

Light Measurement Report

Print date: 6-5-2025

Measurement date and time: 6-5-2025 15:17:21 – Measurement no. VFR-250506-1110-MS

Measurement tracking No. and Link: [VT250506-000824](#)

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°

2,00 m

9,5 W – PF 0,9 – DPF 0,97

230 V – 0,046 A

50 Hz

Lamp stabilized in 21 min 1 sec – 2,0%

Tested Light Source

Product Name

Item No. and Manufacturer

Product Description (line 1)

845734-4000K

845734-4000K – Dutchfulfillment

3-FASE RAILSPOT ELARA 10W ZWART

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

951 lm – 0,03% / 99,97%

100 lm/W

1976 cd – 40°

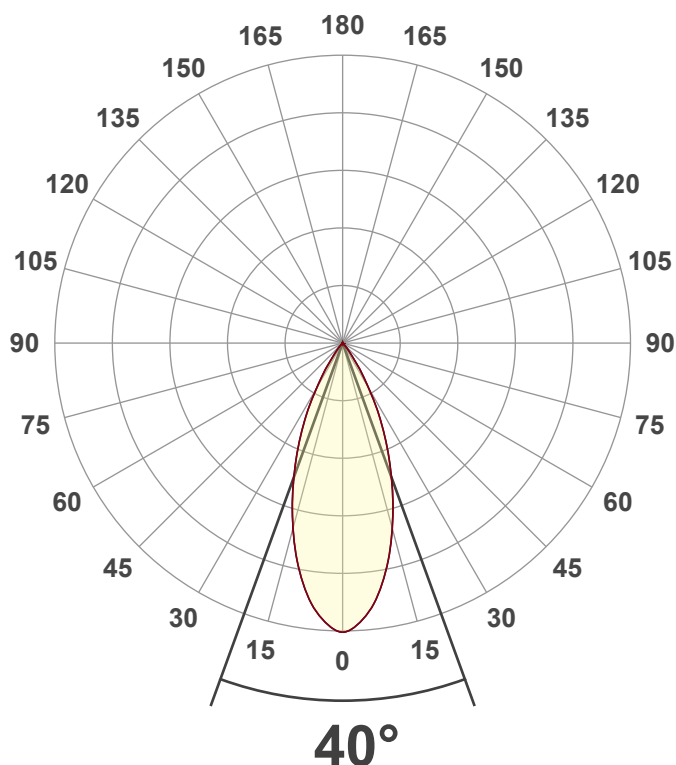
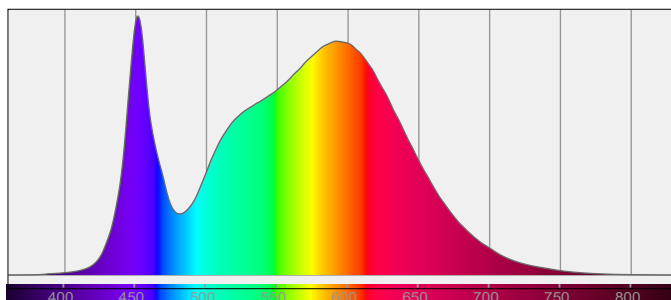
CCT = 4000 K / 3995 K

CRI 81,8

R_f 83,1 – R_g 95,1

Duv 0,0009 – SDCM 0,8

SVM 0,01 – PstLM 0,03



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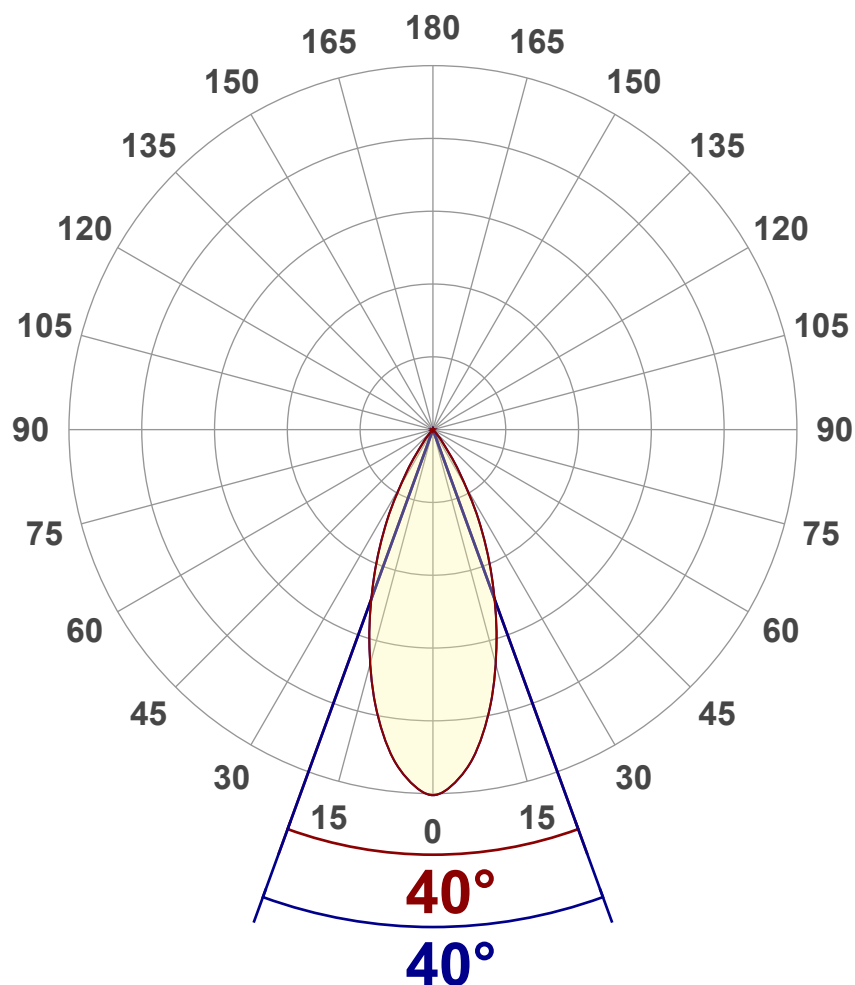
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Operator:



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	951 lm
Lumen Up% / Down%	0,03% / 99,97%
Peak Intensity	1976 cd
Beam Angle (50%)	40°
Beam Angle (90%)	40°
Beam Angle (10%)	40°

Cut-off Angle

Average 2,5%	79,7°
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Field Angle

Average 10%	67,7°
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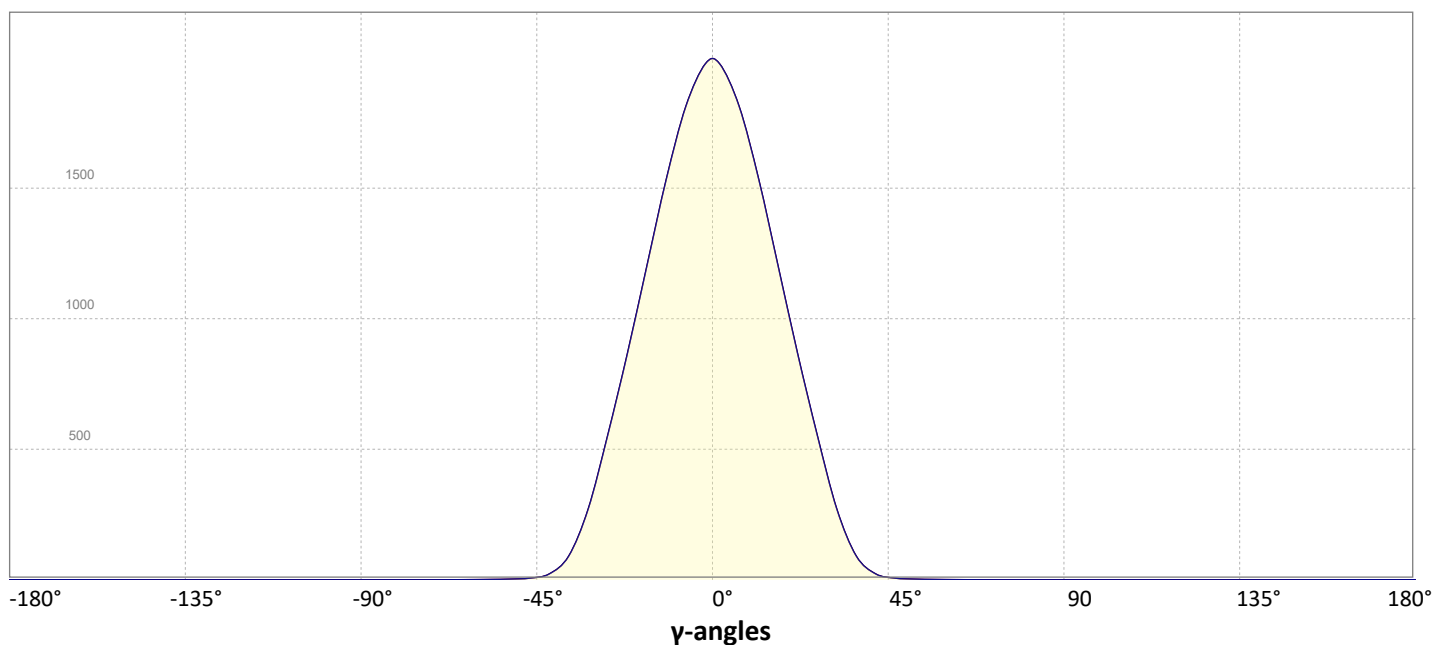
Intensity Ratio

