

Light Measurement Report

Print date: 31-10-2024

Measurement date and time: 31-10-2024 08:22:06 – Measurement no. VFR-241031-1741-MS

Measurement tracking No. and Link: [VT241031-001705](#)

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°

1,99 m

8,8 W – PF 0,46 – DPF 0,97

230 V – 0,084 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)

FUT061-4000K

FUT061-4000K – Dutchfulfillment

MI-LIGHT | DOWNLIGHT | RGB+CCT | Ø110 | 9W | WIT

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

734 lm – 0,11% / 99,89%

83 lm/W

271 cd – 108,8°

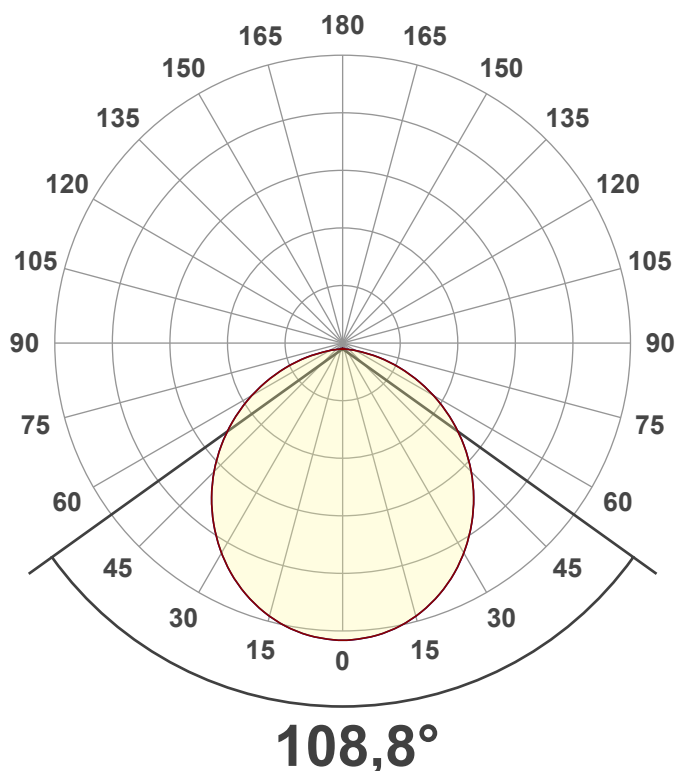
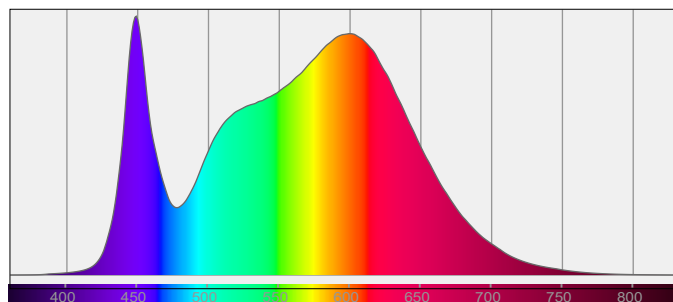
CCT = 4000 K / 3959 K

CRI 86,1

R_f 86,4 – R_g 97,8

Duv -0,0013 – SDCM 1,2

SVM 0,01 – PstLM 0,03



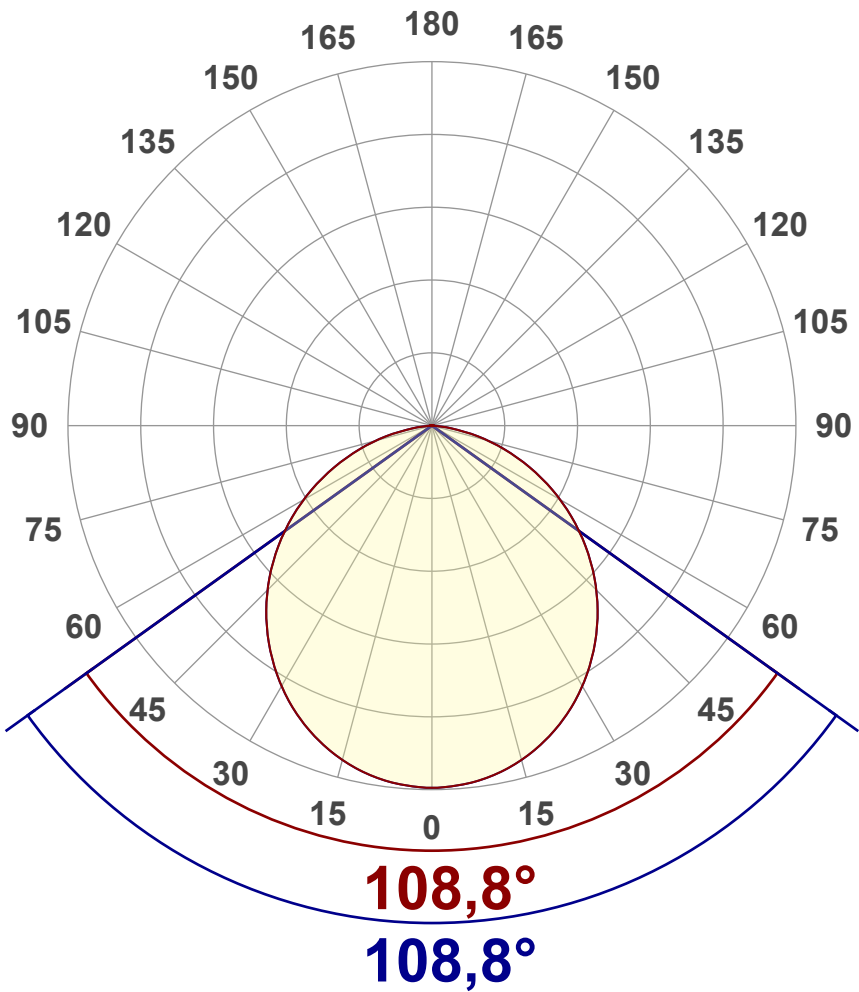
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	734 lm
Lumen Up% / Down%	0,11% / 99,89%
Peak Intensity	271 cd
Beam Angle (50%)	108,8°
Beam Angle (90%)	108,8°
Beam Angle (10%)	108,8°

