

Light Measurement Report

Print date: 27/04/2026

Measurement date and time: 23/04/2026 16:24:28 – Measurement no. VFR-260423-1409-MS

Measurement tracking No. and Link: [VT260423-002925](#)

Operator: LC



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 – 11/12/2024 – 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°

2,09 m

22,9 W – PF 0,97 – DPF 0,98

231 V – 0,103 A

50,2 Hz

Lamp stabilized in 17 min 19 sec – 2,0%

Tested Light Source

Product Name

Item No. and Manufacturer

Product Description (line 1)

FRONTLED 4000K 120D WHITE

25030000909203 – ELECTRUM

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

2552 lm – 0,24% / 99,76%

111 lm/W

853 cd – 115,7°

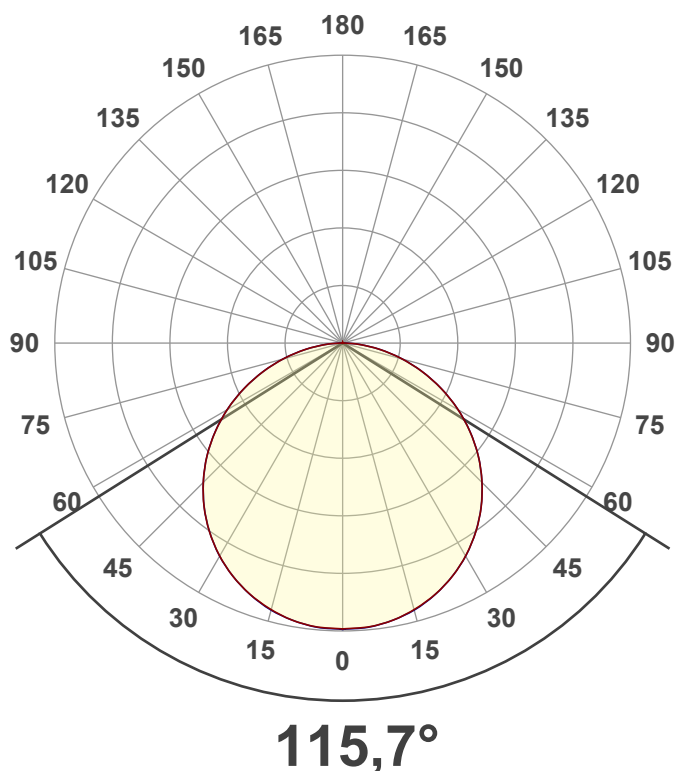
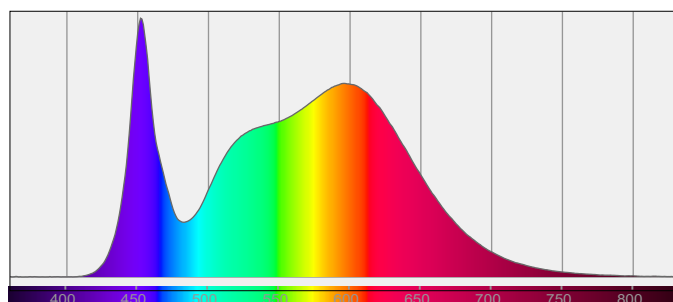
CCT = 4000 K / 4164 K

CRI 85,3

R_f 84,3 – R_g 96,8

Duv -0,0021 – SDCM 4,0

SVM 0,02 – PstLM 0,52



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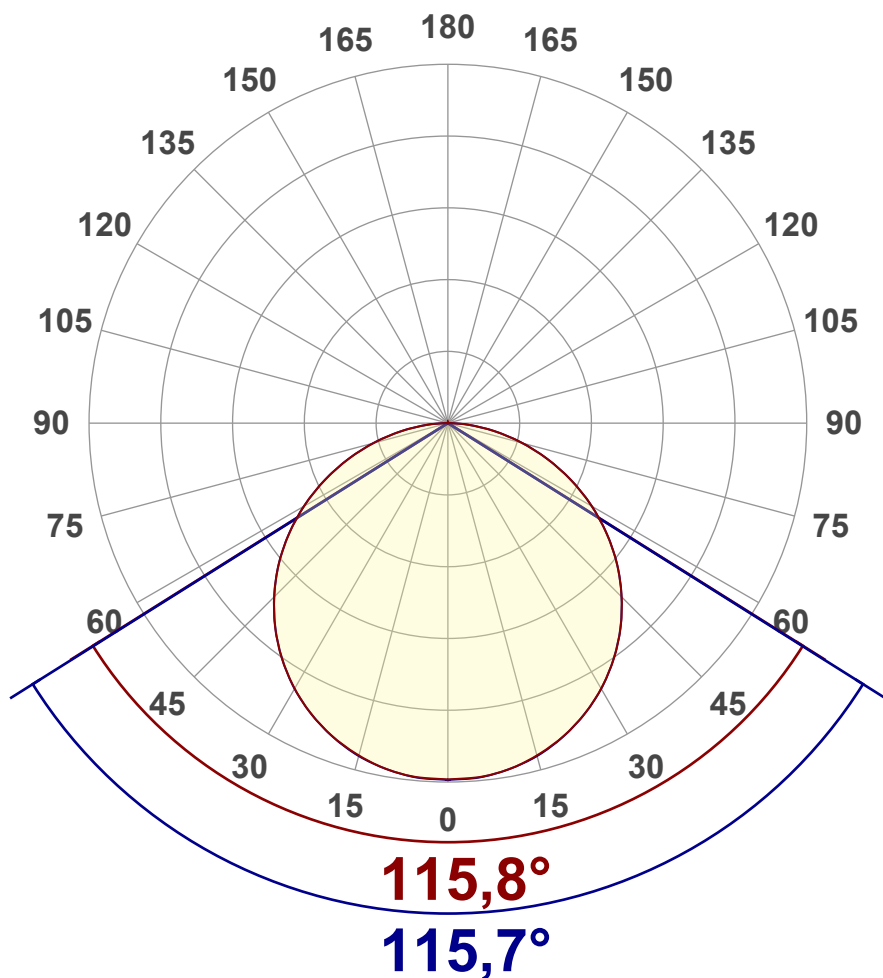
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	2552 lm
Lumen Up% / Down%	0,24% / 99,76%
Peak Intensity	853 cd
Beam Angle (50%-FWHM)	115,66°