In 120° cone	99,9%
In 90° cone	99,5%

C000-C180

C090-C270

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

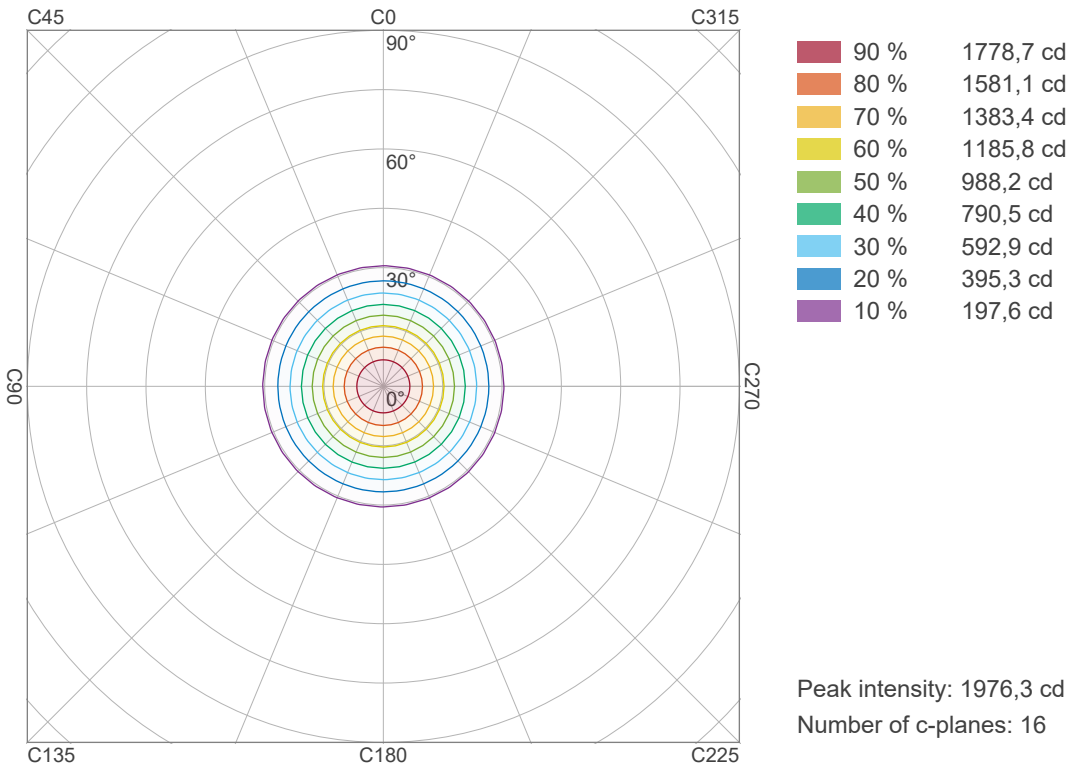


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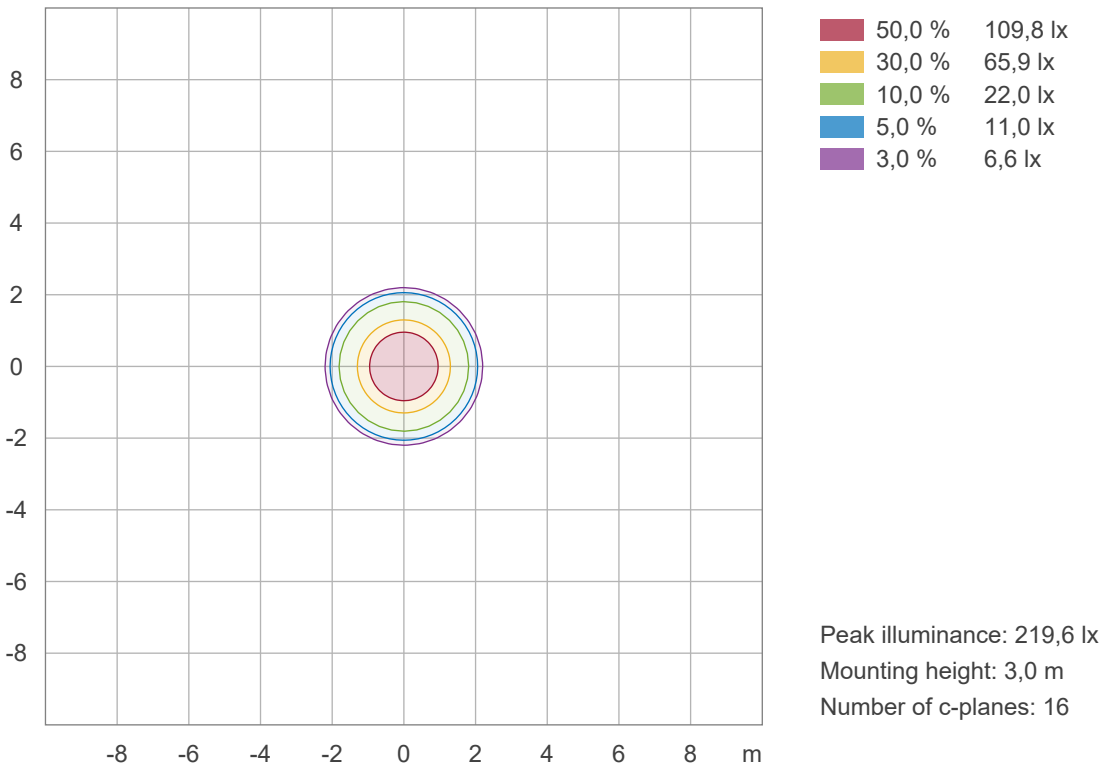
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Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



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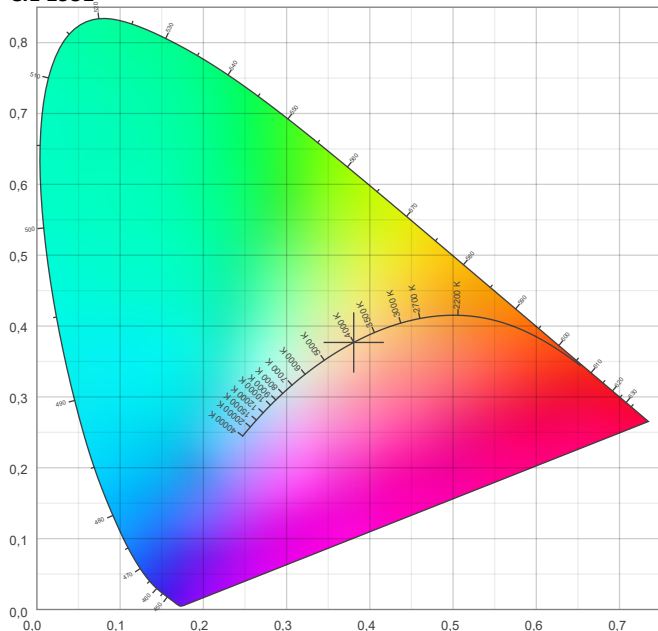


