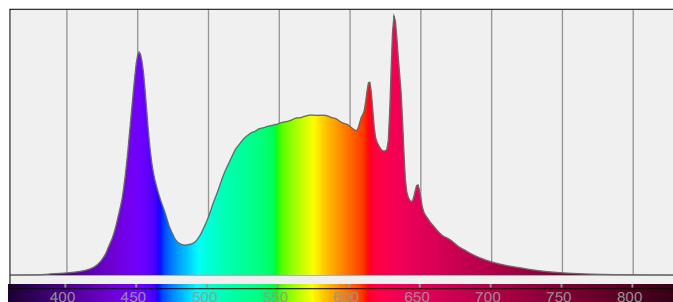
CCT = 4000 K / 4086 K

CRI 82,1

R_f 82,0 – R_g 98,1

Duv 0,0022 – SDCM 2,4

SVM 0,03 – PstLM 0,01



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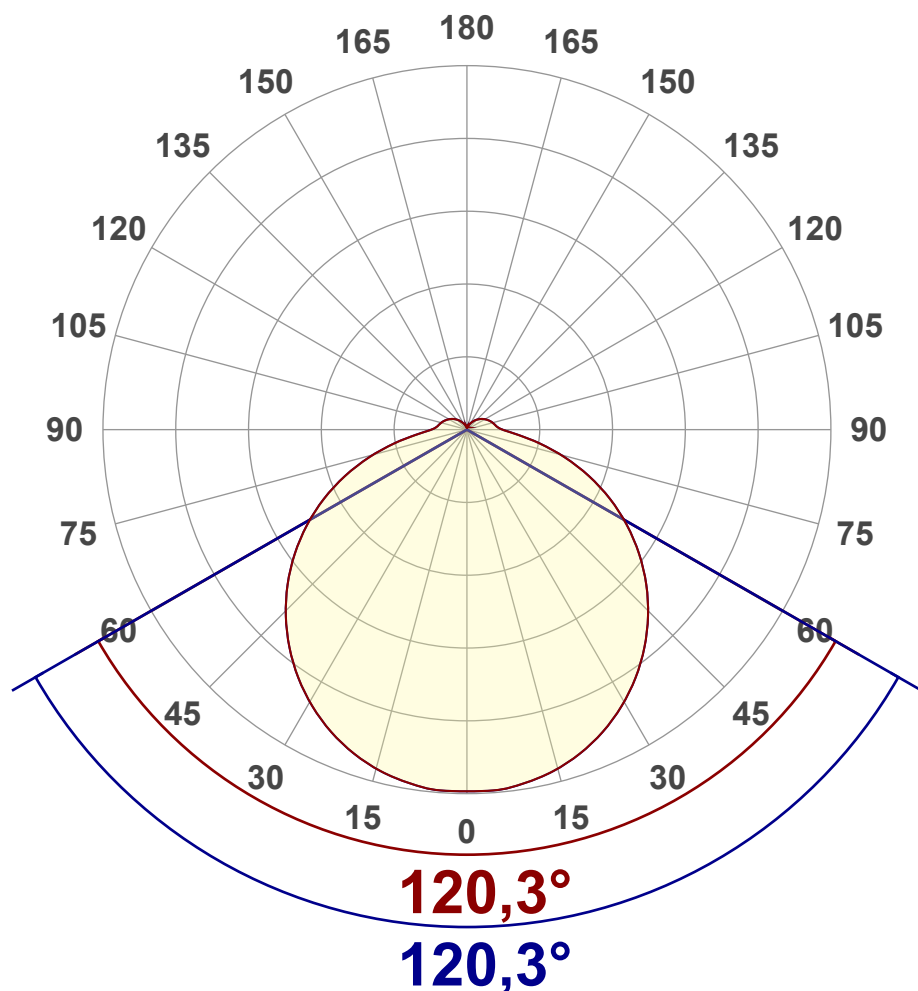
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Operator:



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	10808 lm
Lumen Up% / Down%	9,51% / 90,49%
Peak Intensity	3038 cd
Beam Angle (50%)	120,3°
Beam Angle (90%)	120,3°
Beam Angle (10%)	120,3°

Cut-off Angle

Average 2,5%	292,2°
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Field Angle