Cut-off Angle

Average 2,5%	177,2°
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Field Angle

Average 10%	164,9°
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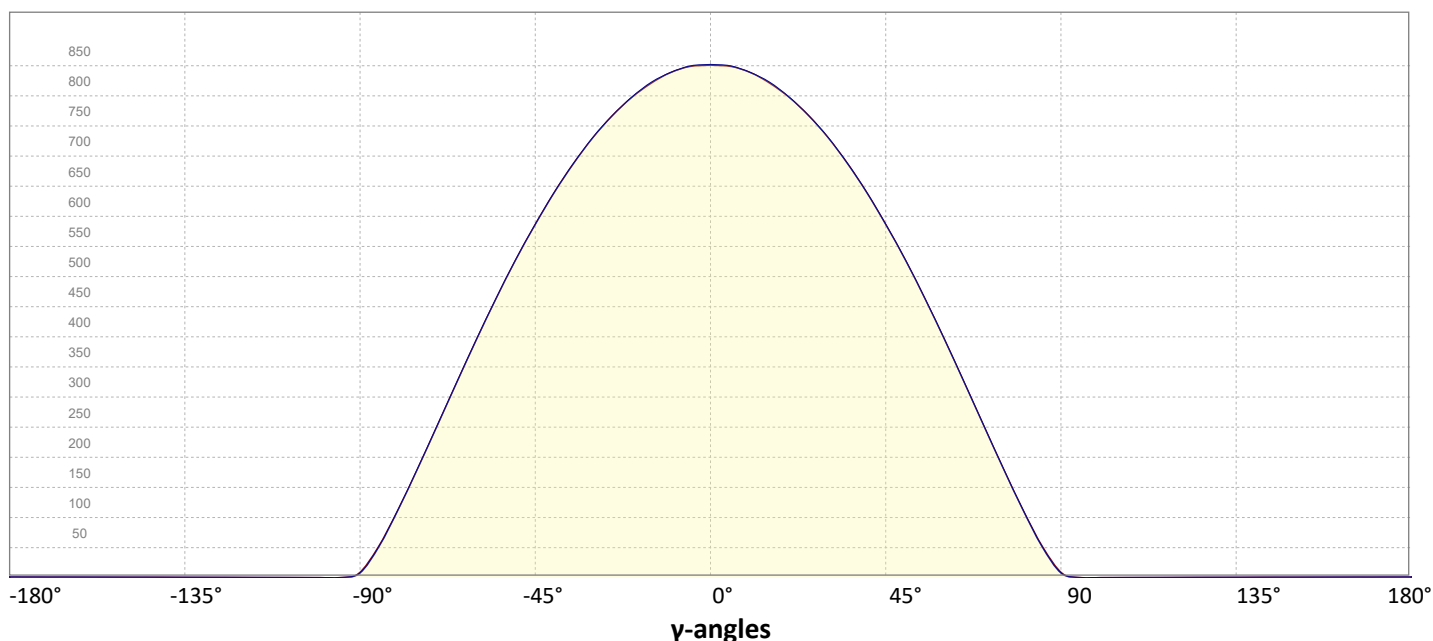
Intensity Ratio

