

Light Measurement Report

Print date: 20/07/2023

Measurement date and time: 03/02/2023 10:51:03 – Measurement no. VFR-230203-0046-MS

Measurement tracking No. and Link: [n/a](#)

Operator: CR



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 – 07/12/2022 – 3532797498

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°

11,78 m

36,0 W – PF 0,61 – DPF n/a

223 V – 0,161 A

0 Hz

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

Tested Light Source

Product Name

Item No. and Manufacturer

Product Description (line 1)

GRAPE P1.5 3000K

8190250030 – ELECTRUM

LED STRIP SMD2016 12W 3000K 24V

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

2779 lm – 0,82% / 99,18%

77 lm/W

1009 cd – 109,1°

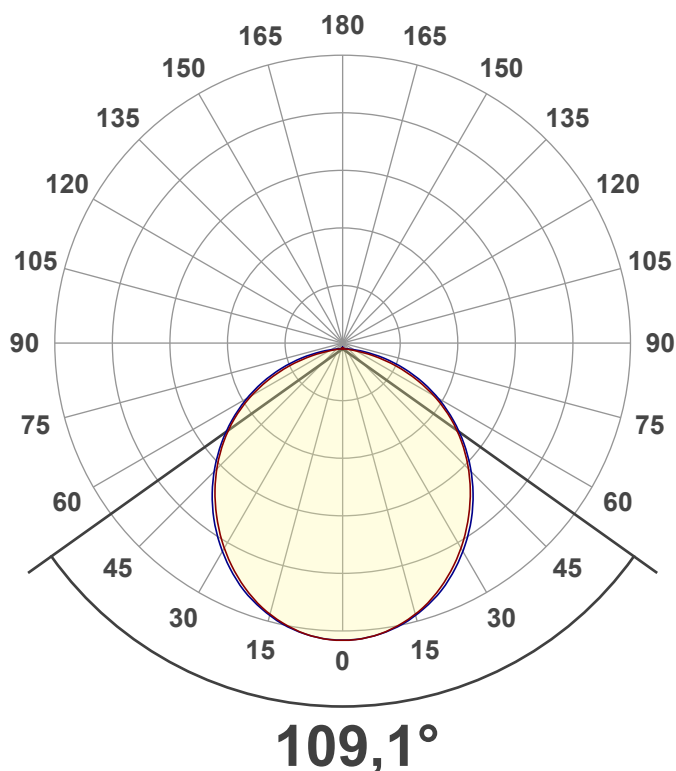
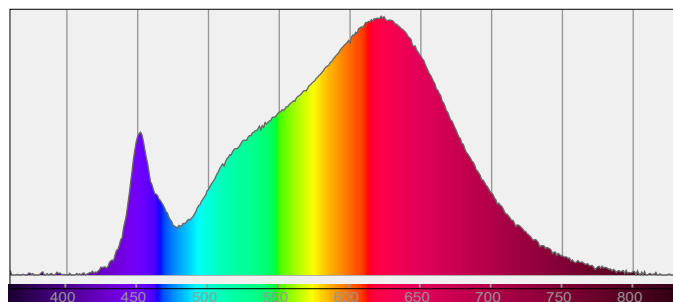
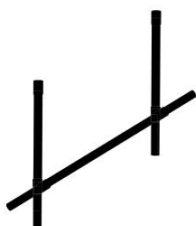
CCT = 3000 K / 2937 K

CRI 92,2

R_f 90,9 – R_g 99,8

Duv -0,0004 – SDCM 2,2

SVM 0 – PstLM 0



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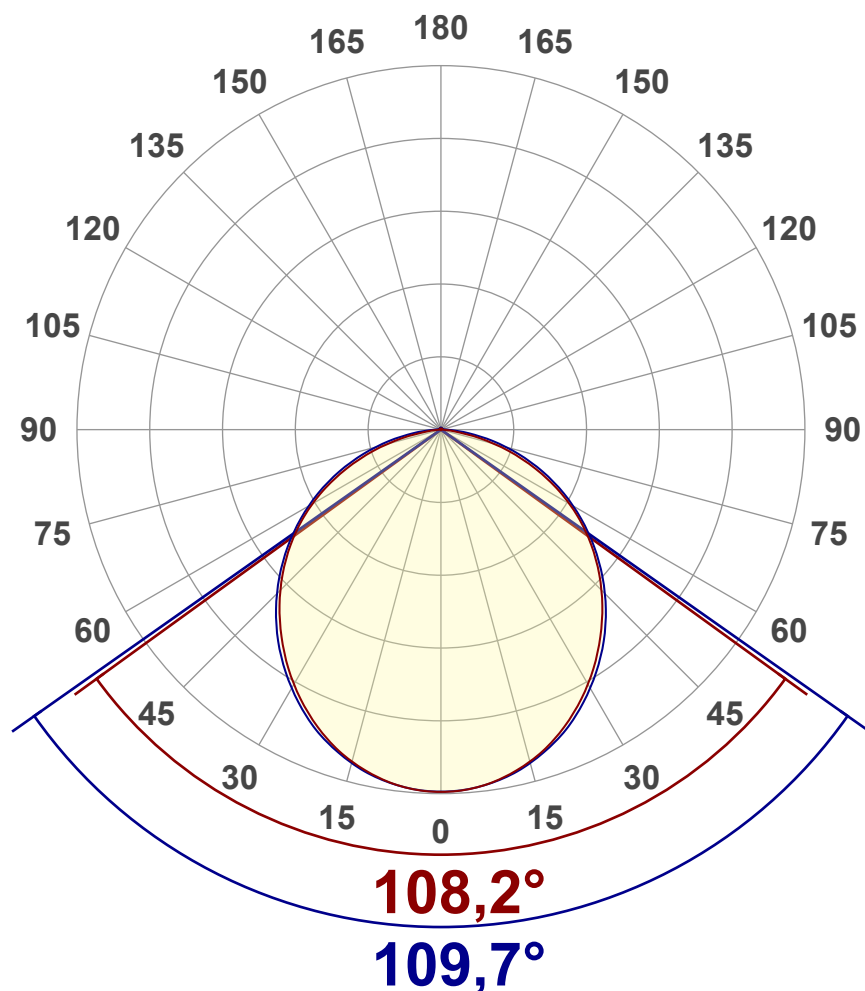
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	2779 lm
Lumen Up% / Down%	0,82% / 99,18%
Peak Intensity	1009 cd
Beam Angle (50%)	109,1°
Beam Angle (90%)	109,7°
Beam Angle (10%)	108,2°