Cut-off Angle

Average 2,5%	170,1°
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Field Angle

Average 10%	157,9°
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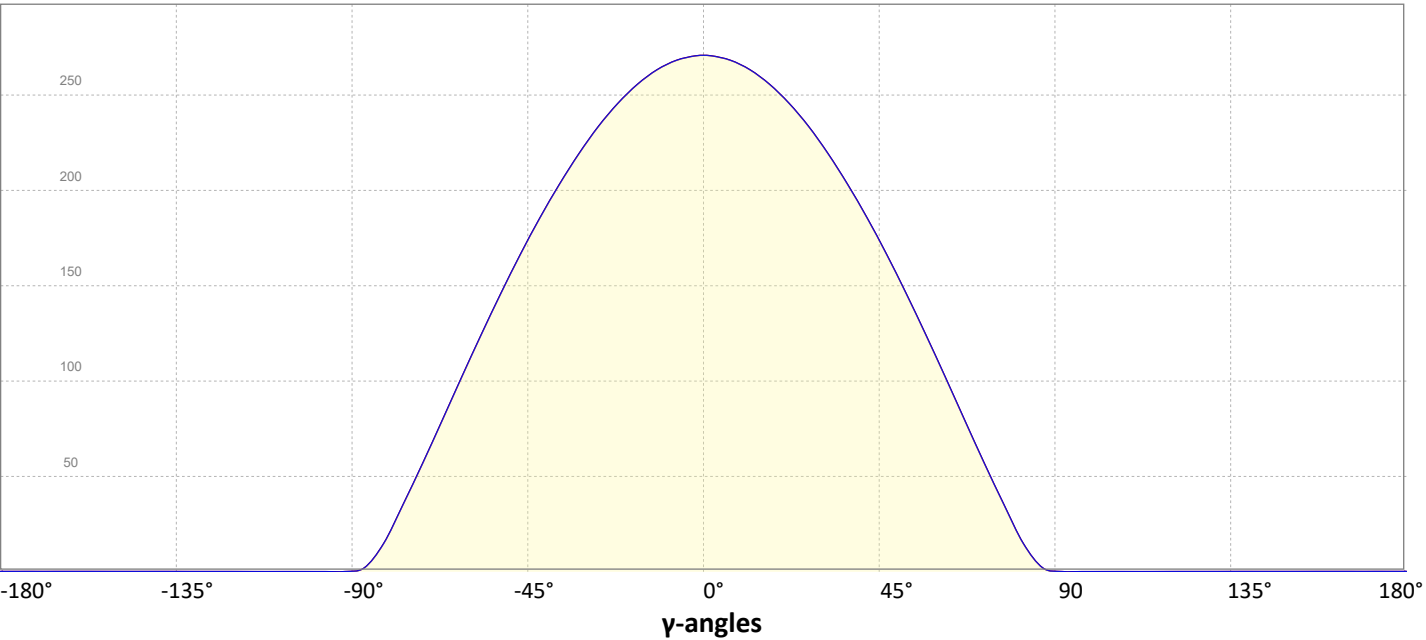
Intensity Ratio