In 120° cone	77,0%
In 90° cone	51,9%

C000-C180

C090-C270

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



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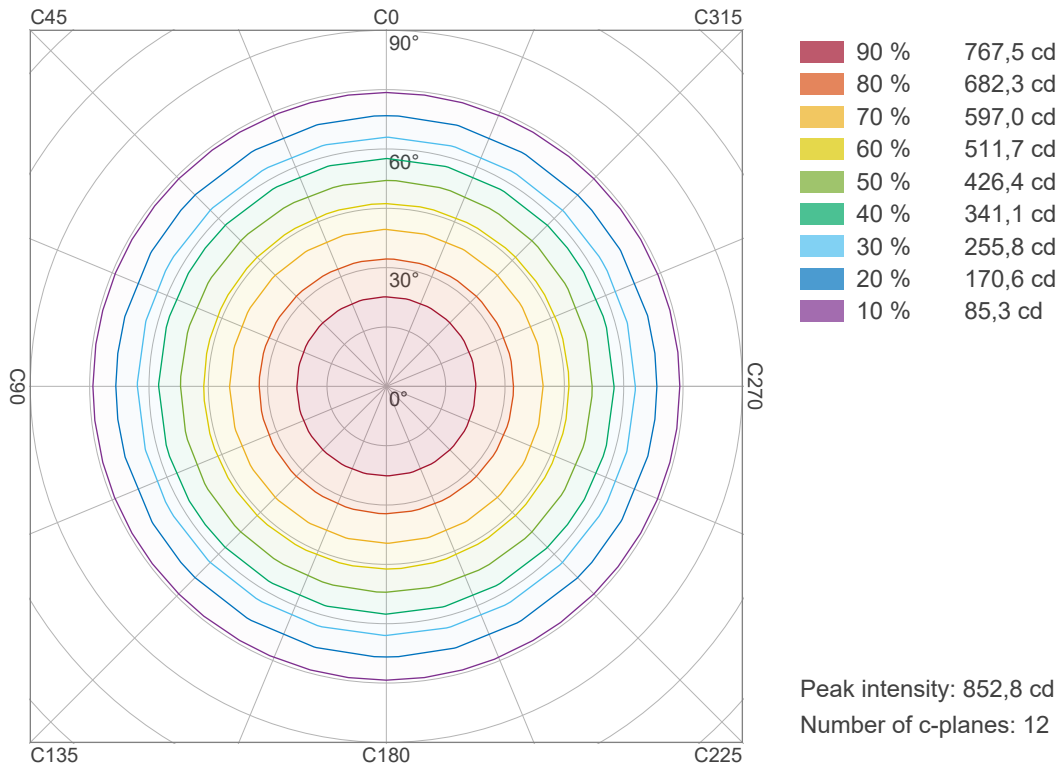
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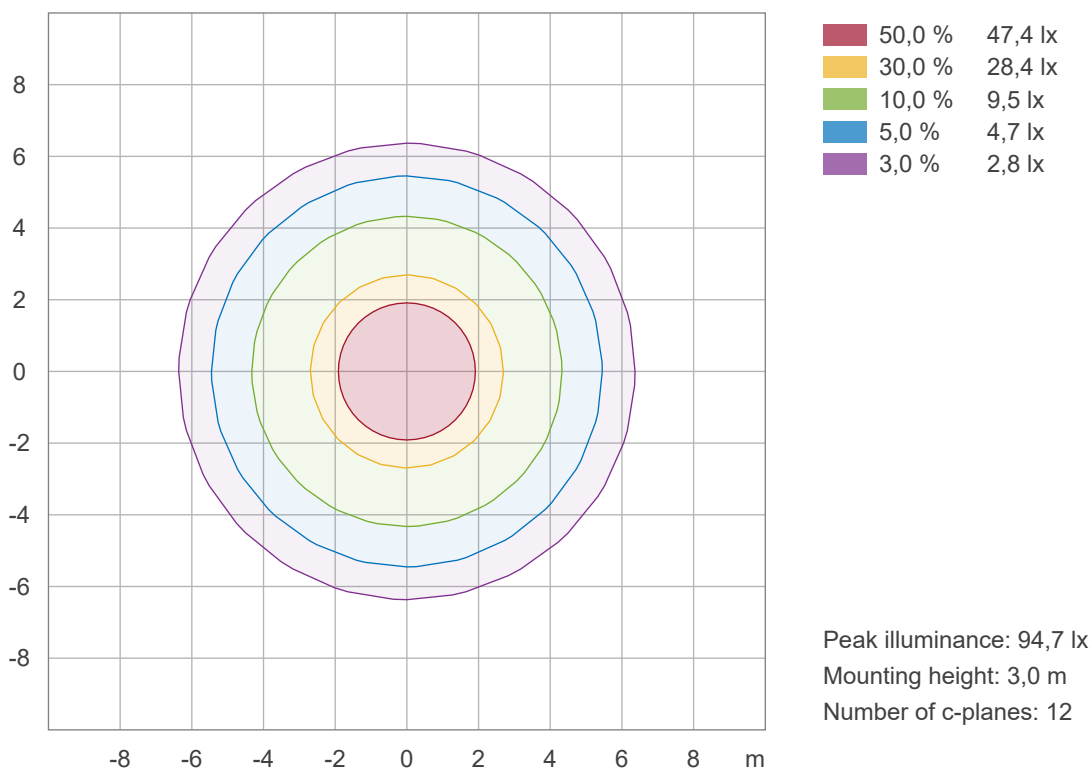
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Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



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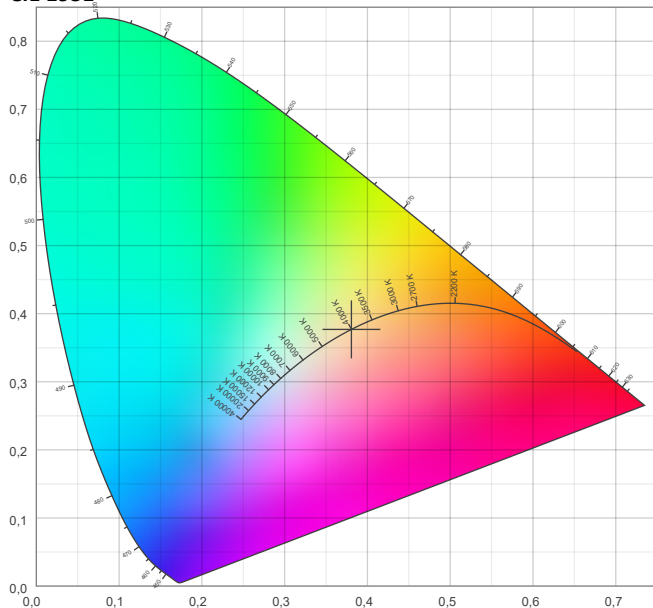


Color details

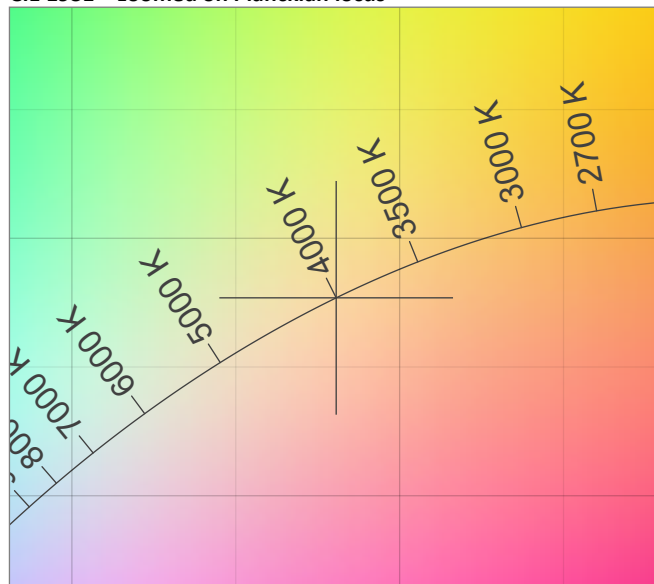
Correlated Color Temperature, Target CCT = 4000 K
Correlated Color Temperature, Measured CCT = 4164 K
Color Rendering Index CRI 85,3
Color Rendering Index, R9 (red component) R9 = 20,7
Color Rendering TM30-18 R_f 84,3 – R_g 96,8
Color Quality Scale CQS = 83,0