Cut-off Angle

Average 2,5%	172,4°
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Field Angle

Average 10%	159,4°
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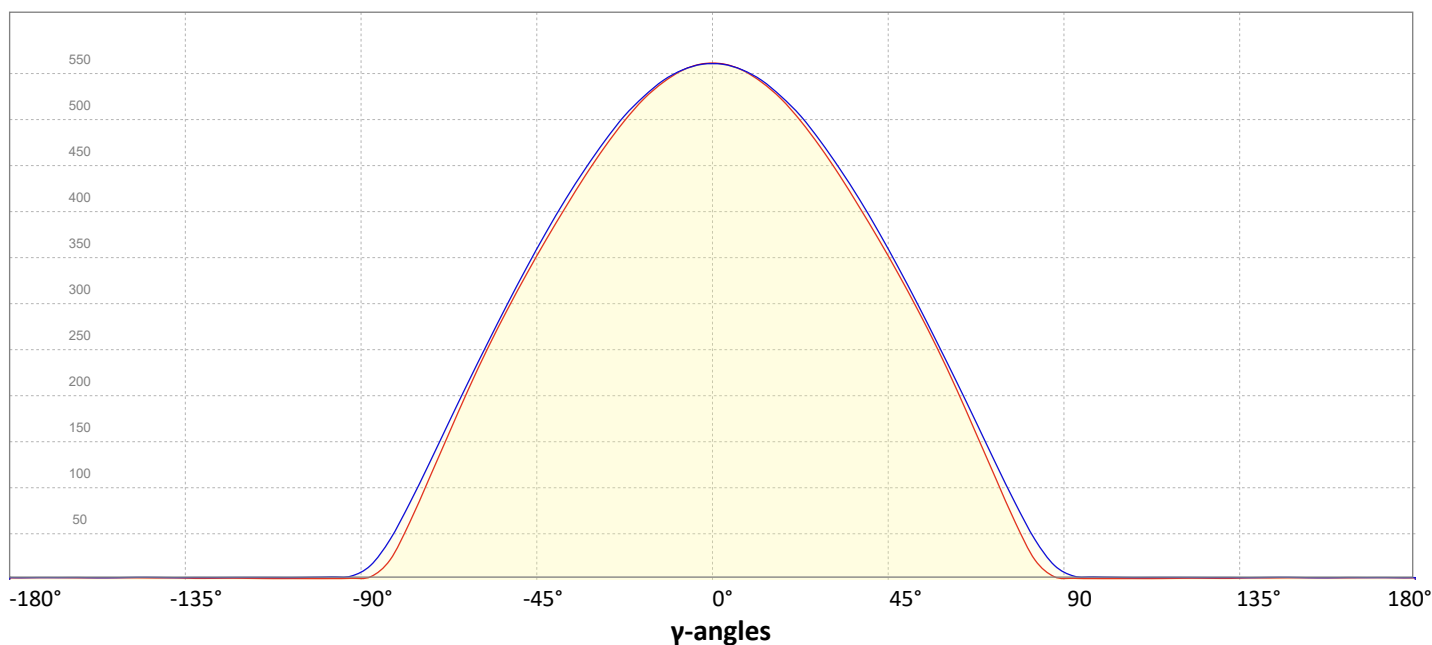
Intensity Ratio