Average 10%	179,6°
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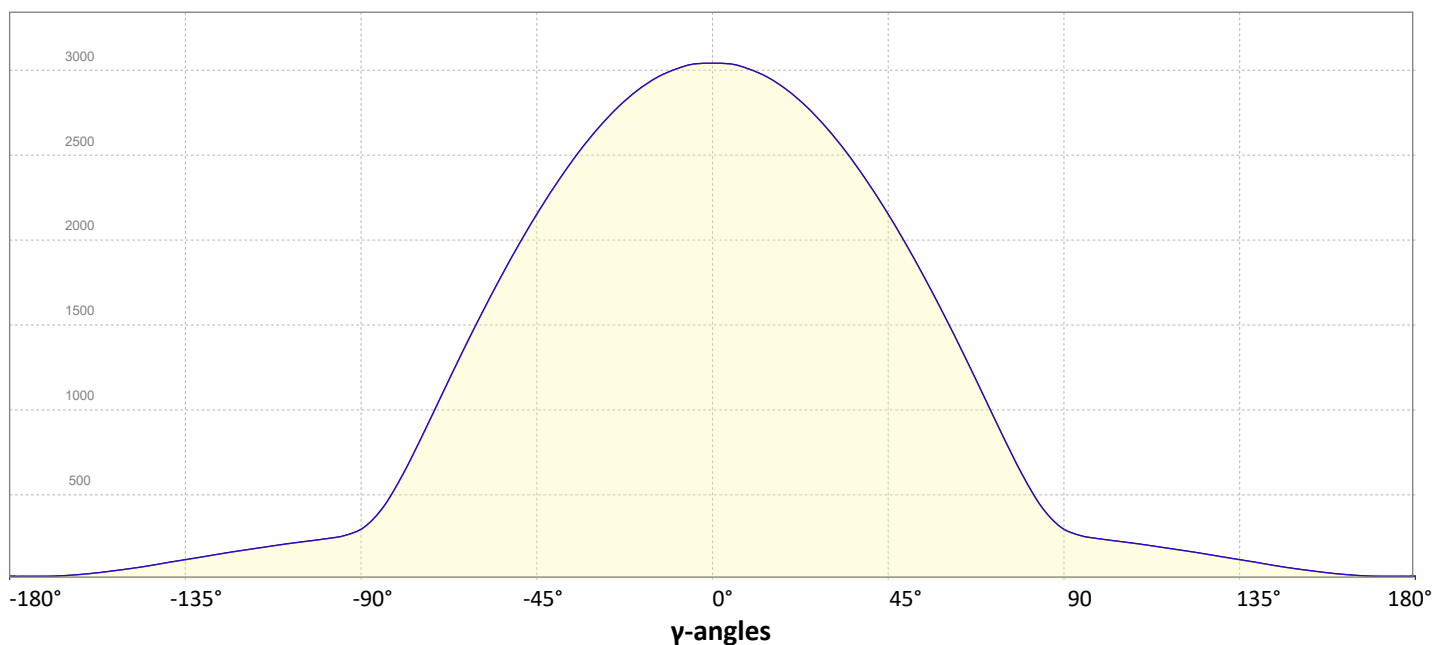
Intensity Ratio