Color details

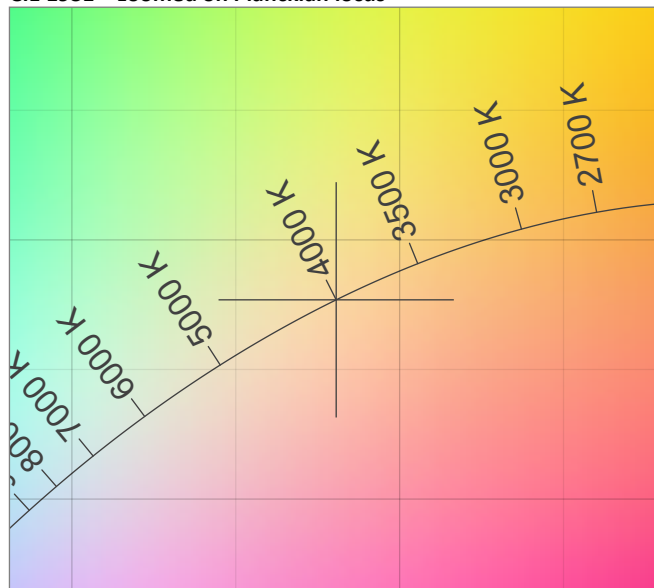
Correlated Color Temperature, Target CCT = 4000 K
Correlated Color Temperature, Measured CCT = 3995 K
Color Rendering Index CRI 81,8
Color Rendering Index, R9 (red component) R9 = 2,8
Color Rendering TM30-18 R_f 83,1 – R_g 95,1
Color Quality Scale CQS = 81,0

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 = 0,0009
Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,225;0,502)

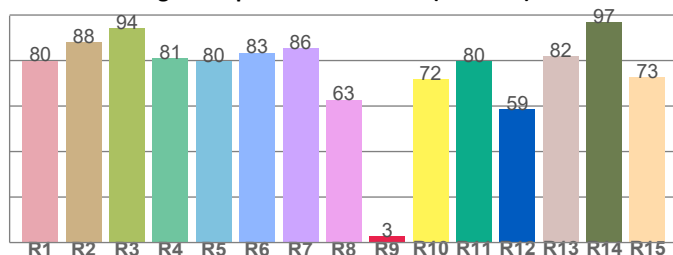
CIE 1931



CIE 1931 – zoomed on Planckian locus



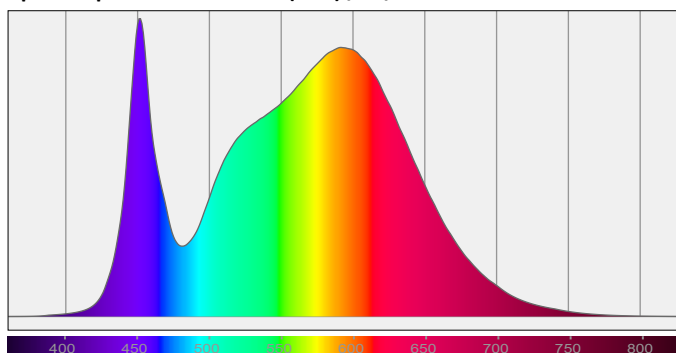
Color Rendering Index per reference color (CIE 1995)



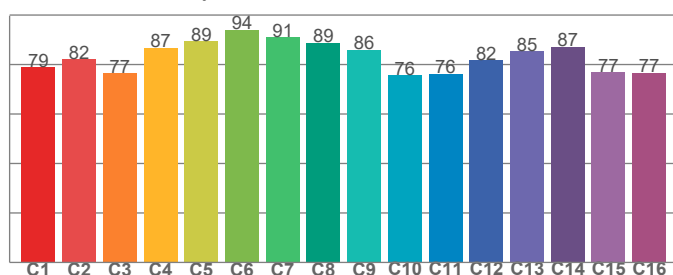
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
79,9	88,1	94,2	80,9	79,7	83,5	85,5	62,7	2,8	71,7	79,7	58,6	82,0	96,9	72,7

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



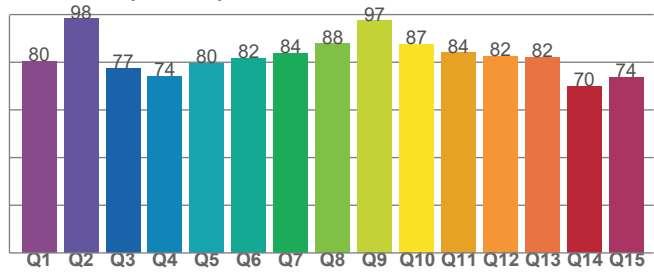
TM30-18 R_f-values per hue bin



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
78,9	82,2	76,5	86,8	89,4	94,0	91,1	88,8	86,0	75,6	76,2	81,7	85,2	87,1	76,8	76,7

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
80,4	98,3	77,4	74,0	79,6	81,7	83,7	87,8	97,3	87,5	83,9	82,5	82,0	69,9	73,7