In 120° cone	78,9%
In 90° cone	54,1%

C000-C180

C090-C270

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

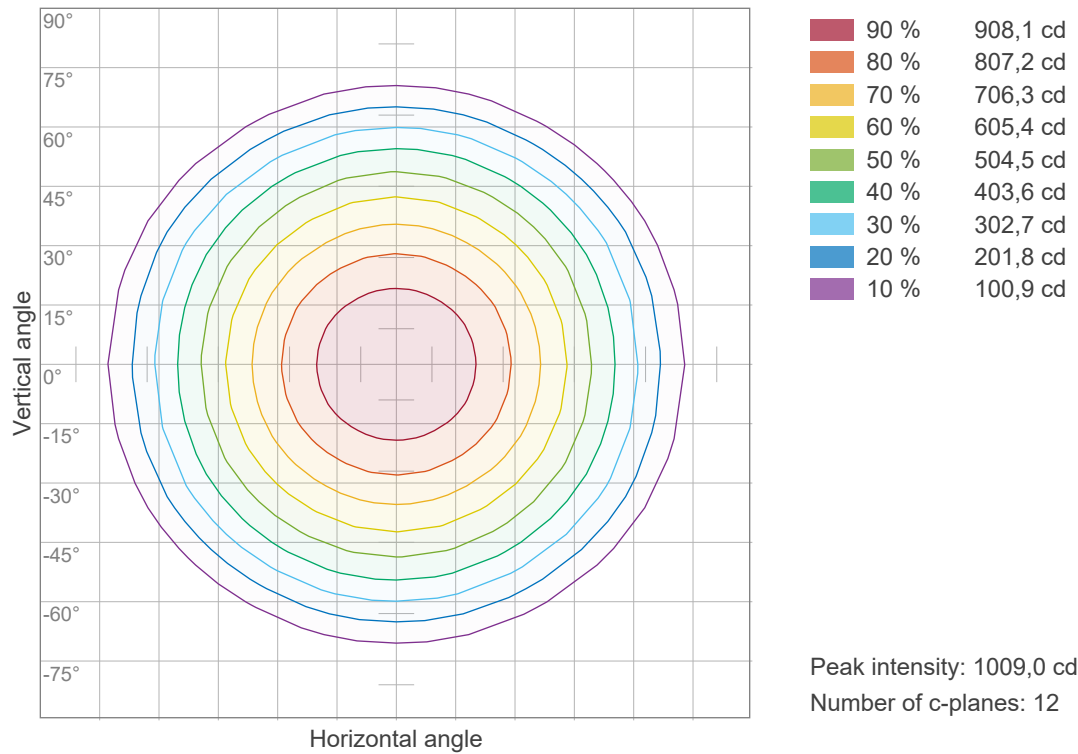


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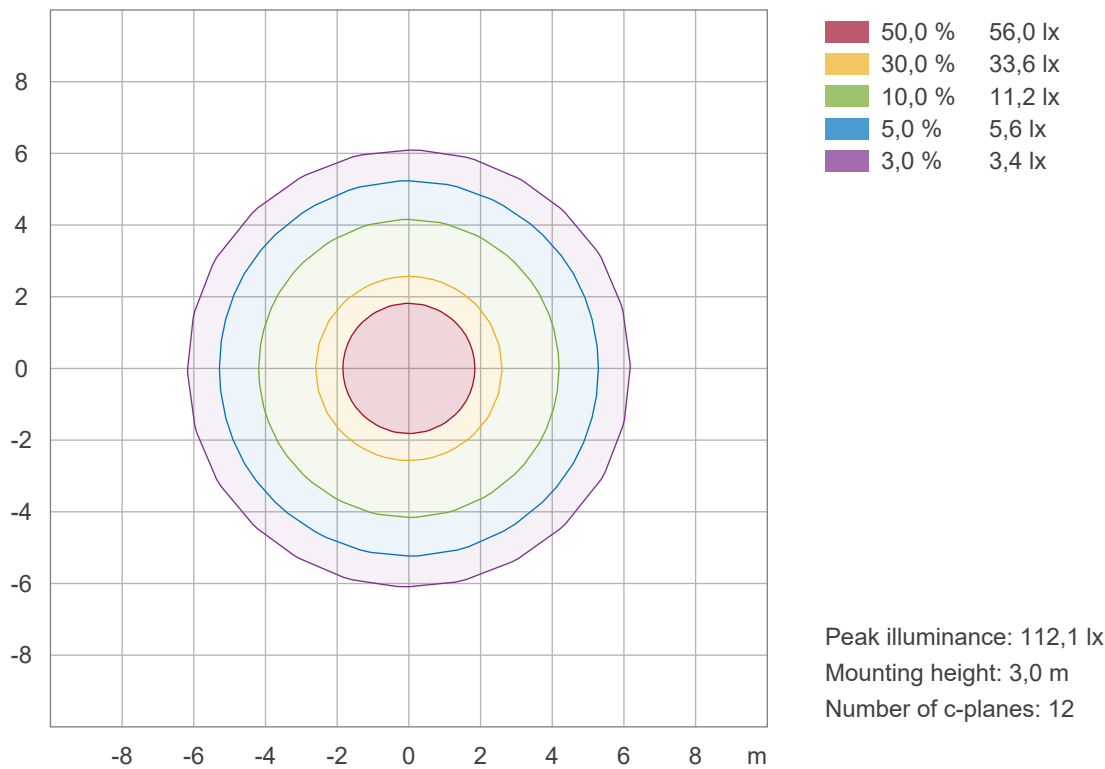
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Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



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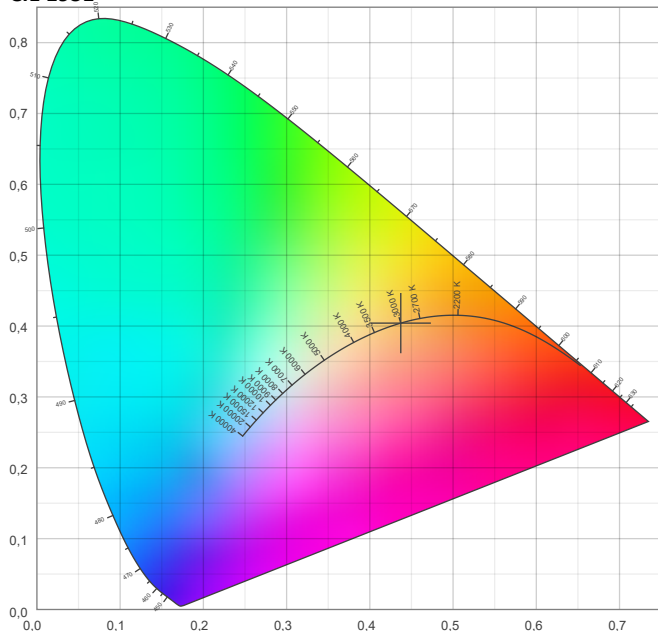


Color details

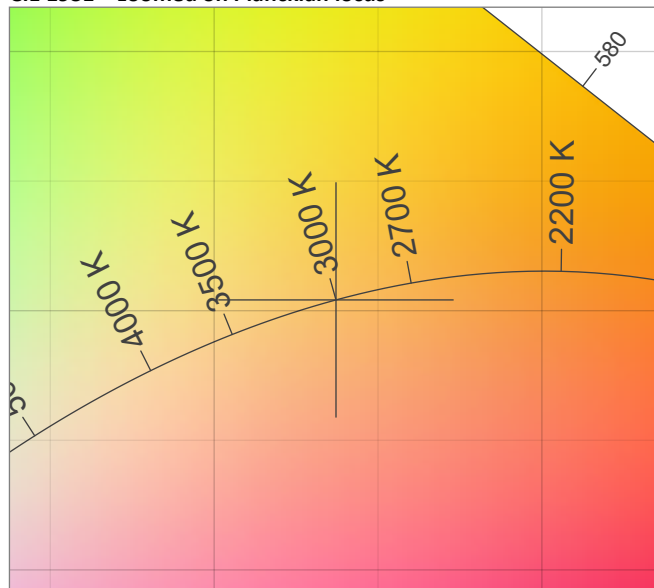
Correlated Color Temperature, Target CCT = 3000 K
Correlated Color Temperature, Measured CCT = 2937 K
Color Rendering Index CRI 92,2
Color Rendering Index, R9 (red component) R9 = 59,2
Color Rendering TM30-18 R_f 90,9 – R_g 99,8
Color Quality Scale CQS = 90,0