In 120° cone	80,6%
In 90° cone	55,5%

C000-C180

C090-C270

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

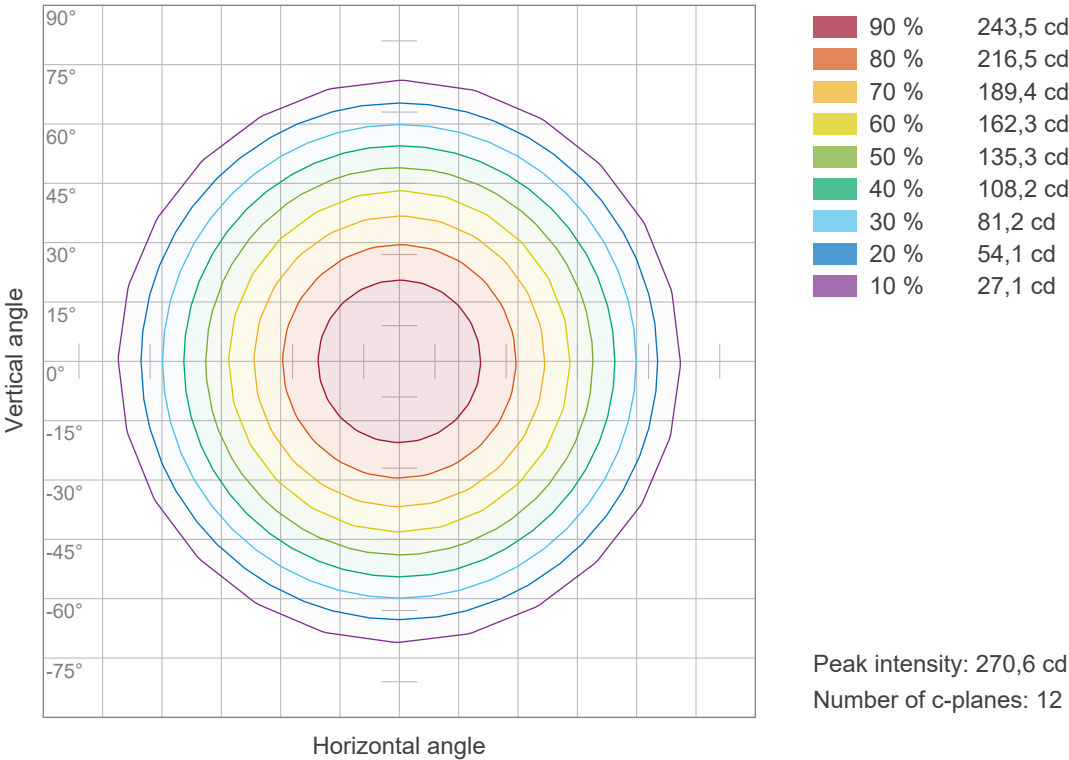


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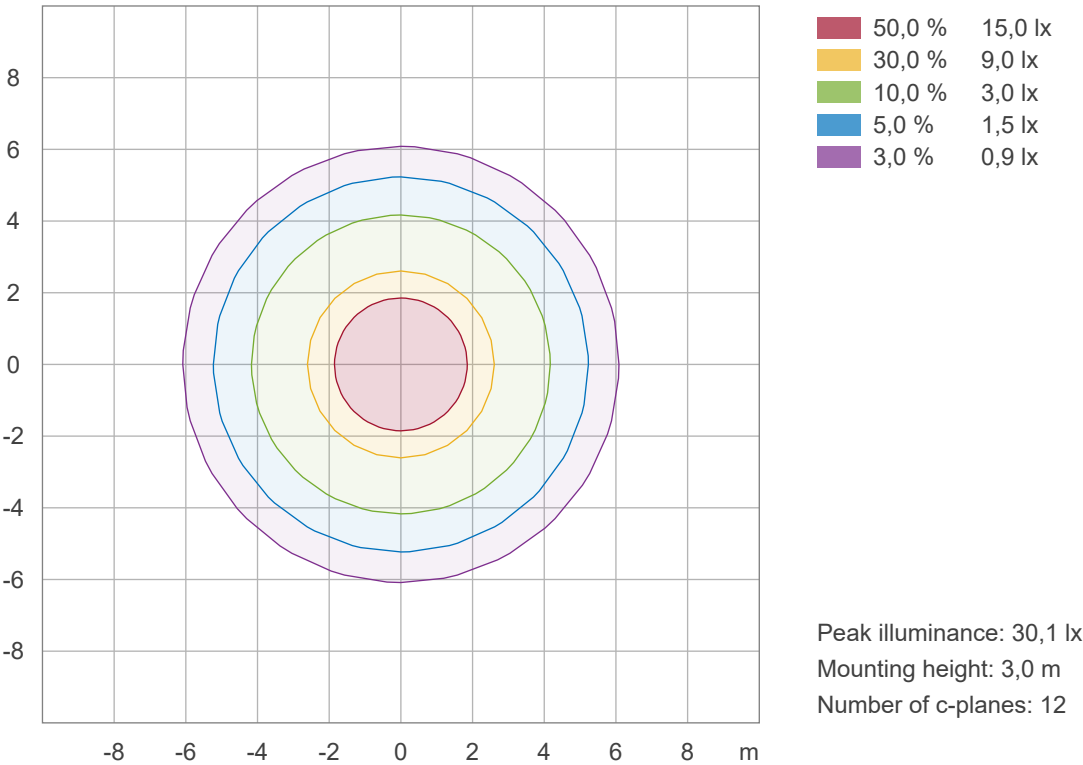
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Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



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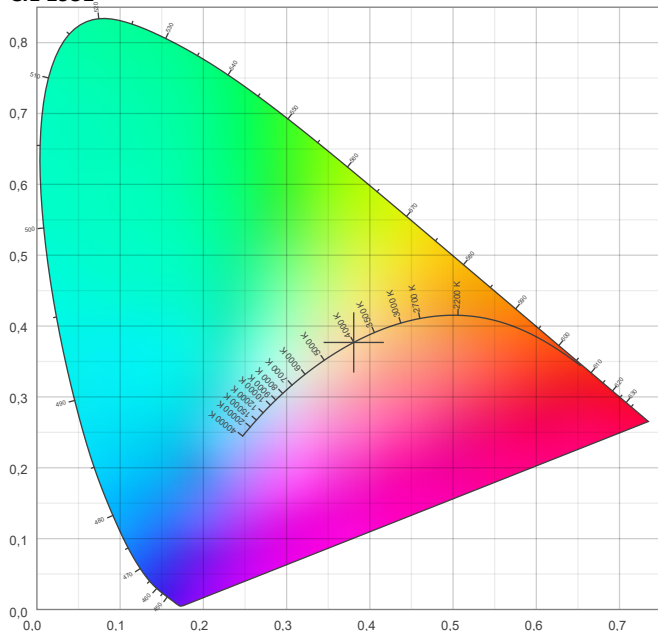


Color details

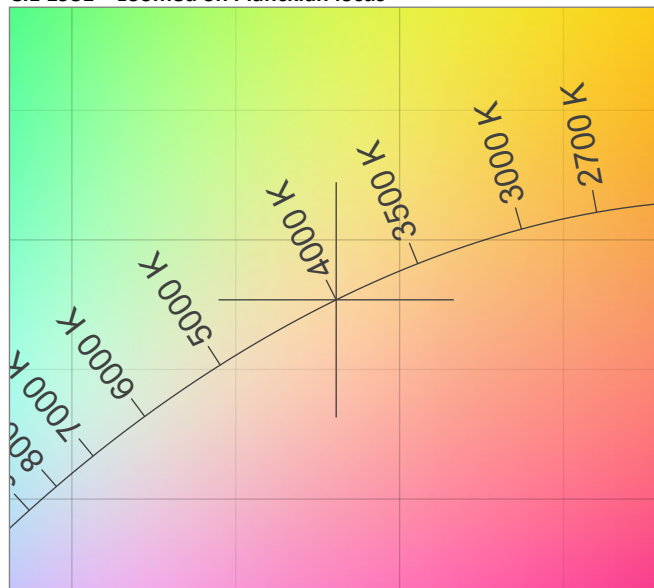
Correlated Color Temperature, Target CCT = 4000 K
Correlated Color Temperature, Measured CCT = 3959 K
Color Rendering Index CRI 86,1
Color Rendering Index, R9 (red component) R9 = 19,6
Color Rendering TM30-18 R_f 86,4 – R_g 97,8
Color Quality Scale CQS = 85,0