In 120° cone	66,4%
In 90° cone	44,3%

C000-C180

C090-C270

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

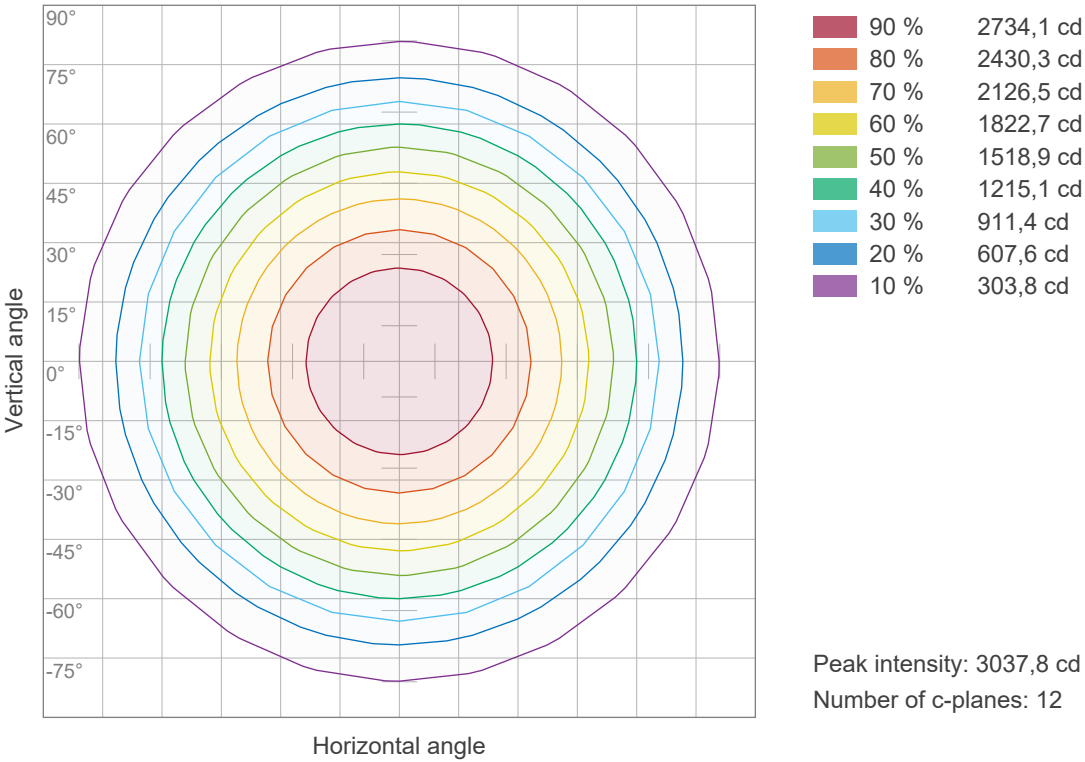


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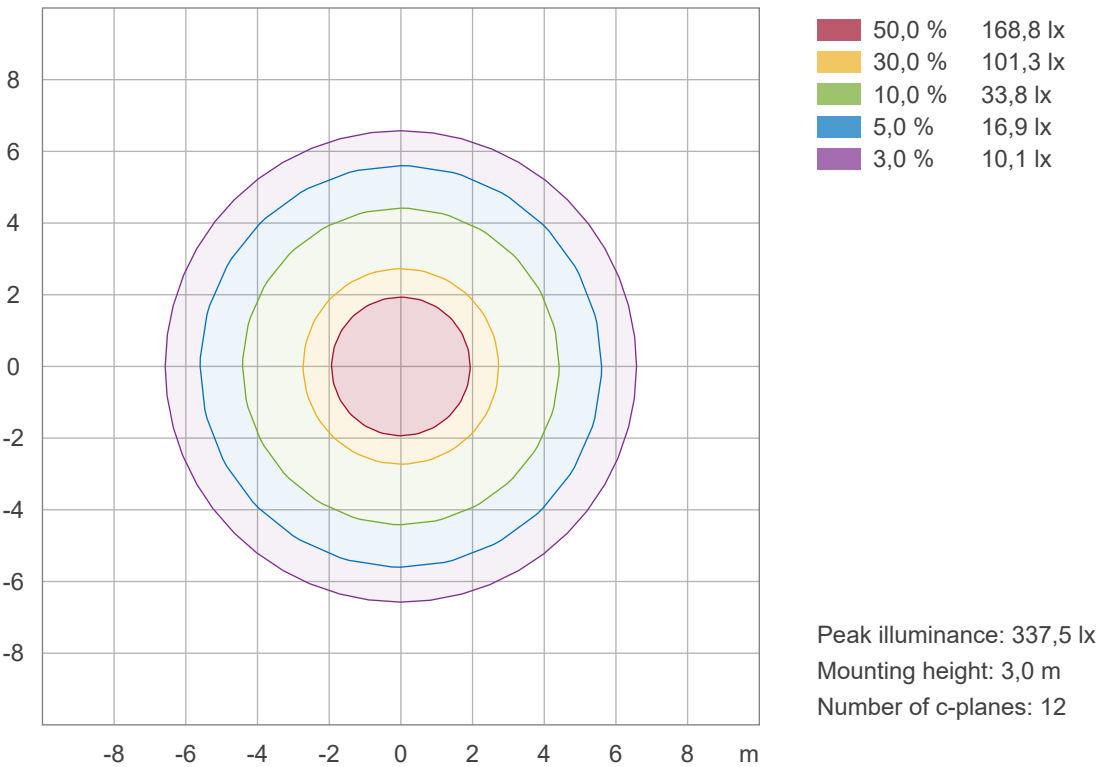
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Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



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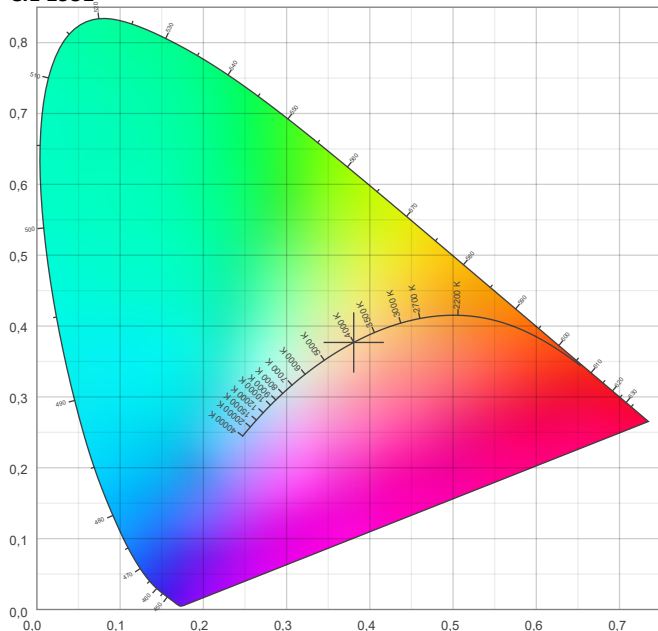


Color details

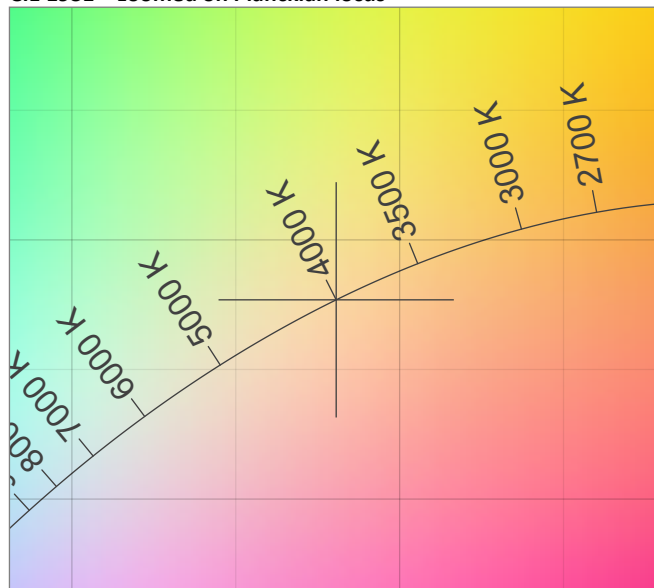
Correlated Color Temperature, Target CCT = 4000 K
Correlated Color Temperature, Measured CCT = 4086 K
Color Rendering Index CRI 82,1
Color Rendering Index, R9 (red component) R9 = 26,2
Color Rendering TM30-18 R_f 82,0 – R_g 98,1
Color Quality Scale CQS = 81,5

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 = 0,0022
Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,225;0,502)