MacAdam Steps
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 = -0,0004
Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,251;0,251)

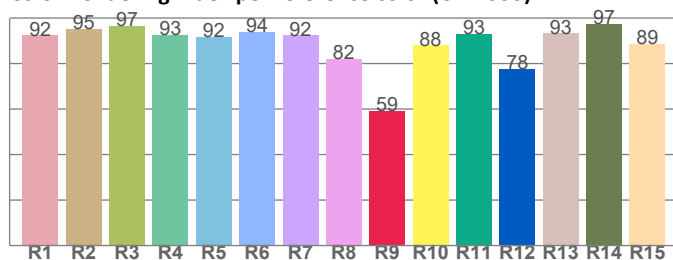
CIE 1931



CIE 1931 – zoomed on Planckian locus



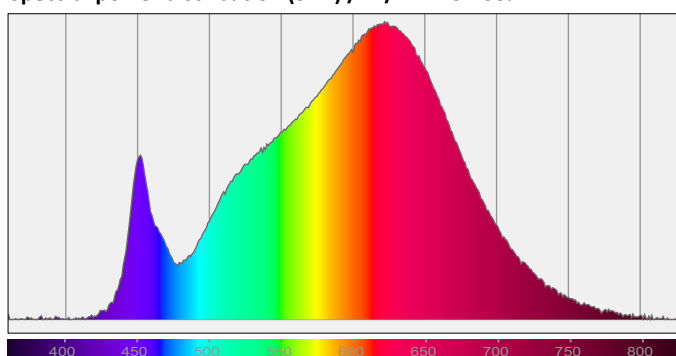
Color Rendering Index per reference color (CIE 1995)



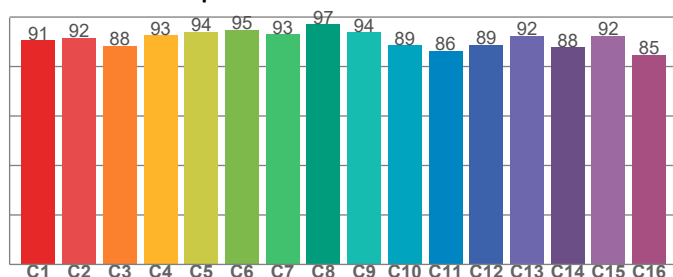
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
92,5	95,4	96,6	92,5	91,8	93,9	92,4	82,2	59,2	88,0	93,0	77,6	93,2	97,4	88,6

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



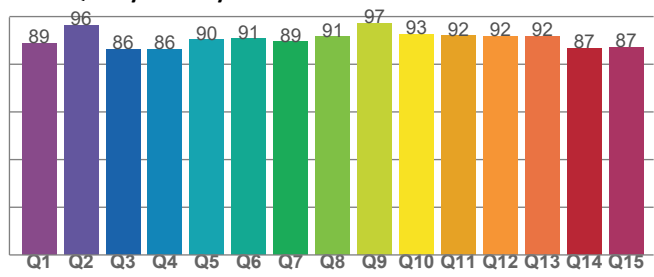
TM30-18 R_f-values per hue bin



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
90,6	91,7	88,4	92,6	94,1	94,8	93,1	97,1	93,9	88,5	86,3	88,7	92,3	87,7	92,3	84,7

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
88,7	96,3	86,3	86,4	90,3	90,7	89,4	91,5	97,2	92,6	92,0	91,7	91,8	86,7	87,2