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 = -0,0013
Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,225;0,502)

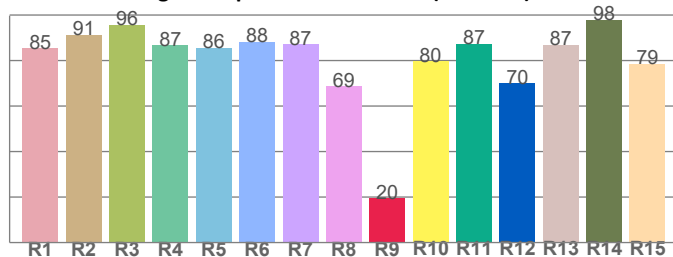
CIE 1931



CIE 1931 – zoomed on Planckian locus



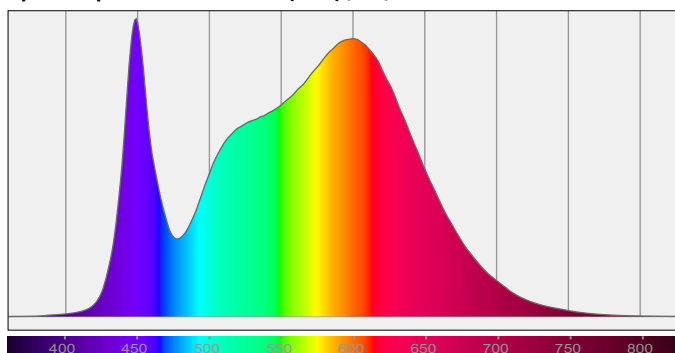
Color Rendering Index per reference color (CIE 1995)



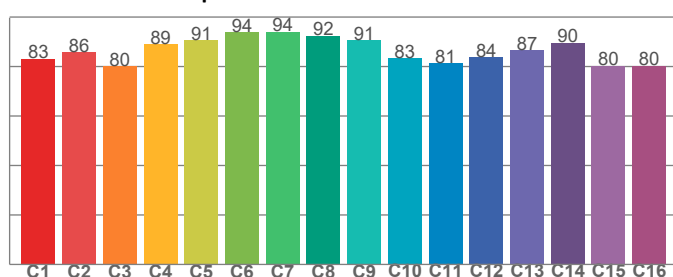
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
85,3	91,3	95,7	86,6	85,7	88,3	87,1	68,6	19,6	79,6	87,3	69,9	86,9	97,8	78,5

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



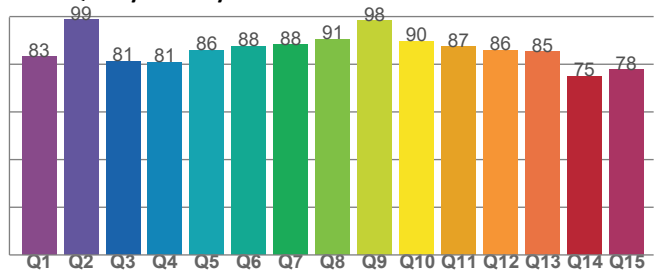
TM30-18 R_f-values per hue bin



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
83,2	85,9	80,1	89,0	90,6	93,8	94,1	92,5	90,7	83,2	81,3	83,9	86,5	89,5	80,3	80,4

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
83,1	98,7	81,4	80,8	86,0	87,6	88,1	90,5	98,2	89,7	87,3	85,8	85,3	74,9	77,8