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 = -0,0021
Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,225;0,502)

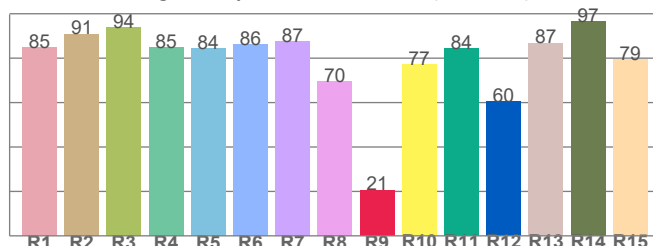
CIE 1931



CIE 1931 – zoomed on Planckian locus



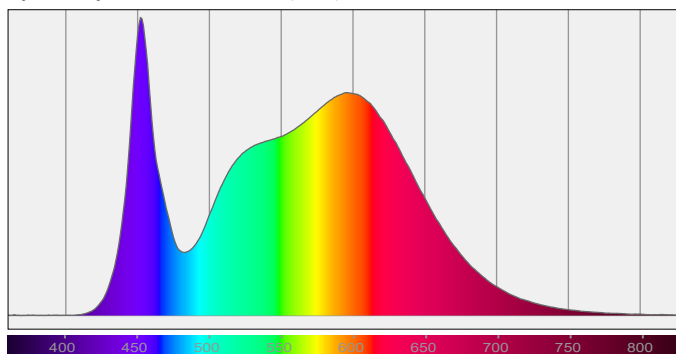
Color Rendering Index per reference color (CIE 1995)



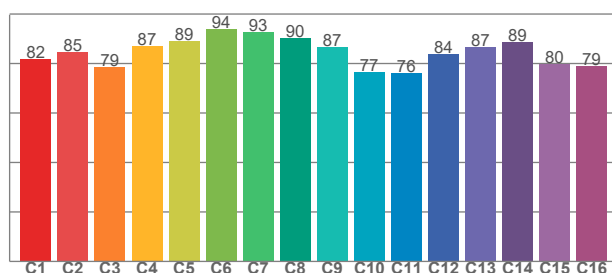
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
85,0	90,9	93,9	85,0	84,3	86,2	87,4	69,5	20,7	77,0	84,4	60,5	86,9	96,6	79,5

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



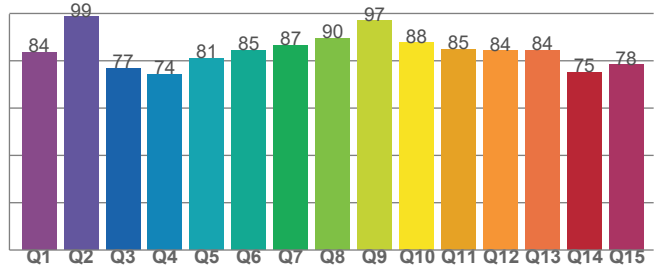
TM30-18 R_f-values per hue bin



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
81,9	84,6	78,8	87,1	89,1	93,7	92,6	90,4	86,8	76,6	76,1	83,8	86,6	88,5	79,6	79,1

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
83,6	98,6	76,9	74,2	81,1	84,5	86,6	89,6	97,0	87,7	84,8	84,1	84,5	75,1	78,2

Beam Details

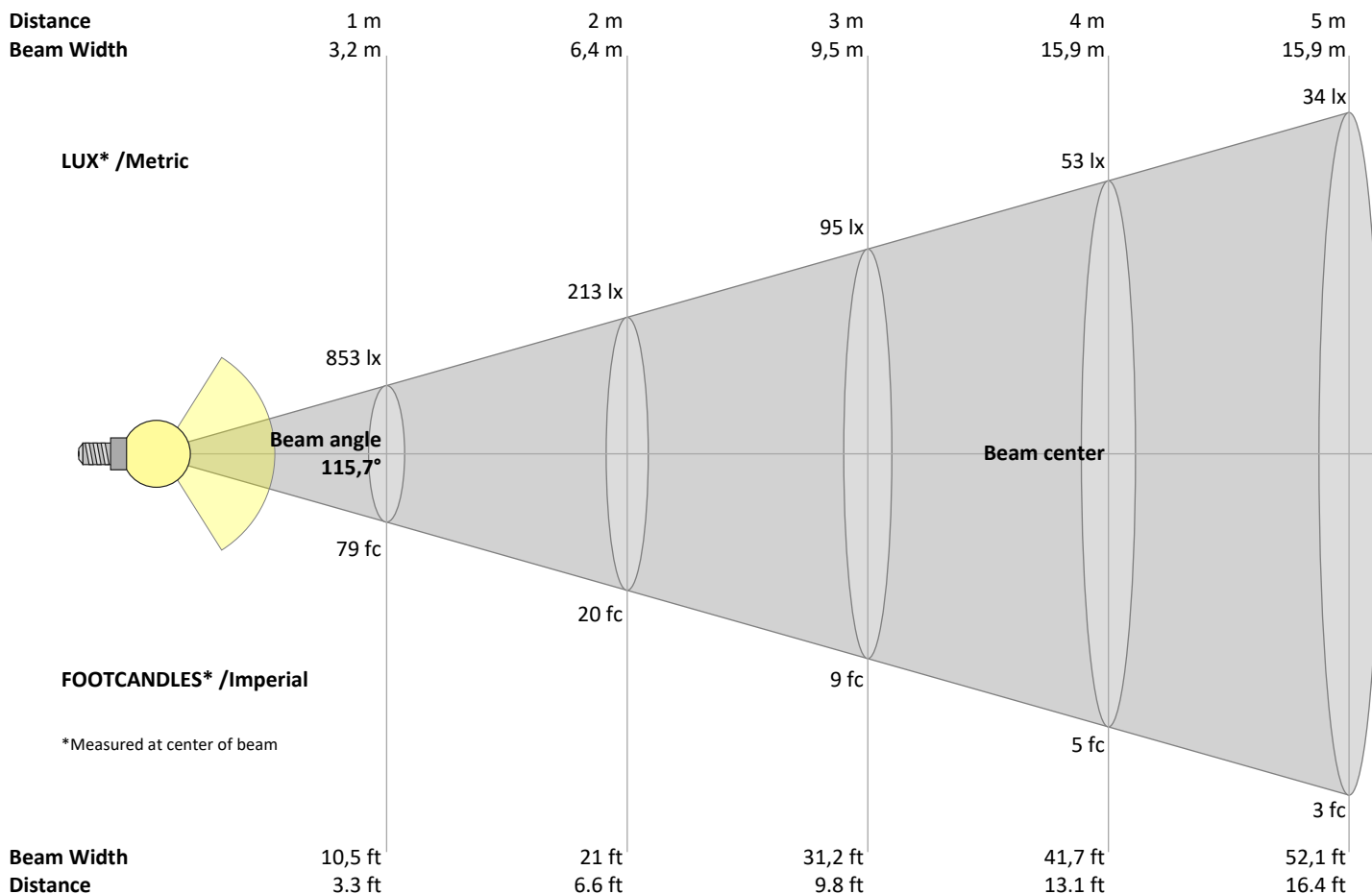
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Beam intensities from 1 – 20 m