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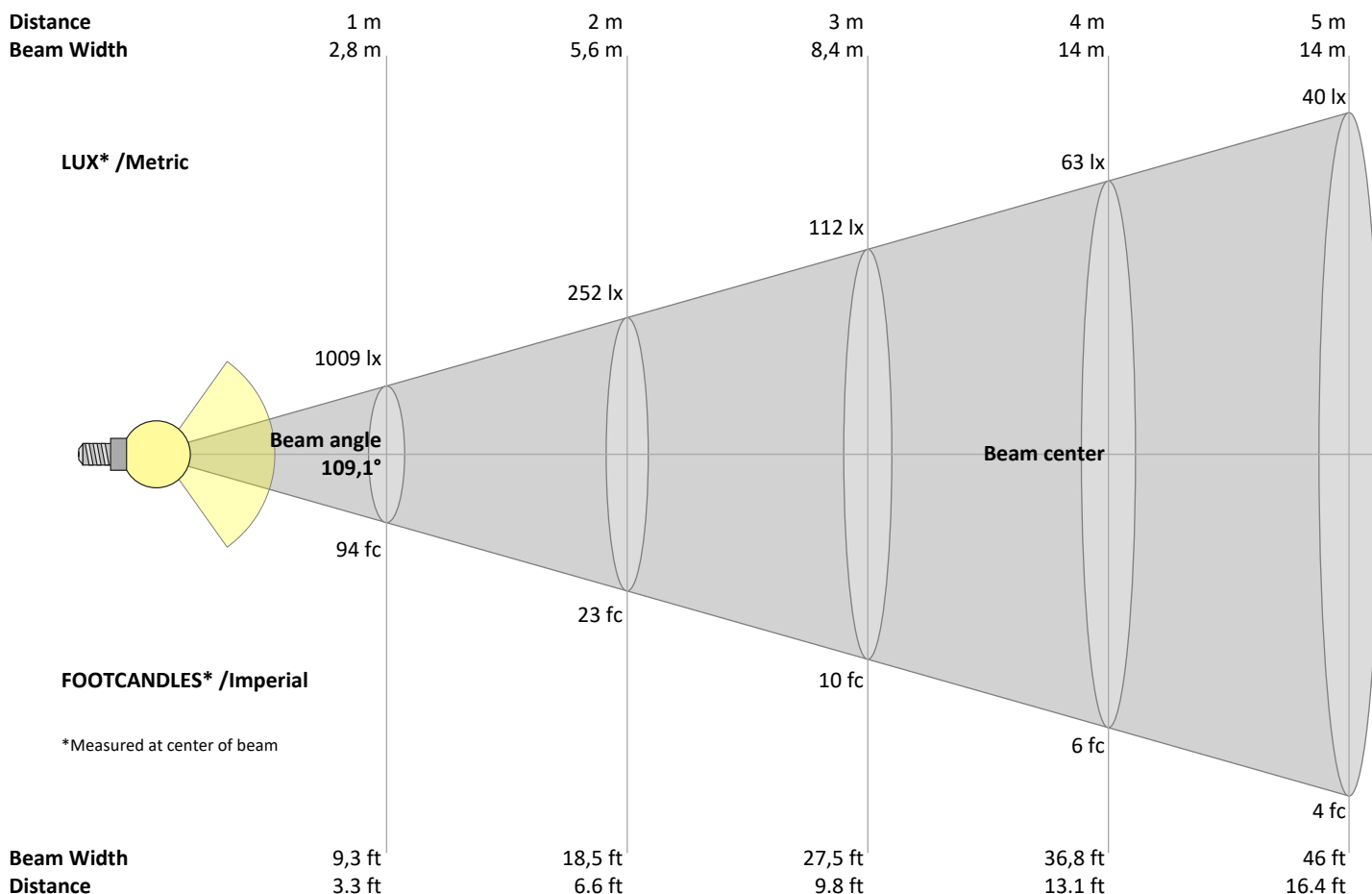
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Beam Details



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
1009	252	112	63	40	28	21	16	12	10	8	7	6	5	4	4	3	3	3	3	lux
93,7	23,4	10,4	5,9	3,7	2,6	1,9	1,5	1,2	0,9	0,8	0,7	0,6	0,5	0,4	0,4	0,3	0,3	0,3	0,2	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
1009	1003	985	957	919	873	819	761	698	633	564	491	413	329	242	156	76	23	4	3	cd
100%	99%	98%	95%	91%	87%	81%	75%	69%	63%	56%	49%	41%	33%	24%	15%	8%	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
1009	1003	987	961	927	883	832	775	713	646	576	502	426	348	268	189	115	54	18	6	cd
100%	99%	98%	95%	92%	88%	82%	77%	71%	64%	57%	50%	42%	34%	27%	19%	11%	5%	2%	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
1009	1003	985	957	919	873	819	761	698	633	564	491	413	329	242	156	76	23	4	3	cd
100%	99%	98%	95%	91%	87%	81%	75%	69%	63%	56%	49%	41%	33%	24%	15%	8%	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
1009	1003	987	961	927	883	832	775	713	646	576	502	426	348	268	189	115	54	18	6	cd
100%	99%	98%	95%	92%	88%	82%	77%	71%	64%	57%	50%	42%	34%	27%	19%	11%	5%	2%	1%	of 0°val

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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	7,1	8,3	7,4	8,7	8,9	7,3	8,5	7,6	8,8	9,1
	3H	8,5	9,7	8,9	10,0	10,3	8,8	10,1	9,2	10,4	10,6
	4H	9,0	10,2	9,4	10,5	10,8	9,5	10,6	9,9	10,9	11,2
	6H	9,4	10,4	9,7	10,7	11,1	10,0	11,0	10,3	11,3	11,7
	8H	9,4	10,4	9,8	10,7	11,2	10,2	11,2	10,5	11,5	11,9
	12H	9,4	10,4	9,8	10,7	11,2	10,3	11,2	10,6	11,6	12,1
4H	2H	7,8	9,0	8,2	9,2	9,5	7,9	9,1	8,3	9,4	9,7
	3H	9,4	10,4	9,8	10,8	11,2	9,7	10,7	10,1	11,1	11,5
	4H	10,0	10,9	10,4	11,3	11,9	10,4	11,3	10,9	11,8	12,3
	6H	10,3	11,2	10,8	11,6	12,0	11,0	11,9	11,5	12,3	12,6
	8H	10,4	11,2	10,9	11,6	12,0	11,2	12,0	11,8	12,4	12,8
	12H	10,4	11,1	11,0	11,5	12,0	11,4	12,0	11,9	12,5	13,0
8H	4H	10,3	11,0	10,8	11,4	11,8	10,7	11,5	11,2	11,9	12,3
	6H	10,8	11,4	11,3	11,8	12,4	11,4	12,0	11,9	12,5	13,1
	8H	10,9	11,4	11,4	12,0	12,6	11,7	12,3	12,3	12,8	13,5
	12H	11,0	11,4	11,6	11,9	12,6	12,0	12,4	12,6	12,9	13,6
12H	4H	10,3	10,9	10,8	11,4	11,9	10,7	11,3	11,2	11,8	12,3
	6H	10,8	11,4	11,4	11,9	12,5	11,5	12,0	12,0	12,5	13,2
	8H	11,0	11,4	11,6	12,0	12,6	11,8	12,2	12,4	12,8	13,4
Variations with the observer position for the luminaire spacings, S:											
S = 1.0H		0,1 / -0,1					0,1 / -0,1				
S = 1.5H		0,2 / -0,3					0,1 / -0,2				
S = 2.0H		0,5 / -0,6					0,4 / -0,5				