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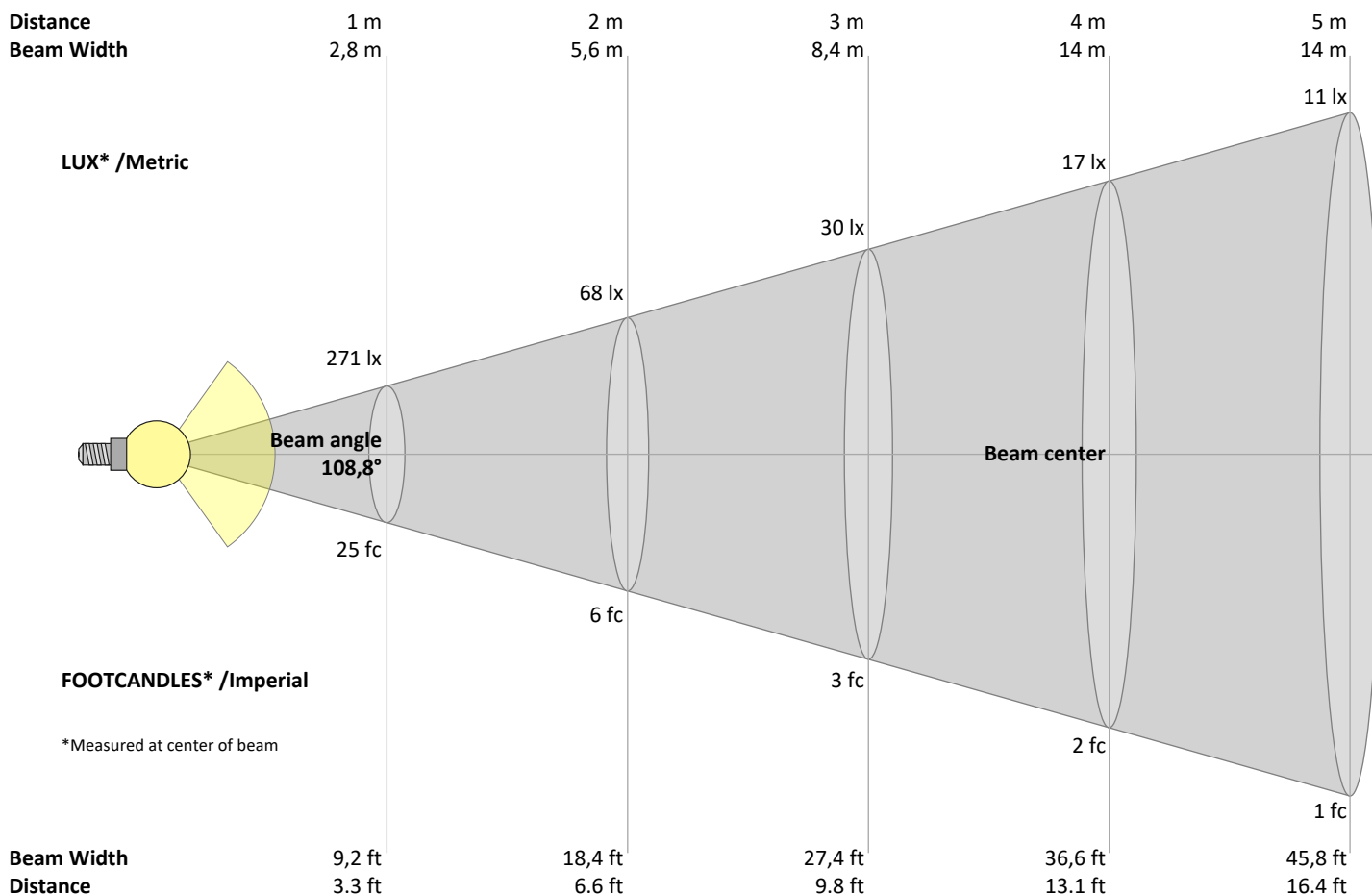
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Beam Details



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
271	68	30	17	11	8	6	4	3	3	2	2	2	1	1	1	1	1	1	1	lux
25,1	6,3	2,8	1,6	1	0,7	0,5	0,4	0,3	0,3	0,2	0,2	0,1	0,1	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
271	269	265	259	249	238	225	209	192	174	154	133	111	88	65	44	23	7	1	0	cd
100%	99%	98%	96%	92%	88%	83%	77%	71%	64%	57%	49%	41%	33%	24%	16%	8%	3%	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
271	269	265	259	249	238	225	209	192	174	154	133	111	88	65	44	23	7	1	0	cd
100%	99%	98%	96%	92%	88%	83%	77%	71%	64%	57%	49%	41%	33%	24%	16%	8%	3%	0%	0%	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
271	269	265	259	249	238	225	209	192	174	154	133	111	88	65	44	23	7	1	0	cd
100%	99%	98%	96%	92%	88%	83%	77%	71%	64%	57%	49%	41%	33%	24%	16%	8%	3%	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
271	269	265	259	249	238	225	209	192	174	154	133	111	88	65	44	23	7	1	0	cd
100%	99%	98%	96%	92%	88%	83%	77%	71%	64%	57%	49%	41%	33%	24%	16%	8%	3%	0%	0%	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											
X	Y	Viewed Crosswise					Viewed Endwise				
		(Viewing direction orthogonal to lamp length axis)					(Viewing direction parallel to lamp length axis)				
2H	2H	24,2	25,4	24,4	25,7	25,9	24,2	25,4	24,4	25,7	25,9
	3H	25,4	26,6	25,8	26,9	27,1	25,4	26,6	25,8	26,9	27,1
	4H	25,8	27,0	26,2	27,3	27,5	25,8	27,0	26,2	27,3	27,5
	6H	26,1	27,2	26,4	27,4	27,8	26,1	27,2	26,4	27,4	27,8
	8H	26,1	27,2	26,5	27,5	27,9	26,1	27,2	26,5	27,5	27,9
	12H	26,1	27,1	26,5	27,4	27,9	26,1	27,1	26,5	27,4	27,9
4H	2H	24,7	25,9	25,1	26,1	26,4	24,7	25,9	25,1	26,1	26,4
	3H	26,2	27,2	26,6	27,5	28,0	26,2	27,2	26,6	27,5	28,0
	4H	26,7	27,6	27,1	28,0	28,5	26,7	27,6	27,1	28,0	28,5
	6H	27,0	27,8	27,5	28,2	28,6	27,0	27,8	27,5	28,2	28,6
	8H	27,0	27,8	27,5	28,2	28,6	27,0	27,8	27,5	28,2	28,6
	12H	27,0	27,7	27,5	28,1	28,6	27,0	27,7	27,5	28,1	28,6
8H	4H	26,9	27,6	27,4	28,0	28,4	26,9	27,6	27,4	28,0	28,4
	6H	27,3	27,9	27,8	28,3	28,9	27,3	27,9	27,8	28,3	28,9
	8H	27,4	27,9	27,9	28,4	29,1	27,4	27,9	27,9	28,4	29,1
	12H	27,4	27,9	28,0	28,4	29,0	27,4	27,9	28,0	28,4	29,0
12H	4H	26,8	27,5	27,3	27,9	28,4	26,8	27,5	27,3	27,9	28,4
	6H	27,3	27,8	27,8	28,3	29,0	27,3	27,8	27,8	28,3	29,0
	8H	27,4	27,9	28,0	28,4	29,0	27,4	27,9	28,0	28,4	29,0
Variations with the observer position for the luminaire spacings, S:											
S = 1.0H		0,1 / -0,2					0,1 / -0,2				
S = 1.5H		0,3 / -0,4					0,3 / -0,4				
S = 2.0H		0,6 / -0,8					0,6 / -0,8				