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
853	213	95	53	34	24	17	13	11	9	7	6	5	4	4	3	3	3	2	2	lux
79,2	19,8	8,8	5	3,2	2,2	1,6	1,2	1	0,8	0,7	0,6	0,5	0,4	0,4	0,3	0,3	0,2	0,2	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
853	849	839	821	798	768	732	689	641	587	528	464	397	327	255	184	117	55	11	1	cd
100%	100%	98%	96%	94%	90%	86%	81%	75%	69%	62%	54%	47%	38%	30%	22%	14%	6%	1%	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
853	850	839	823	799	768	732	689	641	586	528	464	397	326	255	184	116	53	8	0	cd
100%	100%	98%	97%	94%	90%	86%	81%	75%	69%	62%	54%	47%	38%	30%	22%	14%	6%	1%	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
853	849	839	821	798	768	732	689	641	587	528	464	397	327	255	184	117	55	11	1	cd
100%	100%	98%	96%	94%	90%	86%	81%	75%	69%	62%	54%	47%	38%	30%	22%	14%	6%	1%	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
853	850	839	823	799	768	732	689	641	586	528	464	397	326	255	184	116	53	8	0	cd
100%	100%	98%	97%	94%	90%	86%	81%	75%	69%	62%	54%	47%	38%	30%	22%	14%	6%	1%	0%	of 0°val

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Light Planning – UGR table

Corrected, 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	2H	22,1	23,3	22,3	23,6	23,9	22,1	23,3	22,3	23,6	23,9
		3H	23,6	24,9	24,1	25,2	25,4	23,6	24,9	24,1	25,2	25,4
		4H	24,3	25,6	24,8	25,9	26,1	24,3	25,6	24,8	25,9	26,1
		6H	25,0	26,0	25,3	26,3	26,7	25,0	26,0	25,3	26,3	26,7
		8H	25,1	26,2	25,5	26,5	26,9	25,1	26,2	25,5	26,5	26,9
		12H	25,3	26,3	25,6	26,6	27,1	25,3	26,3	25,6	26,6	27,1
4H	4H	2H	22,7	23,9	23,1	24,2	24,5	22,7	24,0	23,1	24,2	24,5
		3H	24,6	25,6	25,0	26,0	26,4	24,6	25,6	25,0	26,0	26,4
		4H	25,3	26,3	25,8	26,7	27,3	25,4	26,3	25,8	26,7	27,3
		6H	26,0	26,9	26,5	27,3	27,7	26,0	26,9	26,5	27,3	27,7
		8H	26,3	27,1	26,8	27,5	27,9	26,3	27,1	26,8	27,5	27,9
		12H	26,5	27,1	27,0	27,6	28,1	26,5	27,1	27,0	27,6	28,1
8H	8H	4H	25,7	26,5	26,2	26,9	27,3	25,7	26,5	26,2	26,9	27,3
		6H	26,5	27,2	27,0	27,6	28,2	26,5	27,2	27,0	27,6	28,2
		8H	26,9	27,4	27,4	28,0	28,6	26,9	27,5	27,4	28,0	28,6
		12H	27,2	27,6	27,8	28,1	28,8	27,2	27,6	27,8	28,1	28,8
12H	12H	4H	25,7	26,4	26,2	26,8	27,3	25,7	26,4	26,2	26,8	27,3
		6H	26,6	27,2	27,1	27,7	28,3	26,6	27,2	27,2	27,7	28,4
		8H	27,0	27,5	27,6	28,0	28,6	27,0	27,5	27,6	28,0	28,6
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 / -0,2					0,1 / -0,2				
S = 2.0H			0.3 / -0,4					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	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	108	103	99	95	105	101	97	93	97	93	90	93	90	87	89	87	85	83
2	98	90	83	77	95	88	81	76	84	79	74	81	76	72	78	74	71	68
3	89	78	70	63	87	77	69	63	74	67	62	71	65	61	68	64	59	57
4	82	69	60	53	79	68	60	53	65	58	52	63	57	52	61	55	51	49
5	75	62	53	46	73	61	52	46	59	51	45	57	50	45	55	49	44	42
6	69	56	46	40	67	55	46	40	53	45	39	51	44	39	49	43	39	37
7	64	50	41	35	62	50	41	35	48	40	35	46	40	34	45	39	34	32
8	60	46	37	31	58	45	37	31	44	36	31	43	36	31	41	35	31	29
9	56	42	34	28	54	41	34	28	40	33	28	39	33	28	38	32	28	26
10	52	39	31	25	51	38	31	25	37	30	25	36	30	25	35	29	25	23