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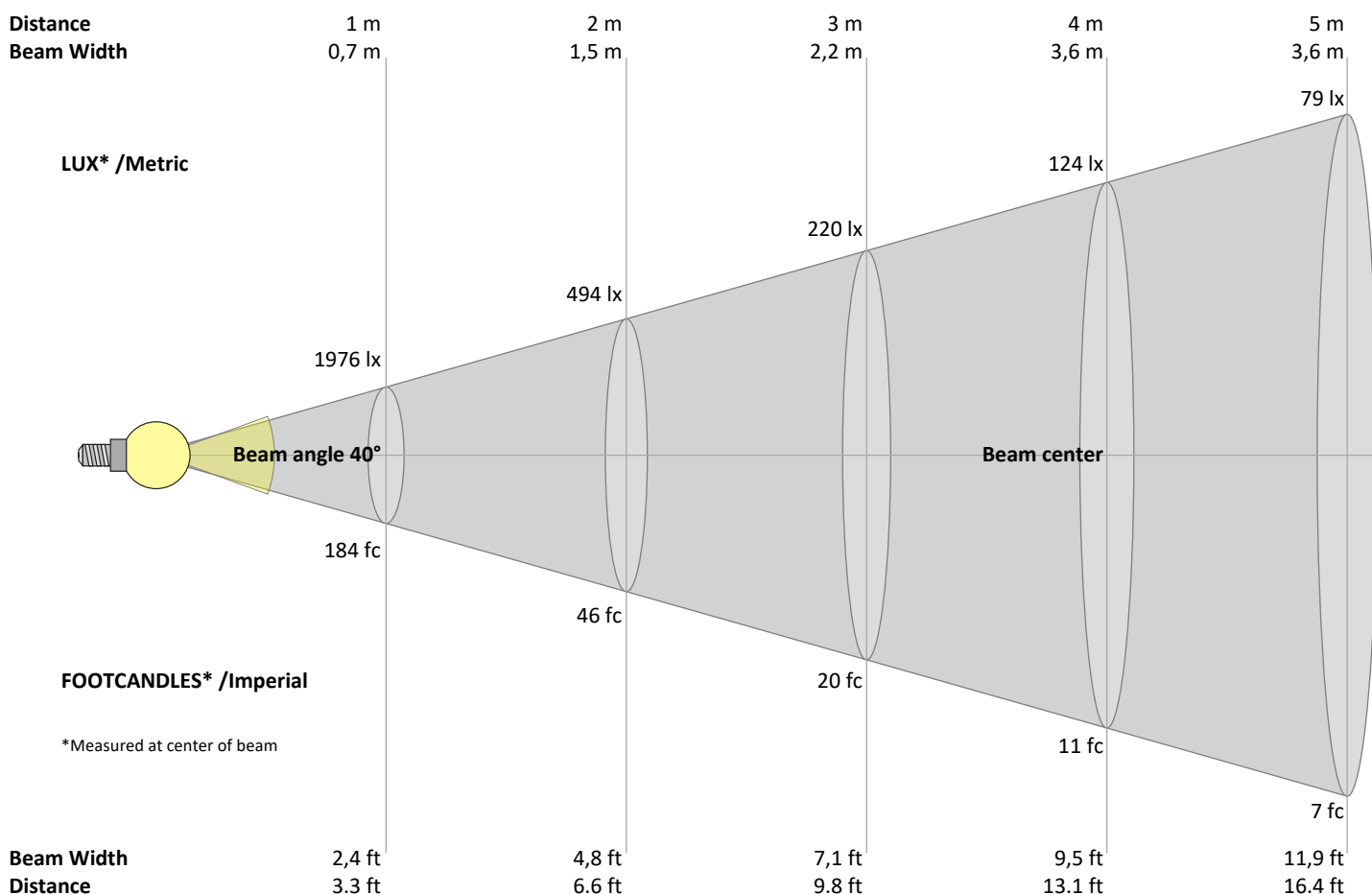
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Beam Details



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
1976	494	220	124	79	55	40	31	24	20	16	14	12	10	9	8	7	6	5	5	lux
183,6	45,9	20,4	11,5	7,3	5,1	3,7	2,9	2,3	1,8	1,5	1,3	1,1	0,9	0,8	0,7	0,6	0,6	0,5	0,5	fc

Intensities in 0° c-plane

0°	2°	4°	6°	8°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	32°	34°	36°	38°	γ
1976	1971	1906	1840	1748	1637	1523	1389	1256	1122	987	854	730	606	488	375	265	193	121	75	cd
100%	100%	96%	93%	88%	83%	77%	70%	64%	57%	50%	43%	37%	31%	25%	19%	13%	10%	6%	4%	of 0°val

Intensities in 90° c-plane

0°	2°	4°	6°	8°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	32°	34°	36°	38°	γ
1976	1971	1906	1840	1748	1637	1523	1389	1256	1122	987	854	730	606	488	375	265	193	121	75	cd
100%	100%	96%	93%	88%	83%	77%	70%	64%	57%	50%	43%	37%	31%	25%	19%	13%	10%	6%	4%	of 0°val

Intensities in 180° c-plane

0°	2°	4°	6°	8°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	32°	34°	36°	38°	γ
1976	1971	1906	1840	1748	1637	1523	1389	1256	1122	987	854	730	606	488	375	265	193	121	75	cd
100%	100%	96%	93%	88%	83%	77%	70%	64%	57%	50%	43%	37%	31%	25%	19%	13%	10%	6%	4%	of 0°val

Intensities in 270° c-plane

0°	2°	4°	6°	8°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	32°	34°	36°	38°	γ
1976	1971	1906	1840	1748	1637	1523	1389	1256	1122	987	854	730	606	488	375	265	193	121	75	cd
100%	100%	96%	93%	88%	83%	77%	70%	64%	57%	50%	43%	37%	31%	25%	19%	13%	10%	6%	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											
H = mounting height above eye level											
X	Y	Viewed Crosswise (Viewing direction orthogonal to lamp length axis)					Viewed Endwise (Viewing direction parallel to lamp length axis)				
2H	2H	15,8	16,4	15,9	16,6	16,8	15,8	16,4	15,9	16,6	16,8
	3H	15,5	16,2	15,9	16,4	16,6	15,5	16,2	15,9	16,4	16,6
	4H	15,5	16,1	15,8	16,3	16,6	15,5	16,1	15,8	16,3	16,6
	6H	15,5	16,0	15,7	16,3	16,6	15,5	16,0	15,7	16,3	16,6
	8H	15,4	15,9	15,7	16,2	16,6	15,4	15,9	15,7	16,2	16,6
	12H	15,3	15,8	15,7	16,2	16,6	15,3	15,8	15,7	16,2	16,6
4H	2H	15,5	16,1	15,8	16,3	16,6	15,5	16,1	15,8	16,3	16,6
	3H	15,3	15,8	15,7	16,2	16,6	15,3	15,8	15,7	16,2	16,6
	4H	15,2	15,7	15,6	16,1	16,6	15,2	15,7	15,6	16,1	16,6
	6H	15,1	15,6	15,6	15,9	16,3	15,1	15,6	15,6	15,9	16,3
	8H	15,1	15,5	15,6	15,9	16,2	15,1	15,5	15,6	15,9	16,2
	12H	15,0	15,4	15,5	15,8	16,2	15,0	15,4	15,5	15,8	16,2
8H	4H	15,1	15,5	15,6	15,9	16,2	15,1	15,5	15,6	15,9	16,2
	6H	15,0	15,3	15,5	15,7	16,3	15,0	15,3	15,5	15,7	16,3
	8H	15,0	15,2	15,5	15,7	16,4	15,0	15,2	15,5	15,7	16,4
	12H	14,9	15,1	15,5	15,6	16,2	14,9	15,1	15,5	15,6	16,2
12H	4H	15,0	15,4	15,5	15,8	16,2	15,0	15,4	15,5	15,8	16,2
	6H	15,0	15,2	15,5	15,7	16,4	15,0	15,2	15,5	15,7	16,4
	8H	14,9	15,1	15,5	15,6	16,2	14,9	15,1	15,5	15,6	16,2
Variations with the observer position for the luminaire spacings, S:											
S = 1.0H		6,2 / -20,9					6,2 / -20,9				
S = 1.5H		9,0 / -25,1					9,0 / -25,1				
S = 2.0H		11,0 / -29,7					11,0 / -29,7				