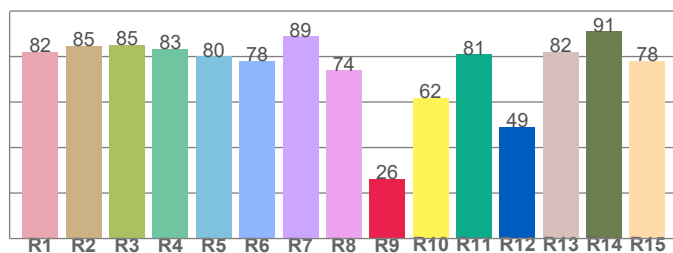
CIE 1931



CIE 1931 – zoomed on Planckian locus



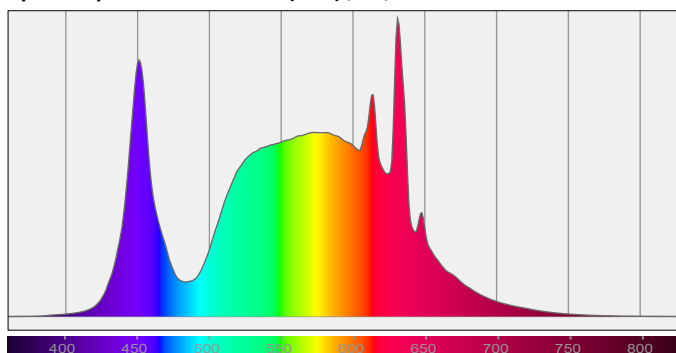
Color Rendering Index per reference color (CIE 1995)



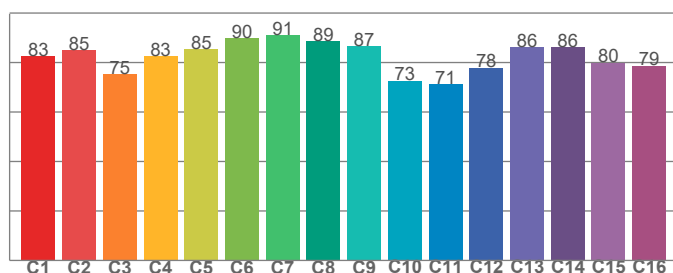
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
82,1	84,8	85,3	83,4	80,2	78,2	89,0	74,0	26,2	61,9	81,0	49,1	82,1	91,0	78,1

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



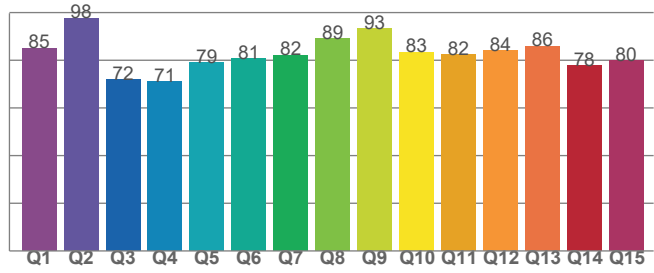
TM30-18 R_f-values per hue bin



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
82,6	85,0	75,1	82,5	85,4	89,8	91,1	88,6	86,5	72,6	71,1	77,9	86,1	86,2	80,0	78,7

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
85,0	97,6	71,8	70,9	78,9	80,6	82,1	89,0	93,3	83,5	82,3	84,1	85,9	77,7	79,9

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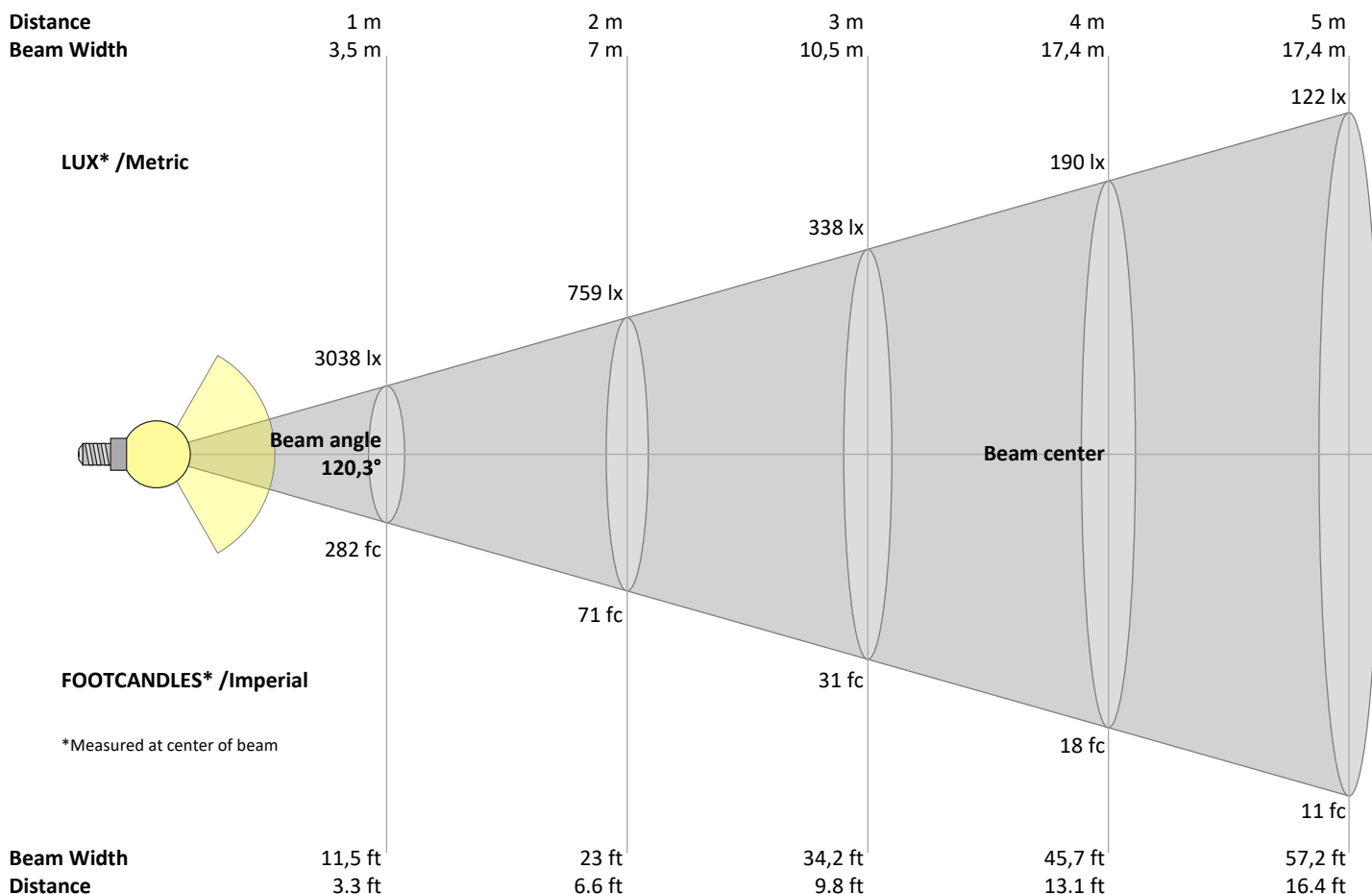
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Beam Details