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	102	102	102	100	
1	109	105	100	97	106	102	99	95	98	95	92	94	92	89	90	88	87	85
2	99	91	85	79	97	89	83	78	86	81	76	83	78	75	80	76	73	71
3	91	80	72	66	88	79	71	65	76	69	64	73	68	63	70	66	62	60
4	83	71	63	56	81	70	62	56	67	60	55	65	59	54	63	58	53	51
5	76	64	55	48	74	63	54	48	60	53	47	58	52	47	57	51	46	44
6	71	57	49	42	69	56	48	42	55	47	42	53	46	41	51	45	41	39
7	65	52	43	37	64	51	43	37	50	42	37	48	42	37	47	41	36	34
8	61	48	39	33	59	47	39	33	45	38	33	44	38	33	43	37	33	31
9	57	44	35	30	56	43	35	30	42	35	30	41	34	30	40	34	29	28
10	53	40	32	27	52	40	32	27	39	32	27	38	31	27	37	31	27	25

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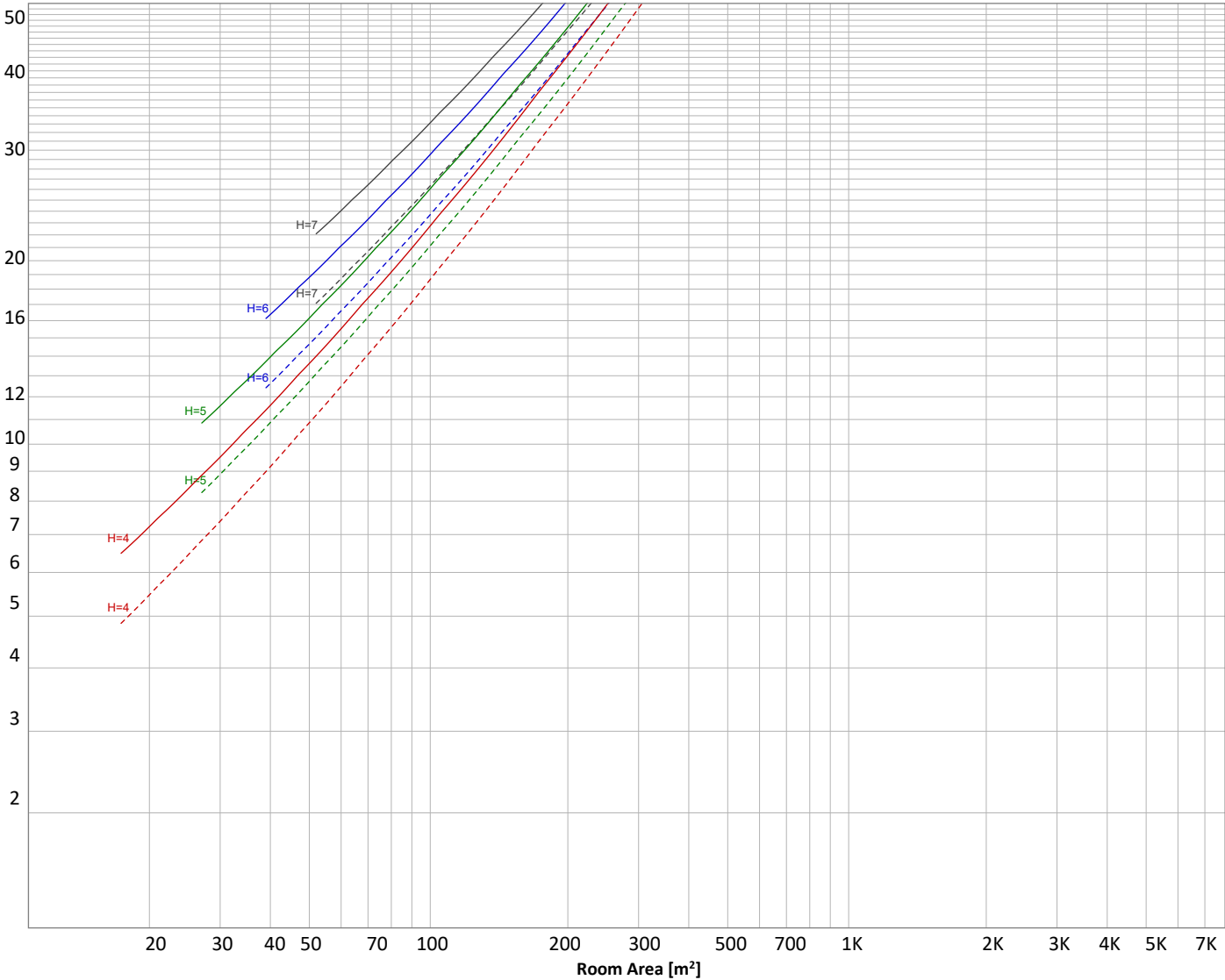
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 734 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°
25,6 lm	73,0 lm	110 lm	131 lm	134 lm	119 lm	87,2 lm	46,0 lm	8,19 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
0,116 lm	0,112 lm	0,110 lm	0,127 lm	0,123 lm	0,104 lm	0,082 lm	0,053 lm	0,018 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	26 lm	3,5%
10-20°	73 lm	9,9%
20-30°	110 lm	15,0%
30-40°	131 lm	17,8%
40-50°	134 lm	18,3%
50-60°	119 lm	16,1%
60-70°	87 lm	11,9%
70-80°	46 lm	6,3%
80-90°	8 lm	1,1%
90-100°	0 lm	0,0%
100-110°	0 lm	0,0%
110-120°	0 lm	0,0%
120-130°	0 lm	0,0%
130-140°	0 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	734 lm	100,0%

Intensity peaks

Max intensity	271 cd
Intensity, 90°	1 cd
Intensity, 0°	271 cd

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	208 lm	28,4%
0-40°	340 lm	46,2%
0-60°	592 lm	80,6%
60-90°	141 lm	19,3%
70-100°	54 lm	7,4%
90-120°	0 lm	0,0%
0-90°	734 lm	99,9%
90-180°	1 lm	0,1%
0-180°	734 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	104 lm	14,2%
Medium(30-60°)	192 lm	26,1%
High(60-80°)	67 lm	9,1%
Very high(80-90°)	4 lm	0,6%
Back light		
Low(0-30°)	104 lm	14,2%
Medium(30-60°)	192 lm	26,1%
High(60-80°)	67 lm	9,1%
Very high(80-90°)	4 lm	0,6%

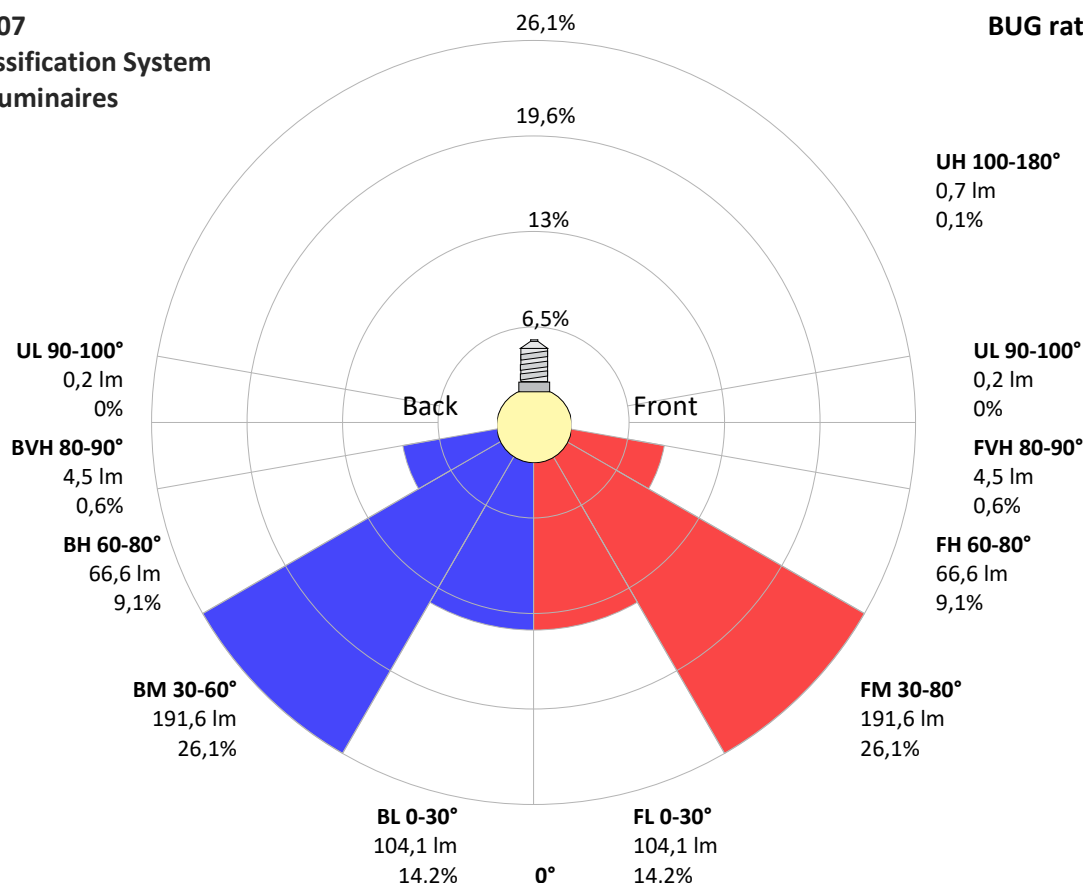
Uplight

Low(90-100°)	0 lm	0,0%
High(100-180°)	1 lm	0,1%

IESNA TM-15-07

Luminaire Classification System For Outdoor Luminaires

BUG rating B0 U1 G0



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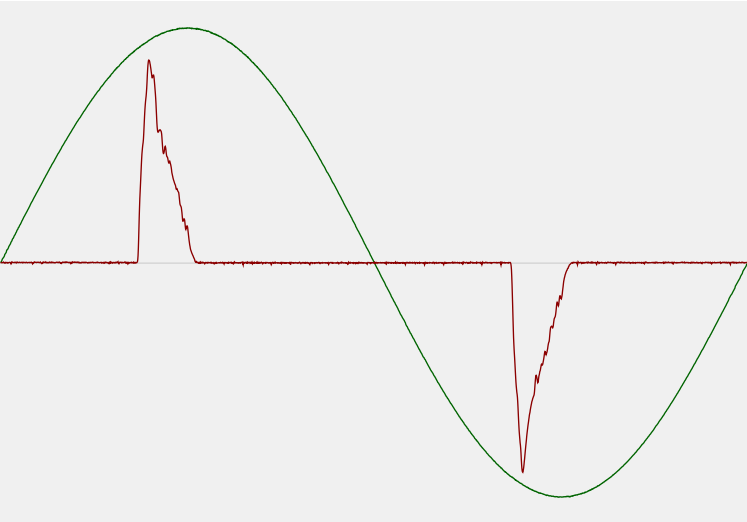


Power Details

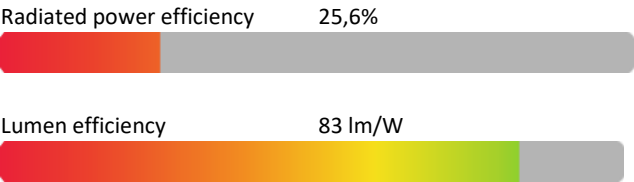
Input Power

Power feed to light source	8,8 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,084 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	19,24 VA
Displacement factor of AC power feed	0,97
Power factor of AC current feed	0,46
Total harmonic distortion of the current	183,23%
Total harmonic distortion of the voltage	0,15%