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	106	106	106	101	101	101	99	
1	109	104	100	96	106	102	98	94	97	94	91	93	91	88	90	87	86	83
2	99	91	84	78	96	89	83	77	85	80	75	82	77	74	79	75	72	70
3	90	80	72	65	88	78	71	64	75	69	63	72	67	62	69	65	61	59
4	83	71	62	55	80	69	61	55	67	60	54	64	58	53	62	57	52	50
5	76	63	54	48	74	62	54	47	60	52	47	58	51	46	56	50	45	43
6	70	57	48	41	68	56	47	41	54	46	41	52	46	40	51	45	40	38
7	65	52	43	37	63	51	42	36	49	42	36	48	41	36	46	40	36	34
8	61	47	39	33	59	46	38	33	45	38	32	44	37	32	42	36	32	30
9	57	43	35	29	55	43	35	29	41	34	29	40	34	29	39	33	29	27
10	53	40	32	27	52	39	32	27	38	31	26	37	31	26	36	30	26	24

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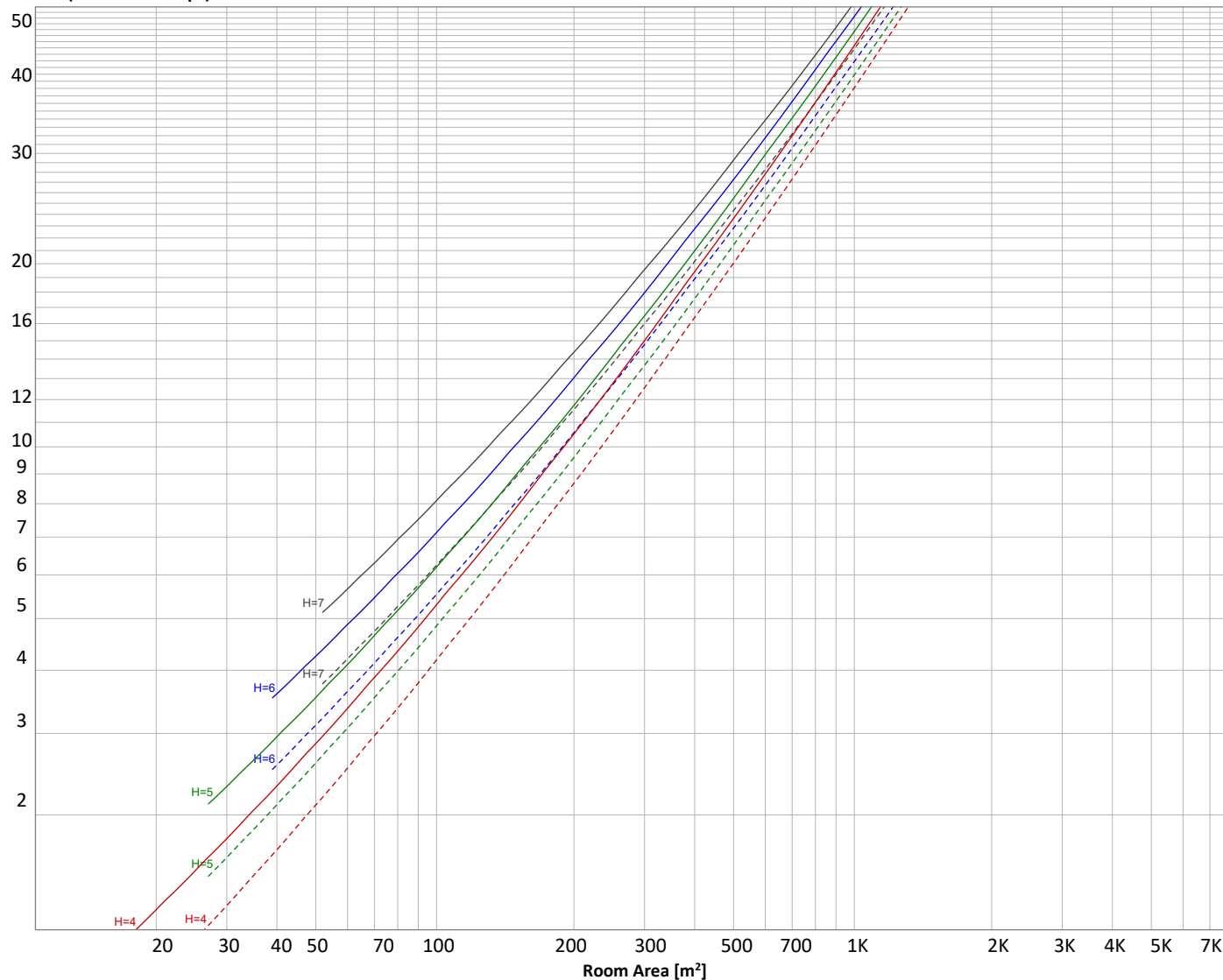
Operator: CR



Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 2779 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°
95,5 lm	271 lm	405 lm	481 lm	494 lm	445 lm	339 lm	185 lm	40,2 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
4,06 lm	3,52 lm	3,44 lm	3,19 lm	2,90 lm	2,48 lm	1,80 lm	1,14 lm	0,381 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	95 lm	3,4%
10-20°	271 lm	9,8%
20-30°	405 lm	14,6%
30-40°	481 lm	17,3%
40-50°	494 lm	17,8%
50-60°	445 lm	16,0%
60-70°	339 lm	12,2%
70-80°	185 lm	6,7%
80-90°	40 lm	1,4%
90-100°	4 lm	0,1%
100-110°	4 lm	0,1%
110-120°	3 lm	0,1%
120-130°	3 lm	0,1%
130-140°	3 lm	0,1%
140-150°	2 lm	0,1%
150-160°	2 lm	0,1%
160-170°	1 lm	0,0%
170-180°	0 lm	0,0%
Total	2779 lm	100,0%

Intensity peaks

Max intensity	1009 cd
Intensity, 90°	4 cd
Intensity, 0°	1009 cd

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	772 lm	27,8%
0-40°	1253 lm	45,1%
0-60°	2192 lm	78,9%
60-90°	564 lm	20,3%
70-100°	230 lm	8,3%
90-120°	11 lm	0,4%
0-90°	2756 lm	99,2%
90-180°	23 lm	0,8%
0-180°	2779 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	385 lm	13,9%
Medium(30-60°)	709 lm	25,5%
High(60-80°)	262 lm	9,4%
Very high(80-90°)	22 lm	0,8%
Back light		
Low(0-30°)	385 lm	13,9%
Medium(30-60°)	709 lm	25,5%
High(60-80°)	262 lm	9,4%
Very high(80-90°)	22 lm	0,8%

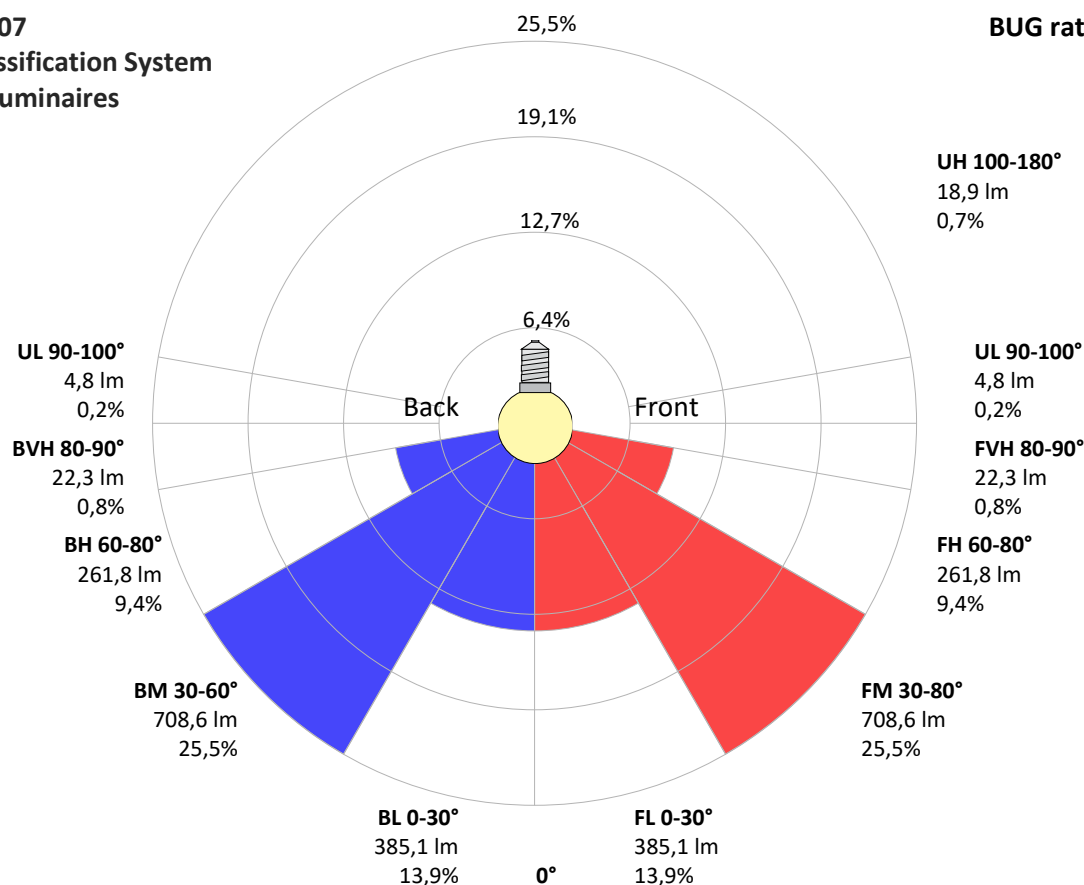
Uplight

Low(90-100°)	5 lm	0,2%
High(100-180°)	19 lm	0,7%

IESNA TM-15-07

Luminaire Classification System For Outdoor Luminaires

BUG rating B1 U2 G1



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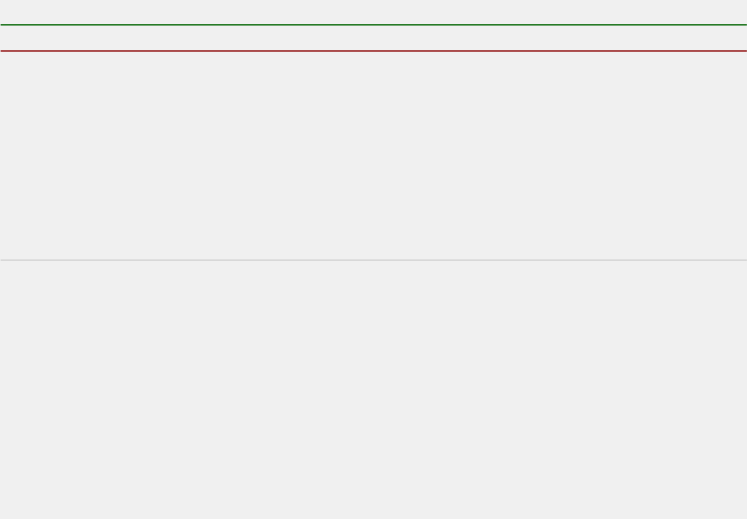


Power Details

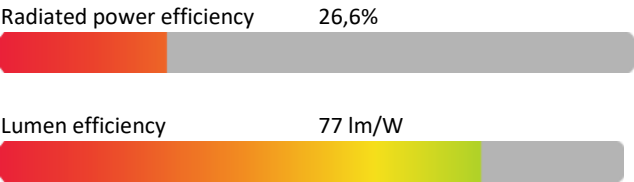
Input Power

Power feed to light source	36,0 W
Frequency of input power	0 Hz
RMS Input voltage feed, V_{RMS}	223 V
RMS Input current feed, I_{RMS}	0,161 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	35,91 VA
Displacement factor of AC power feed	n/a
Power factor of AC current feed	0,61
Total harmonic distortion of the current	n/a%
Total harmonic distortion of the voltage	n/a%