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	114	112	110	108	112	110	108	106	106	104	103	102	101	100	99	98	97	95
2	110	105	102	99	108	104	101	98	101	98	96	98	96	94	95	93	92	90
3	105	100	95	92	103	98	94	91	96	93	90	93	91	89	91	89	87	86
4	101	95	90	86	99	93	89	86	91	88	85	89	86	84	88	85	83	81
5	97	90	85	81	95	89	84	81	87	83	80	86	82	79	84	81	79	78
6	93	85	80	77	92	85	80	77	83	79	76	82	78	76	81	78	75	74
7	89	82	76	73	88	81	76	73	80	75	72	79	75	72	78	74	72	70
8	86	78	73	69	85	77	73	69	76	72	69	75	71	69	74	71	68	67
9	83	75	70	66	82	74	69	66	73	69	66	72	68	66	72	68	65	64
10	80	71	66	63	79	71	66	63	70	66	63	70	66	63	69	65	63	62

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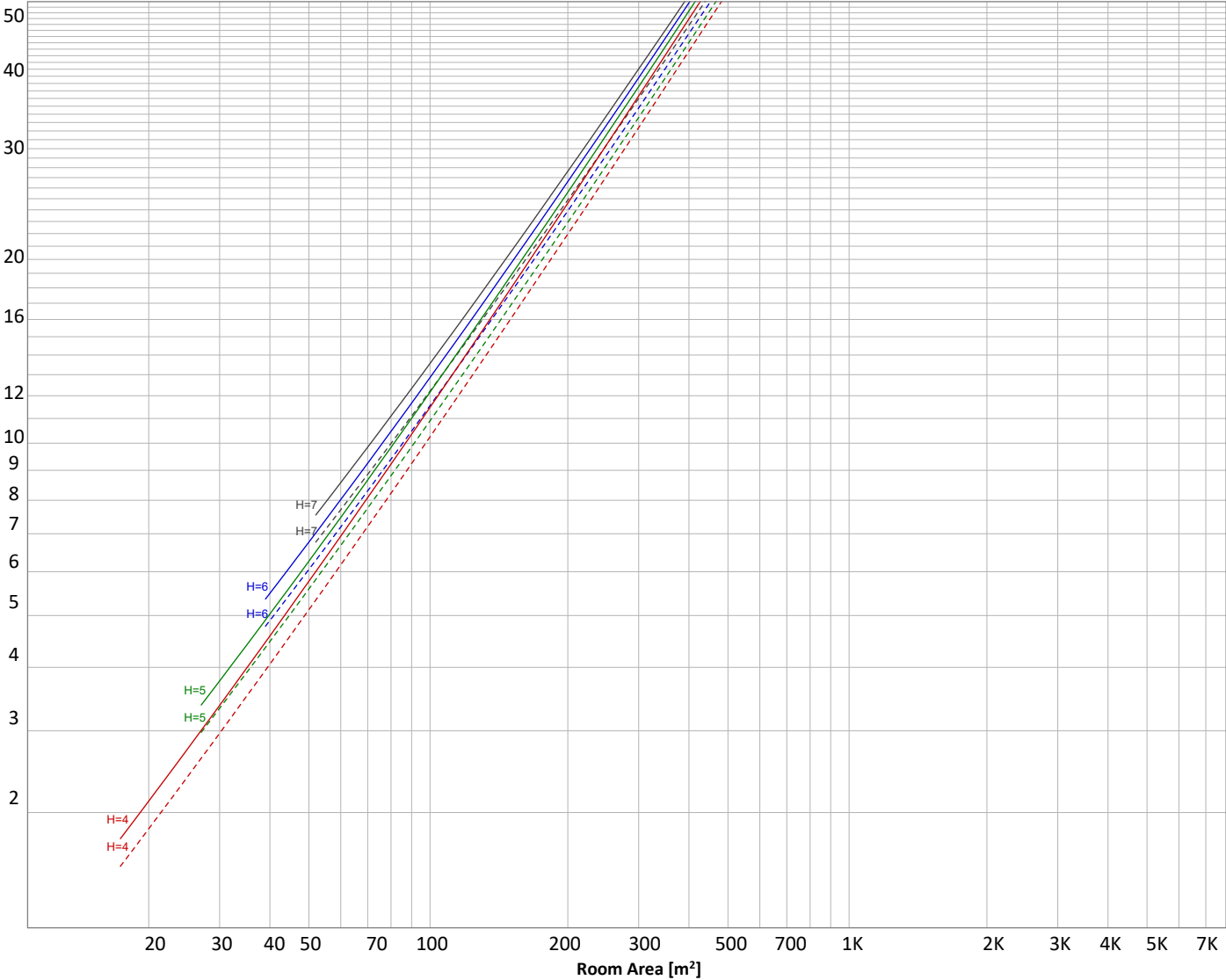
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 951 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°
173 lm	365 lm	302 lm	99,5 lm	9,68 lm	1,67 lm	0,458 lm	0,035 lm	0,000 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
0,001 lm	0,000 lm	0,002 lm	0,000 lm	0,011 lm	0,034 lm	0,116 lm	0,109 lm	0,033 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	173 lm	18,1%
10-20°	365 lm	38,4%
20-30°	302 lm	31,7%
30-40°	100 lm	10,5%
40-50°	10 lm	1,0%
50-60°	2 lm	0,2%
60-70°	0 lm	0,0%
70-80°	0 lm	0,0%
80-90°	0 lm	0,0%
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	951 lm	100,0%

Intensity peaks

Max intensity	1976 cd
Intensity, 90°	0 cd
Intensity, 0°	1976 cd

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	840 lm	88,3%
0-40°	939 lm	98,7%
0-60°	950 lm	99,9%
60-90°	0 lm	0,1%
70-100°	0 lm	0,0%
90-120°	0 lm	0,0%
0-90°	951 lm	100,0%
90-180°	0 lm	0,0%
0-180°	951 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	417 lm	43,8%
Medium(30-60°)	58 lm	6,1%
High(60-80°)	0 lm	0,0%
Very high(80-90°)	0 lm	0,0%
Back light		
Low(0-30°)	417 lm	43,8%
Medium(30-60°)	58 lm	6,1%
High(60-80°)	0 lm	0,0%
Very high(80-90°)	0 lm	0,0%

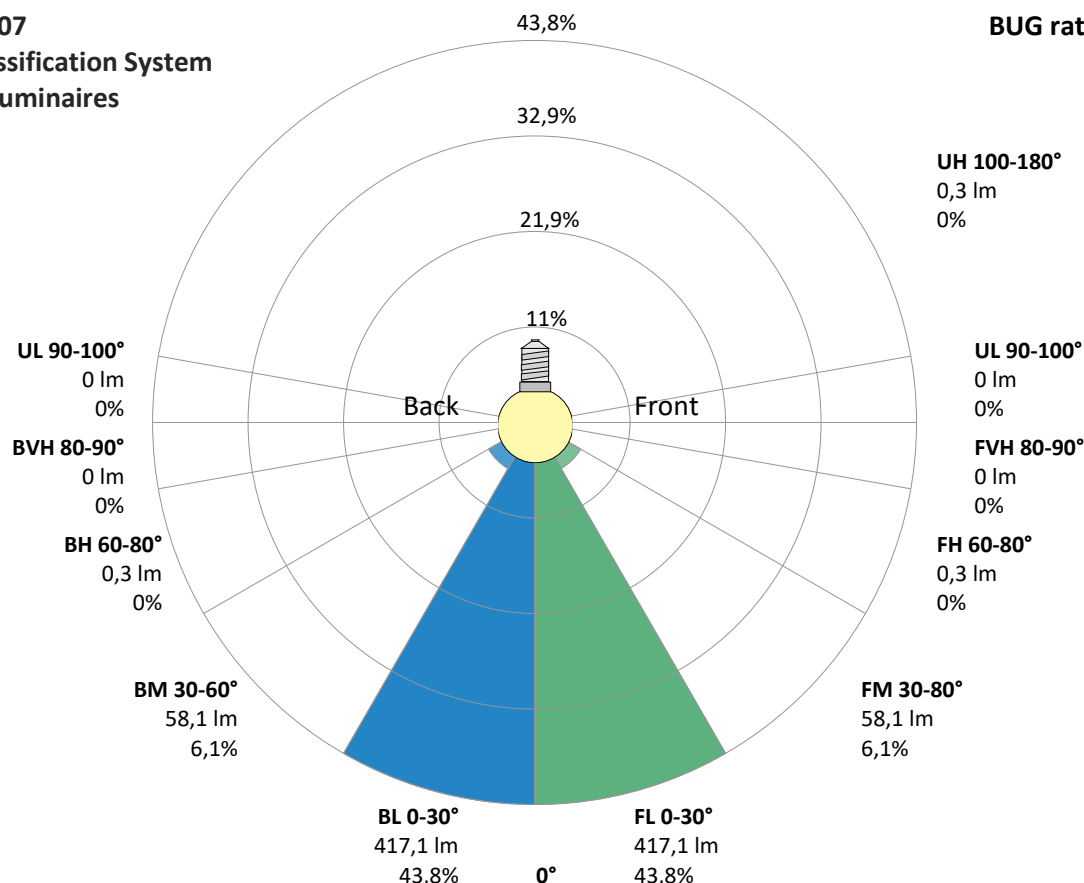
Uplight

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

IESNA TM-15-07

Luminaire Classification System For Outdoor Luminaires

BUG rating B1 U0 G0



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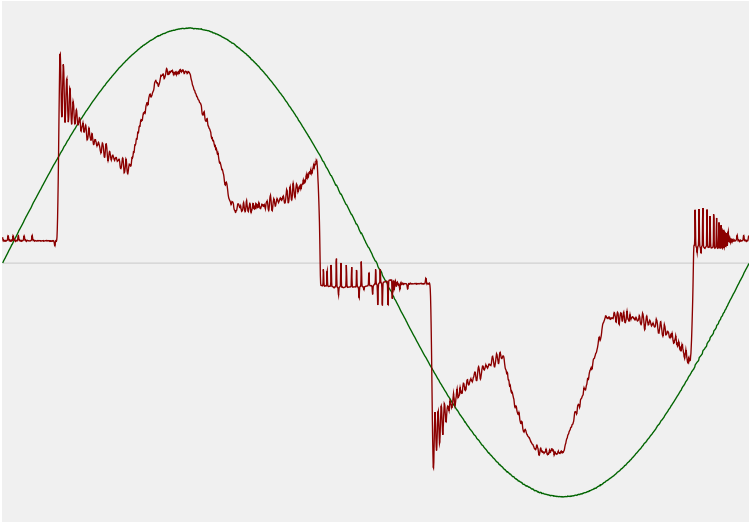


Power Details

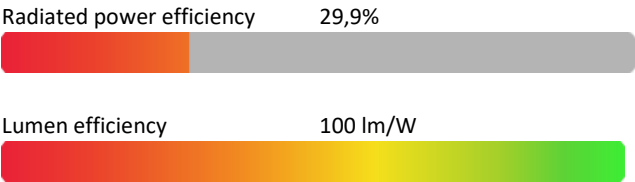
Input Power

Power feed to light source	9,5 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,046 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	10,53 VA
Displacement factor of AC power feed	0,97
Power factor of AC current feed	0,9
Total harmonic distortion of the current	37,23%
Total harmonic distortion of the voltage	0,07%

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	3975 K
CCT shift	+25 K
CCT end	4000 K

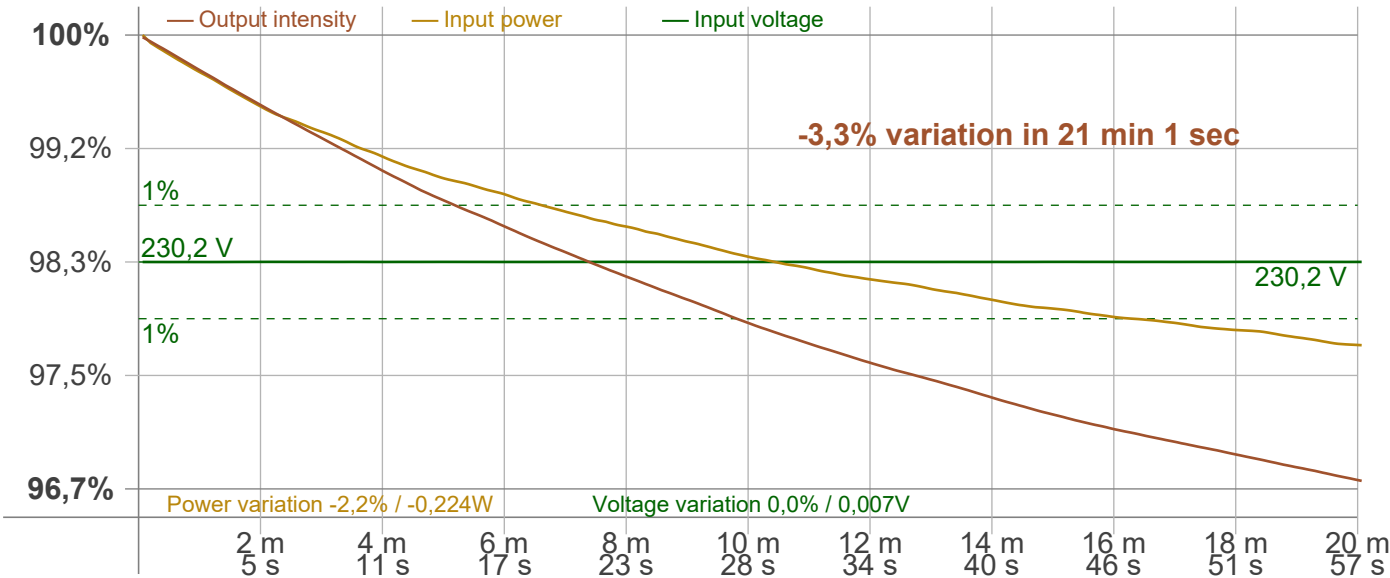
Warmup Result

Total warmup time	Lamp stabilized in 21 min 1 sec
Warmup variation	-3,3%

Output Change

Output start	984 lm
Output change	-33 lm
Output end	951 lm

Stabilization Curve



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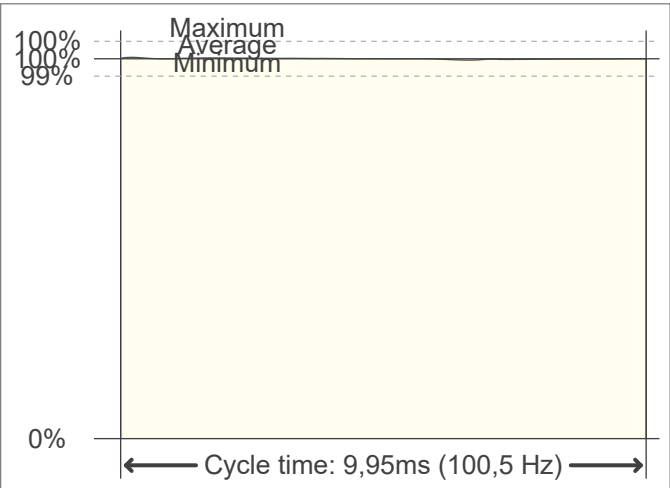
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Flicker /TLA details

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	100,5 Hz	JA8/10 40 Hz	0,02 %
Percent Flicker	0,43 %	JA8/10 90 Hz	0,03 %
Flicker index	0	JA8/10 200 Hz	0,21 %
		JA8/10 400 Hz	0,22 %
		JA8/10 1000 Hz	0,36 %
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)	0,03	Perception metric, Assist Mp	0,02
SVM value (80 < F < 2000 Hz)	0,01		

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot