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	3996 K
CCT shift	+4 K
CCT end	4000 K

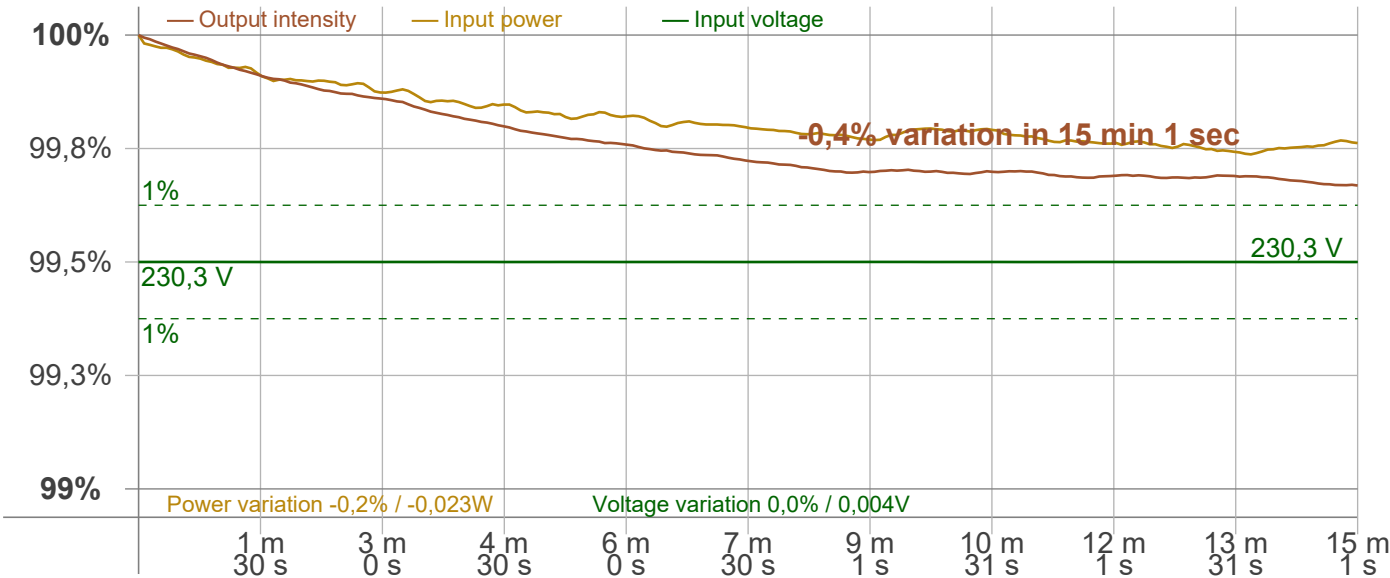
Warmup Result

Total warmup time	Lamp stabilized in 15 min 1 sec
Warmup variation	-0,4%

Output Change

Output start	737 lm
Output change	-3 lm
Output end	734 lm

Stabilization Curve



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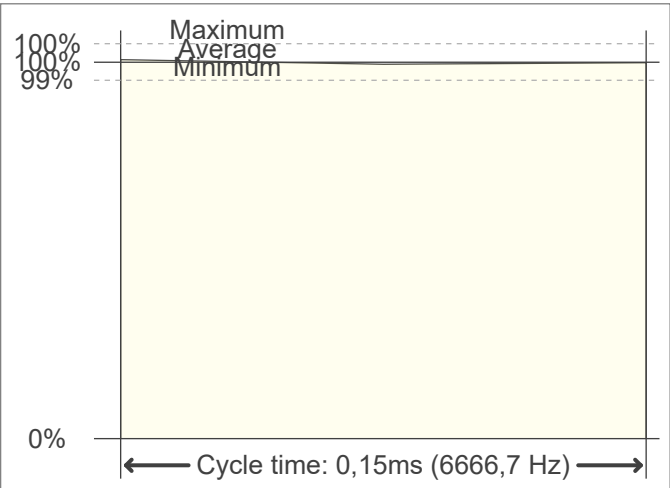
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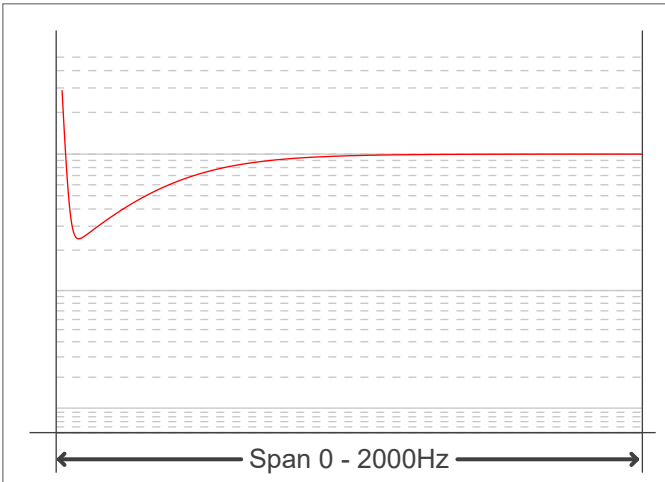
Flicker /TLA details

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	6666,67 Hz	JA8/10 40 Hz	0,04 %
Percent Flicker	1,43 %	JA8/10 90 Hz	0,05 %
Flicker index	0	JA8/10 200 Hz	0,31 %
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)		JA8/10 400 Hz	0,4 %
PstLM value (F < 80 Hz)	0,03	JA8/10 1000 Hz	0,54 %
SVM value (80 < F < 2000 Hz)	0,01	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