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
3038	759	338	190	122	84	62	47	38	30	25	21	18	15	14	12	11	9	8	8	lux
282,2	70,6	31,4	17,6	11,3	7,8	5,8	4,4	3,5	2,8	2,3	2	1,7	1,4	1,3	1,1	1	0,9	0,8	0,7	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
3038	3033	3000	2945	2866	2763	2638	2493	2330	2151	1956	1747	1526	1295	1056	817	593	412	302	257	cd
100%	100%	99%	97%	94%	91%	87%	82%	77%	71%	64%	58%	50%	43%	35%	27%	20%	14%	10%	8%	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
3038	3033	3000	2945	2866	2763	2638	2493	2330	2151	1956	1747	1526	1295	1056	817	593	412	302	257	cd
100%	100%	99%	97%	94%	91%	87%	82%	77%	71%	64%	58%	50%	43%	35%	27%	20%	14%	10%	8%	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
3038	3033	3000	2945	2866	2763	2638	2493	2330	2151	1956	1747	1526	1295	1056	817	593	412	302	257	cd
100%	100%	99%	97%	94%	91%	87%	82%	77%	71%	64%	58%	50%	43%	35%	27%	20%	14%	10%	8%	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
3038	3033	3000	2945	2866	2763	2638	2493	2330	2151	1956	1747	1526	1295	1056	817	593	412	302	257	cd
100%	100%	99%	97%	94%	91%	87%	82%	77%	71%	64%	58%	50%	43%	35%	27%	20%	14%	10%	8%	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	24,0	25,1	24,4	25,6	26,0	23,5	24,7	23,9	25,1	25,6
	3H	25,7	26,9	26,3	27,4	27,8	25,1	26,3	25,6	26,7	27,1
	4H	26,6	27,7	27,1	28,1	28,6	25,8	26,9	26,3	27,4	27,8
	6H	27,4	28,4	27,8	28,8	29,4	26,4	27,4	26,9	27,9	28,4
	8H	27,7	28,7	28,2	29,2	29,8	26,7	27,7	27,1	28,1	28,7
	12H	28,1	29,1	28,6	29,5	30,2	26,9	27,9	27,4	28,3	28,9
4H	2H	24,5	25,7	25,1	26,1	26,5	24,2	25,3	24,7	25,8	26,2
	3H	26,6	27,6	27,1	28,0	28,6	26,0	27,0	26,5	27,5	28,1
	4H	27,5	28,5	28,0	28,9	29,6	26,8	27,8	27,4	28,3	28,9
	6H	28,4	29,2	29,0	29,7	30,3	27,5	28,4	28,1	28,9	29,4
	8H	28,8	29,6	29,4	30,1	30,7	27,8	28,6	28,4	29,1	29,7
	12H	29,3	29,9	29,9	30,5	31,1	28,1	28,7	28,7	29,3	29,9
8H	4H	27,8	28,5	28,4	29,0	29,6	27,2	27,9	27,8	28,5	29,0
	6H	28,8	29,4	29,5	30,0	30,7	28,1	28,7	28,7	29,3	30,0
	8H	29,4	29,9	30,1	30,6	31,4	28,5	29,0	29,1	29,7	30,5
	12H	30,0	30,4	30,7	31,1	31,8	28,9	29,3	29,6	30,0	30,7
12H	4H	27,8	28,4	28,4	29,0	29,6	27,2	27,9	27,8	28,4	29,1
	6H	28,9	29,4	29,6	30,1	30,9	28,2	28,7	28,8	29,4	30,2
	8H	29,5	30,0	30,2	30,6	31,4	28,7	29,1	29,4	29,8	30,5
Variations with the observer position for the luminaire spacings, S:											
S = 1.0H		0,1 / -0,1					0,1 / -0,1				
S = 1.5H		0,1 / -0,1					0,1 / -0,2				
S = 2.0H		0,3 / -0,3					0,3 / -0,4				