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	2997 K
CCT shift	+3 K
CCT end	3000 K

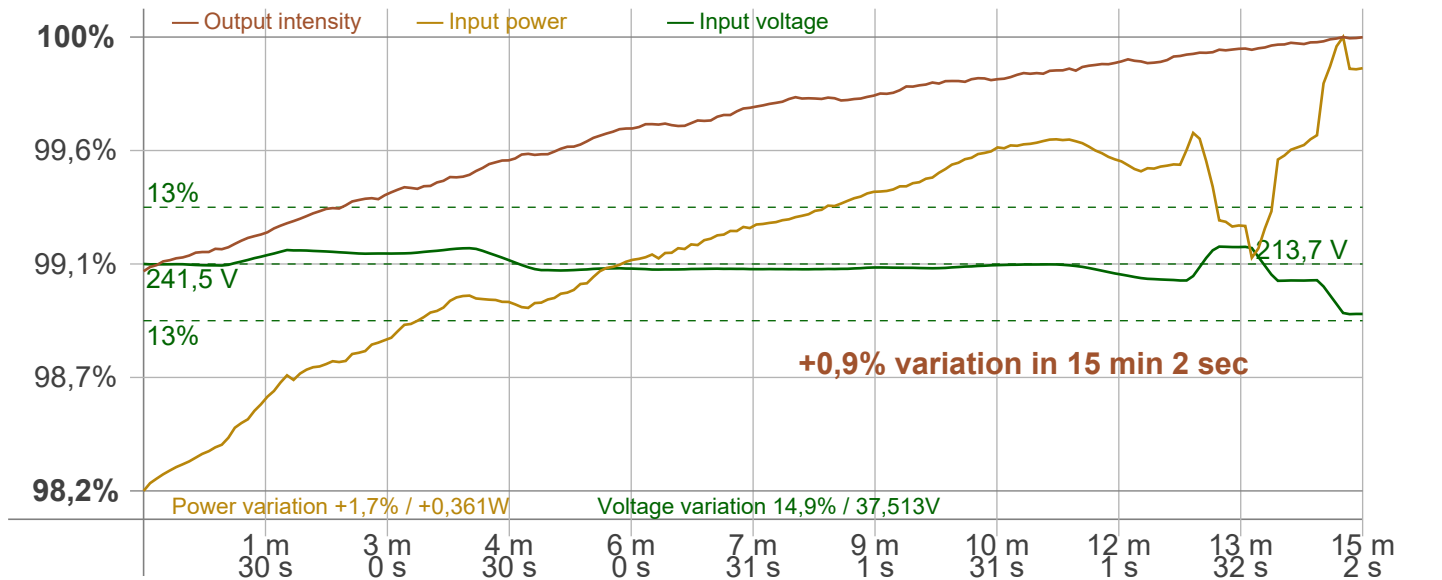
Warmup Result

Total warmup time	Lamp stabilized in 15 min 2 sec
Warmup variation	+0,9%

Output Change

Output start	2757 lm
Output change	+23 lm
Output end	2779 lm

Stabilization Curve



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Flicker /TLA details

Flicker Meter Type Viso Systems LabFlicker
Frequency of input power 0 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 49,02 Hz
Percent Flicker 0,07 %
Flicker index 0

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

JA8/10 40 Hz 0 %
JA8/10 90 Hz 0,01 %
JA8/10 200 Hz 0,03 %
JA8/10 400 Hz 0,03 %
JA8/10 1000 Hz 0,05 %

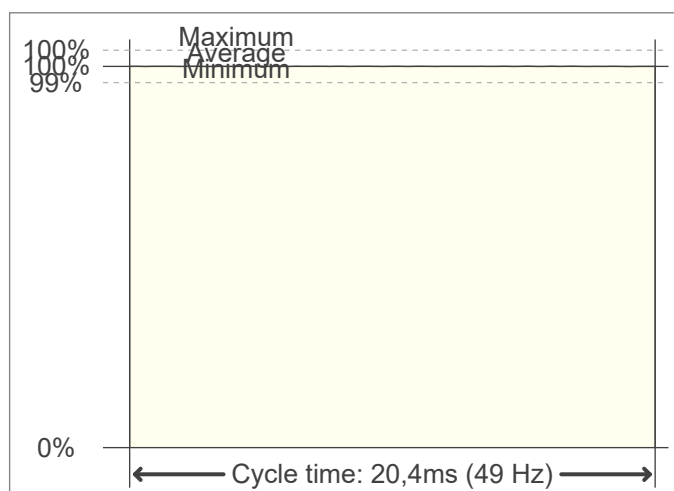
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

PstLM value ($F < 80$ Hz) 0
SVM value ($80 < F < 2000$ Hz) 0

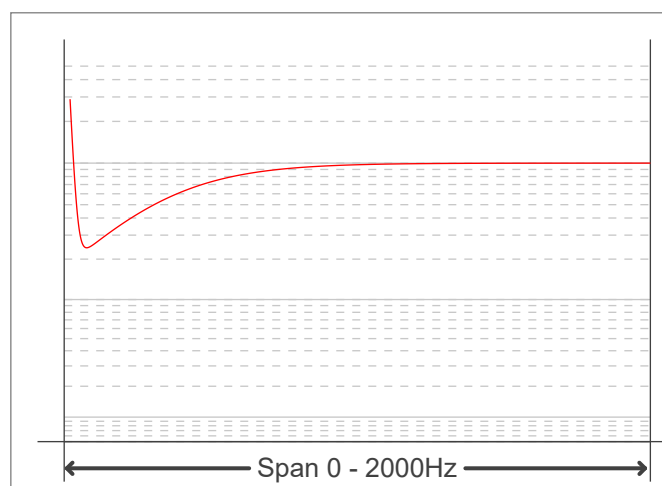
Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp 0

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot