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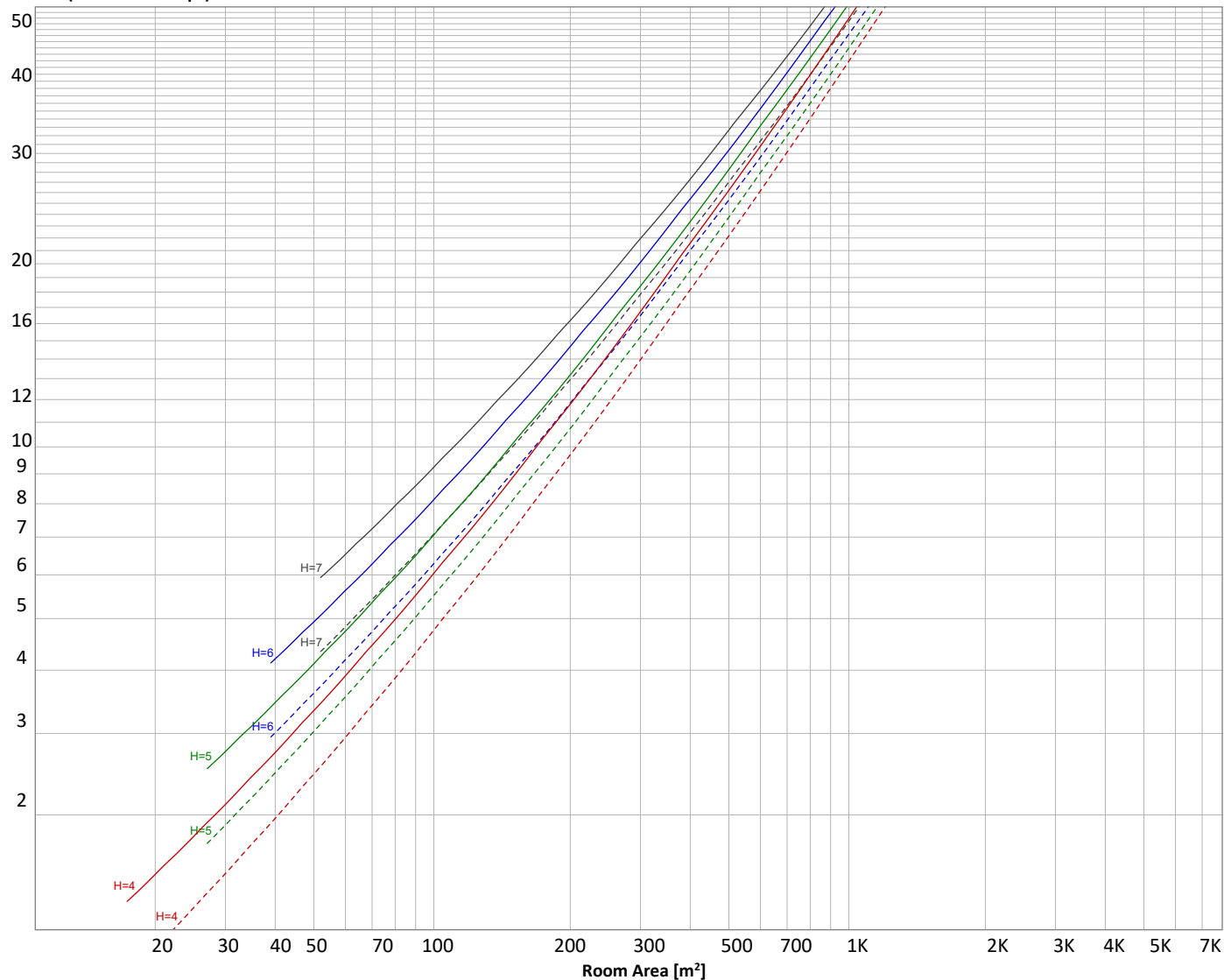
Operator: LC



Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 2552 lm	p(%)			
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°
80,7 lm	232 lm	354 lm	431 lm	452 lm	415 lm	323 lm	195 lm	63,1 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
2,54 lm	0,449 lm	0,554 lm	0,619 lm	0,620 lm	0,565 lm	0,460 lm	0,304 lm	0,107 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	81 lm	3,2%
10-20°	232 lm	9,1%
20-30°	354 lm	13,9%
30-40°	431 lm	16,9%
40-50°	452 lm	17,7%
50-60°	415 lm	16,2%
60-70°	323 lm	12,7%
70-80°	195 lm	7,6%
80-90°	63 lm	2,5%
90-100°	3 lm	0,1%
100-110°	0 lm	0,0%
110-120°	1 lm	0,0%
120-130°	1 lm	0,0%
130-140°	1 lm	0,0%
140-150°	1 lm	0,0%
150-160°	0 lm	0,0%
160-170°	0 lm	0,0%
170-180°	0 lm	0,0%
Total	2552 lm	100,0%

Intensity peaks

Max intensity	853 cd
Intensity, 90°	11 cd
Intensity, 0°	853 cd

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	667 lm	26,1%
0-40°	1098 lm	43,0%
0-60°	1965 lm	77,0%
60-90°	581 lm	22,8%
70-100°	260 lm	10,2%
90-120°	4 lm	0,1%
0-90°	2546 lm	99,8%
90-180°	6 lm	0,2%
0-180°	2552 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	333 lm	13,1%
Medium(30-60°)	649 lm	25,4%
High(60-80°)	259 lm	10,1%
Very high(80-90°)	32 lm	1,2%
Back light		
Low(0-30°)	333 lm	13,1%
Medium(30-60°)	649 lm	25,4%
High(60-80°)	259 lm	10,1%
Very high(80-90°)	32 lm	1,2%

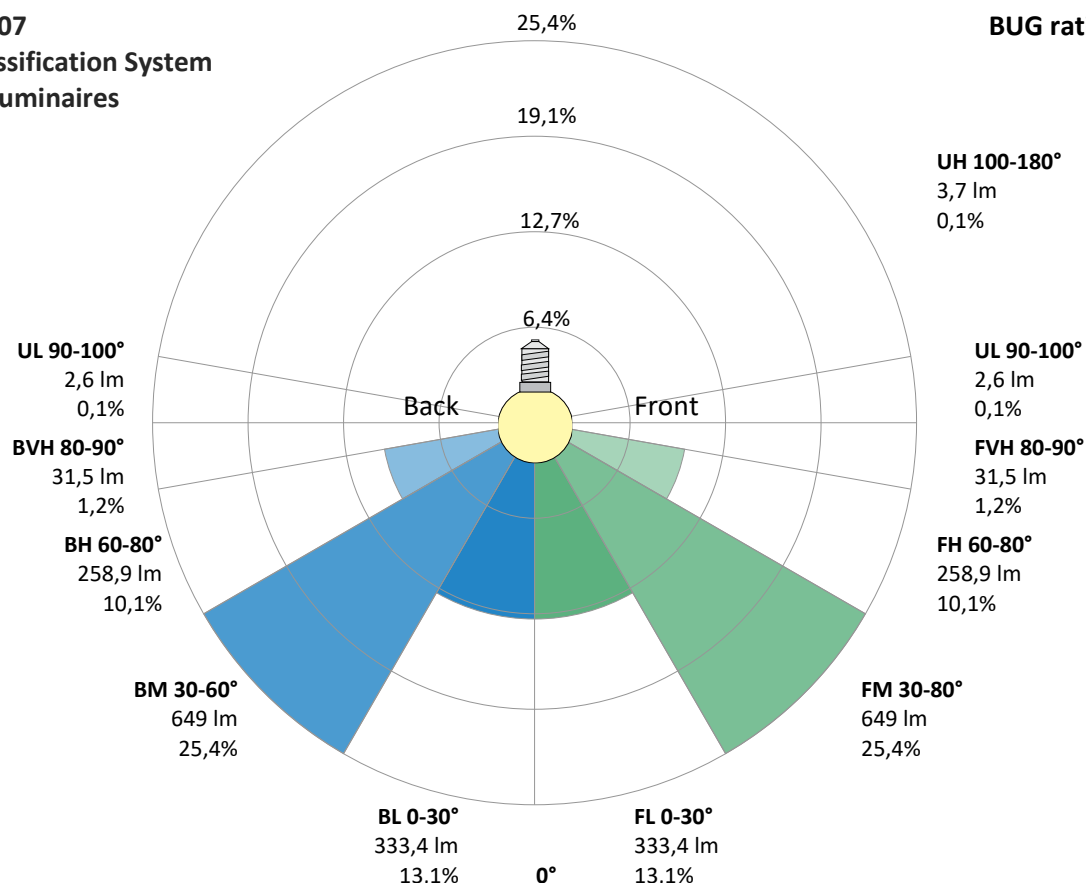
Uplight

Low(90-100°)	3 lm	0,1%
High(100-180°)	4 lm	0,1%

IESNA TM-15-07

Luminaire Classification System For Outdoor Luminaires

BUG rating B1 U1 G1



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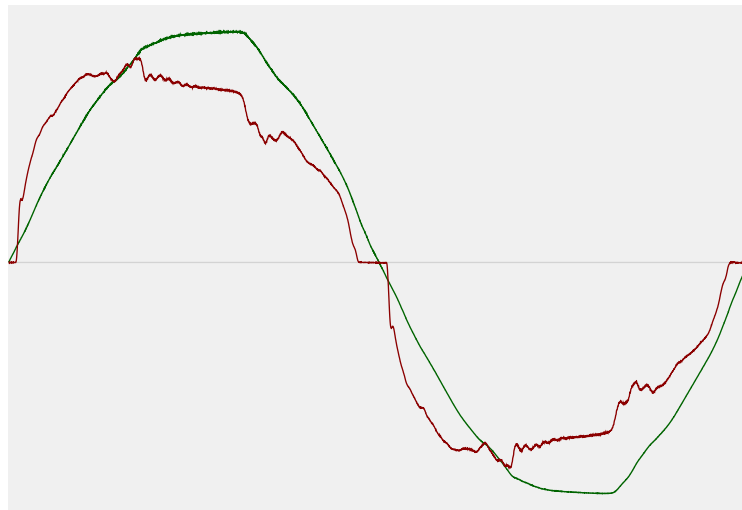


Power Details

Input Power

Power feed to light source	22,9 W
Frequency of input power	50,2 Hz
RMS Input voltage feed, V_{RMS}	231 V
RMS Input current feed, I_{RMS}	0,103 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	23,7 VA
Displacement factor of AC power feed	0,98
Power factor of AC current feed	0,97
Total harmonic distortion of the current	16,78%
Total harmonic distortion of the voltage	3,5%

Input Power Curve



Efficiency

Radiated power efficiency 34,3%



Lumen efficiency 111 lm/W



Stabilization Details

Warmup Conditions

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

Color Temperature Change

CCT start	3983 K
CCT shift	+17 K
CCT end	4000 K

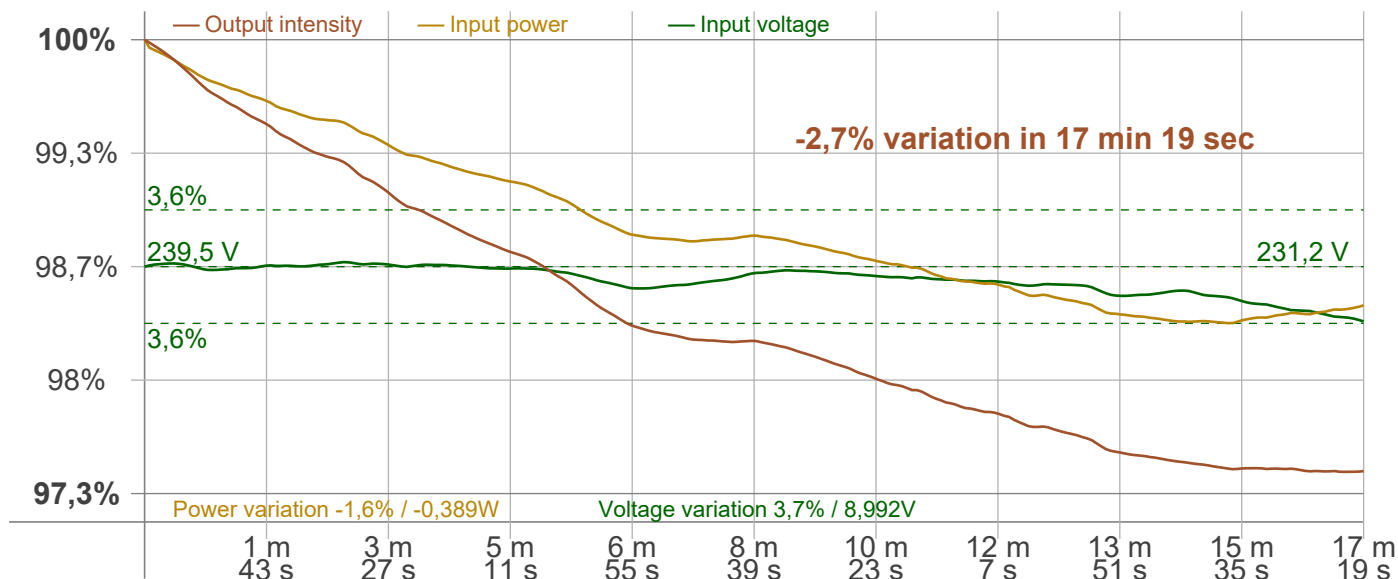
Warmup Result

Total warmup time	Lamp stabilized in 17 min 19 sec
Warmup variation	-2,7%

Output Change

Output start	2619 lm
Output change	-68 lm
Output end	2552 lm

Stabilization Curve



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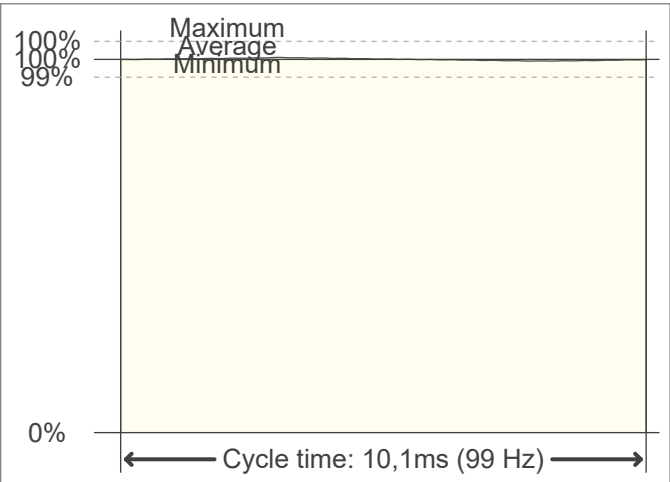
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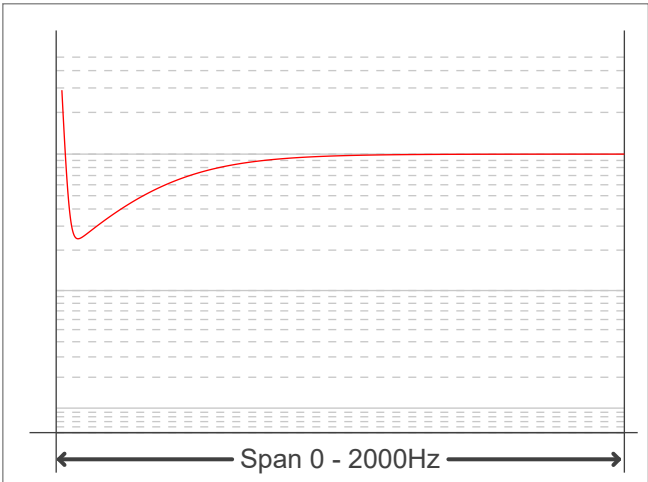
Flicker /TLA details

Flicker Meter Type	Viso Systems LabFlicker	Measurement time	
Frequency of input power	50,2 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	99,01 Hz	JA8/10 40 Hz	0,17 %
Percent Flicker	0,67 %	JA8/10 90 Hz	0,17 %
Flicker index	0	JA8/10 200 Hz	0,55 %
		JA8/10 400 Hz	0,6 %
		JA8/10 1000 Hz	0,63 %
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)	0,52	Perception metric, Assist Mp	0,06
SVM value (80 < F < 2000 Hz)	0,02		

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot