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	117	117	117	117	113	113	113	113	106	106	106	99	99	99	93	93	93	90
1	105	100	95	91	101	97	92	88	91	87	84	85	82	80	80	78	76	73
2	95	86	79	73	92	84	77	71	78	73	68	74	69	65	69	66	62	60
3	86	75	67	60	83	73	65	59	69	62	56	65	59	54	61	56	52	50
4	79	66	57	50	76	64	56	49	61	53	48	57	51	46	54	49	44	42
5	72	59	50	43	70	57	49	42	54	47	41	51	45	40	48	43	38	36
6	67	53	44	37	64	52	43	37	49	41	36	46	40	35	44	38	34	31
7	62	48	39	33	59	47	38	32	44	37	31	42	35	31	40	34	30	28
8	57	44	35	29	55	43	34	29	40	33	28	38	32	27	37	31	26	24
9	54	40	32	26	52	39	31	26	37	30	25	35	29	24	34	28	24	22
10	50	37	29	24	48	36	28	23	34	27	23	33	27	22	31	26	22	20

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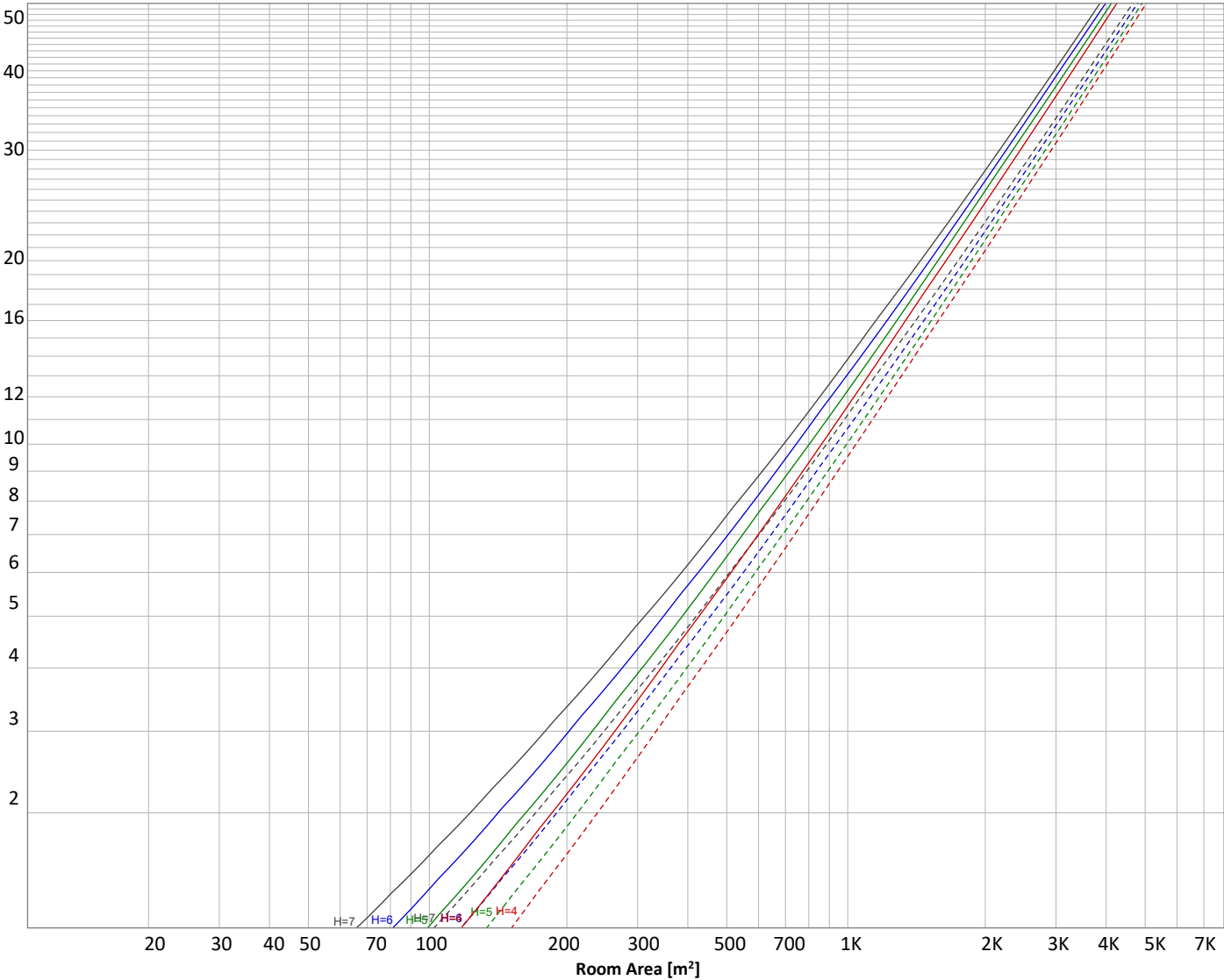
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 10808 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°
288 lm	831 lm	1274 lm	1560 lm	1659 lm	1561 lm	1280 lm	864 lm	462 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
286 lm	236 lm	190 lm	140 lm	92,0 lm	51,0 lm	22,9 lm	7,66 lm	1,96 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	288 lm	2,7%
10-20°	831 lm	7,7%
20-30°	1274 lm	11,8%
30-40°	1560 lm	14,4%
40-50°	1659 lm	15,3%
50-60°	1561 lm	14,4%
60-70°	1280 lm	11,8%
70-80°	864 lm	8,0%
80-90°	462 lm	4,3%
90-100°	286 lm	2,6%
100-110°	236 lm	2,2%
110-120°	190 lm	1,8%
120-130°	140 lm	1,3%
130-140°	92 lm	0,9%
140-150°	51 lm	0,5%
150-160°	23 lm	0,2%
160-170°	8 lm	0,1%
170-180°	2 lm	0,0%
Total	10808 lm	100,0%

Intensity peaks

Max intensity	3038 cd
Intensity, 90°	302 cd
Intensity, 0°	3038 cd

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	2393 lm	22,1%
0-40°	3953 lm	36,6%
0-60°	7174 lm	66,4%
60-90°	2606 lm	24,1%
70-100°	1612 lm	14,9%
90-120°	713 lm	6,6%
0-90°	9780 lm	90,5%
90-180°	1028 lm	9,5%
0-180°	10808 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	1196 lm	11,1%
Medium(30-60°)	2390 lm	22,1%
High(60-80°)	1072 lm	9,9%
Very high(80-90°)	232 lm	2,1%
Back light		
Low(0-30°)	1196 lm	11,1%
Medium(30-60°)	2390 lm	22,1%
High(60-80°)	1072 lm	9,9%
Very high(80-90°)	232 lm	2,1%

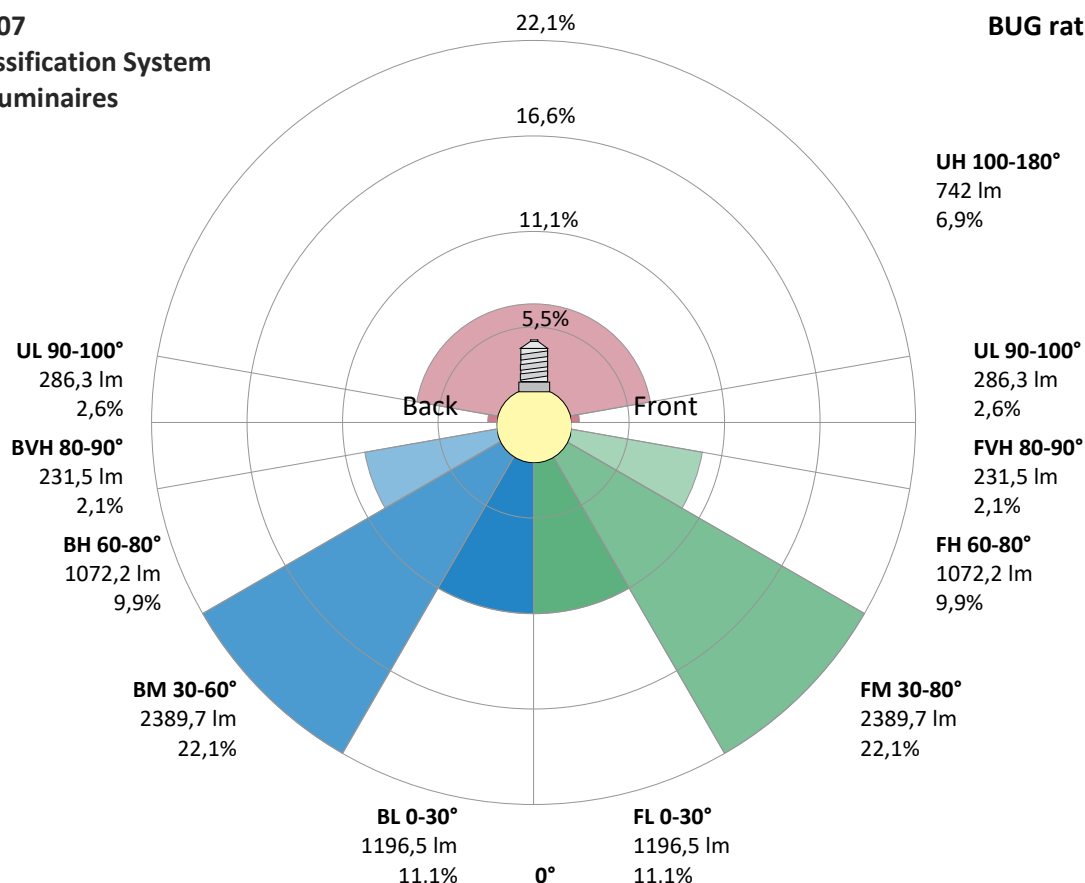
Uplight

Low(90-100°)	286 lm	2,6%
High(100-180°)	742 lm	6,9%

IESNA TM-15-07

Luminaire Classification System For Outdoor Luminaires

BUG rating B3 U4 G3



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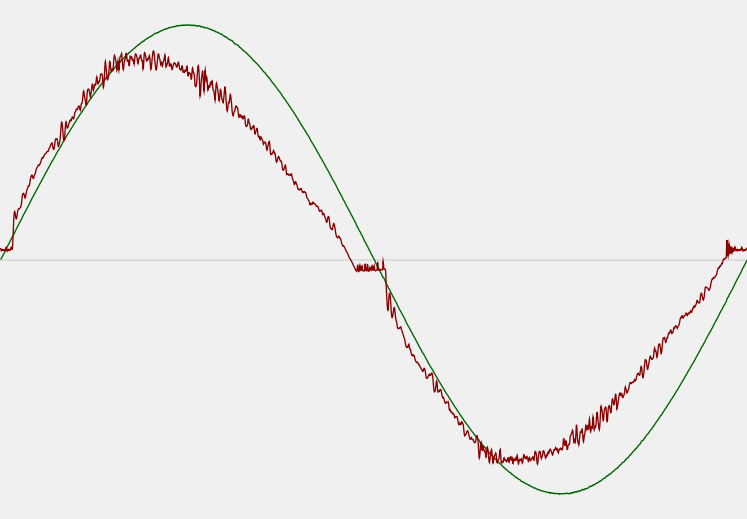


Power Details

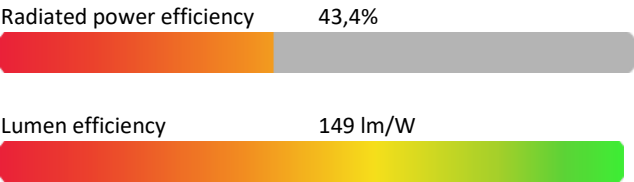
Input Power

Power feed to light source	72,4 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,321 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	73,84 VA
Displacement factor of AC power feed	0,98
Power factor of AC current feed	0,98
Total harmonic distortion of the current	8,41%
Total harmonic distortion of the voltage	0,06%

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	4003 K
CCT shift	-3 K
CCT end	4000 K

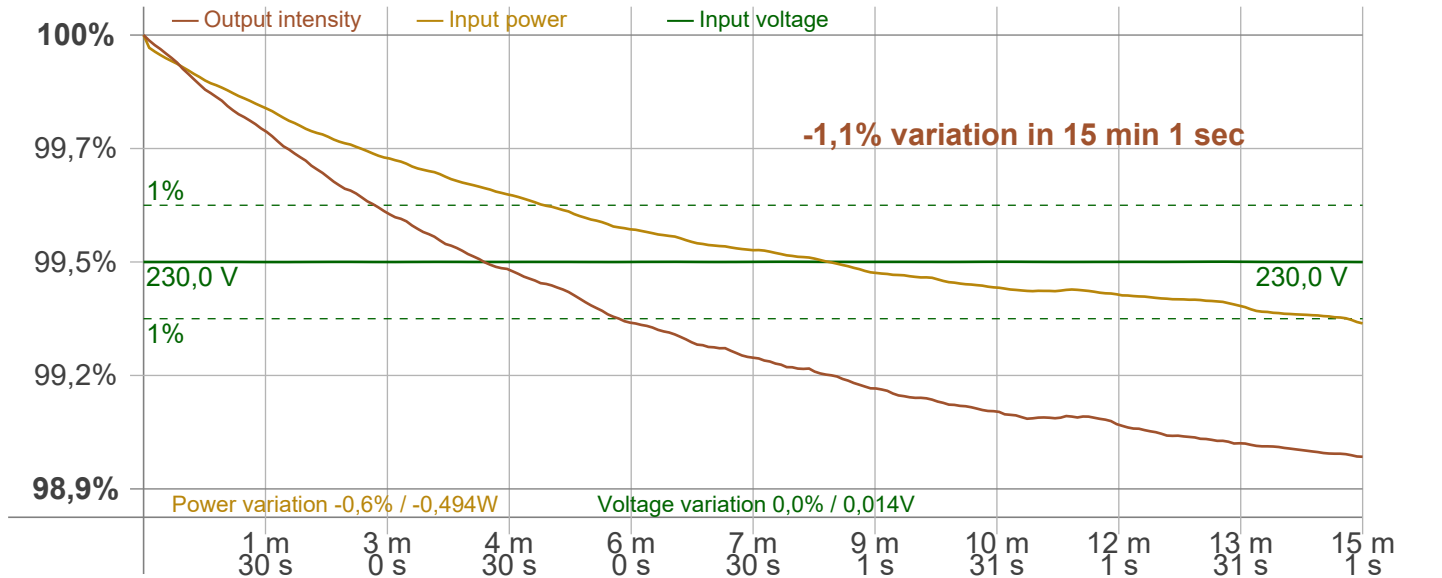
Warmup Result

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

Output Change

Output start	10918 lm
Output change	-110 lm
Output end	10808 lm

Stabilization Curve



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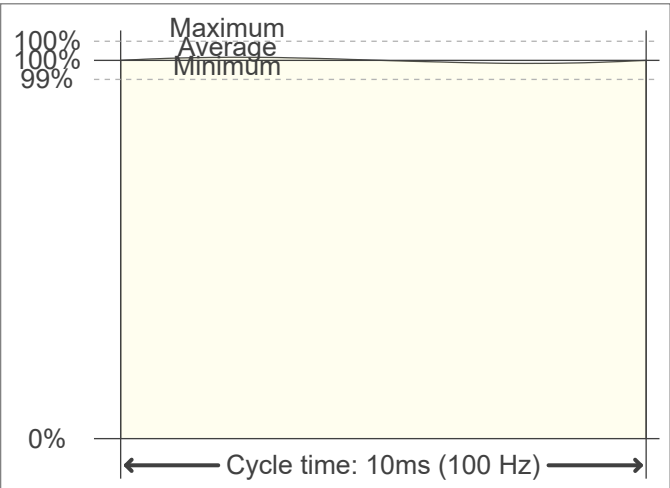
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Flicker /TLA details

Flicker Meter Type	Viso Systems LabFlicker	Measurement time	
Frequency of input power	50 Hz	PstLM	180 sec
Flicker/TLA sample rate	20000 samples/s	All other indices	1,2 sec
Flicker indices according to Illuminating Engineering Society (IES)		Flicker indices according to California Energy Commission (CEC) 2016b	
Flicker frequency	100 Hz	JA8/10 40 Hz	0,02 %
Percent Flicker	0,85 %	JA8/10 90 Hz	0,03 %
Flicker index	0	JA8/10 200 Hz	0,84 %
		JA8/10 400 Hz	0,84 %
		JA8/10 1000 Hz	0,85 %
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)		Flicker indices according to Lighting Research Center (2015)	
PstLM value (F < 80 Hz)	0,01	Perception metric, Assist Mp	0,01
SVM value (80 < F < 2000 Hz)	0,03		

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot

