

Light Measurement Report

Print date: 15-10-2024

Measurement date and time: 15-10-2024 08:29:22 – Measurement no. VFR-241015-1263-MS

Measurement tracking No. and Link: [VT241015-009305](#)

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
58,4 W – PF 0,97 – DPF 0,98
230 V – 0,261 A
50 Hz
Lamp stabilized in 15 min 3 sec – 2,0%

Tested Light Source

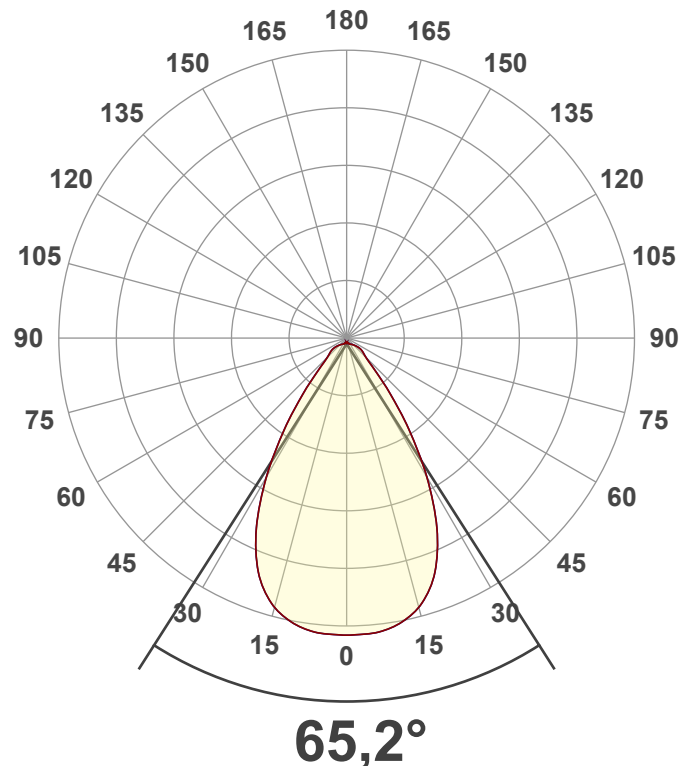
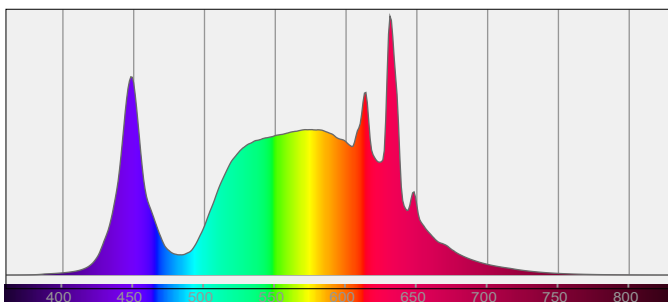
Product Name
Item No. and Manufacturer
Product Description (line 1)

270930-4000K
270930-4000K – Dutchfulfillment
RETROFIT TITAN | LED MODULE | 32W/40W/48W/56W | 60°

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

10722 lm – 3,01% / 96,99%
184 lm/W
8058 cd – 65,2°
CCT = 4000 K / 3973 K
CRI 80,7
 R_f 80,3 – R_g 100,0
Duv 0,0020 – SDCM 1,8
SVM 0 – PstLM 0,01



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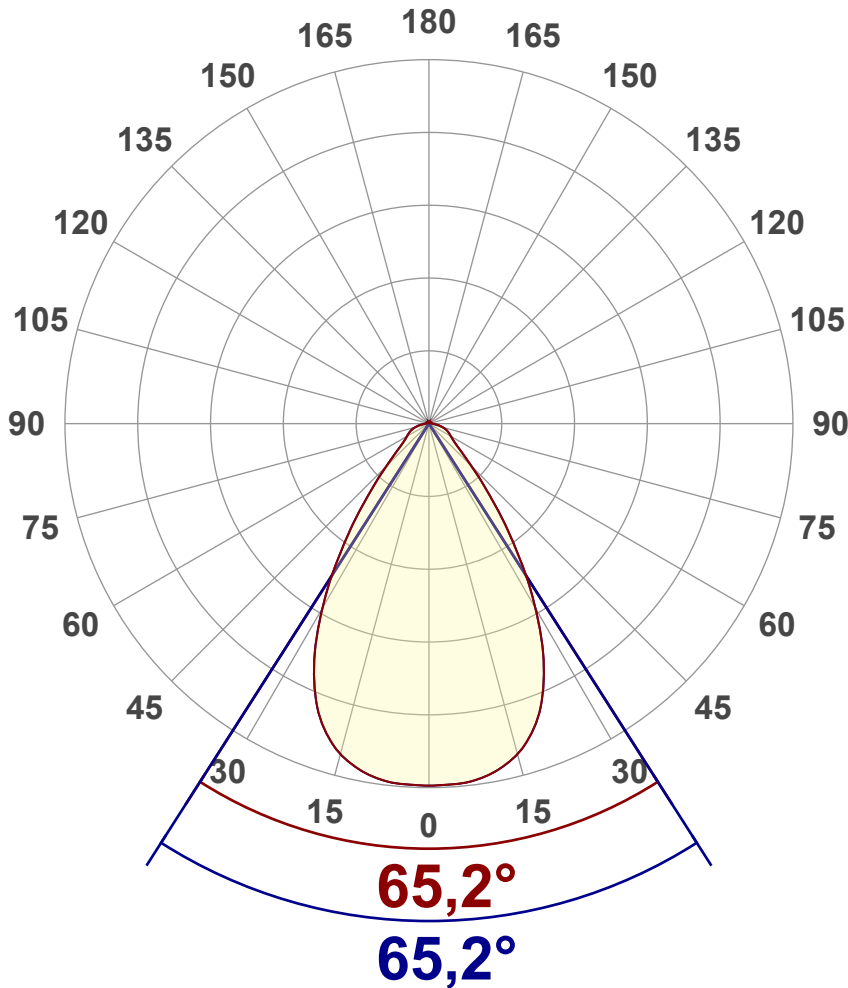
Measurement tracking No. and Link: [VT241015-009305](#)

Operator:



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	10722 lm
Lumen Up% / Down%	3,01% / 96,99%
Peak Intensity	8058 cd
Beam Angle (50%)	65,2°
Beam Angle (90%)	65,2°
Beam Angle (10%)	65,2°

Cut-off Angle

Average 2,5%	162°
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Field Angle

Average 10%	103,1°
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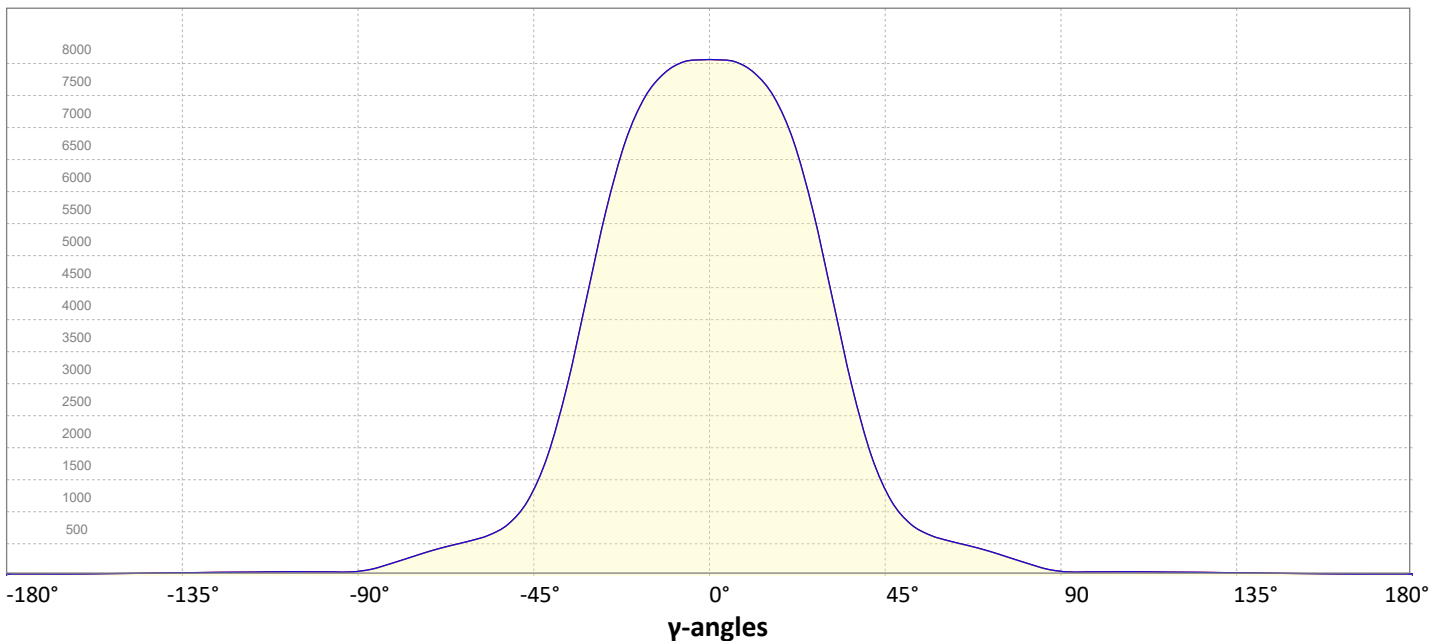
Intensity Ratio

In 120° cone	88,0%
In 90° cone	78,1%

C000-C180

C090-C270

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



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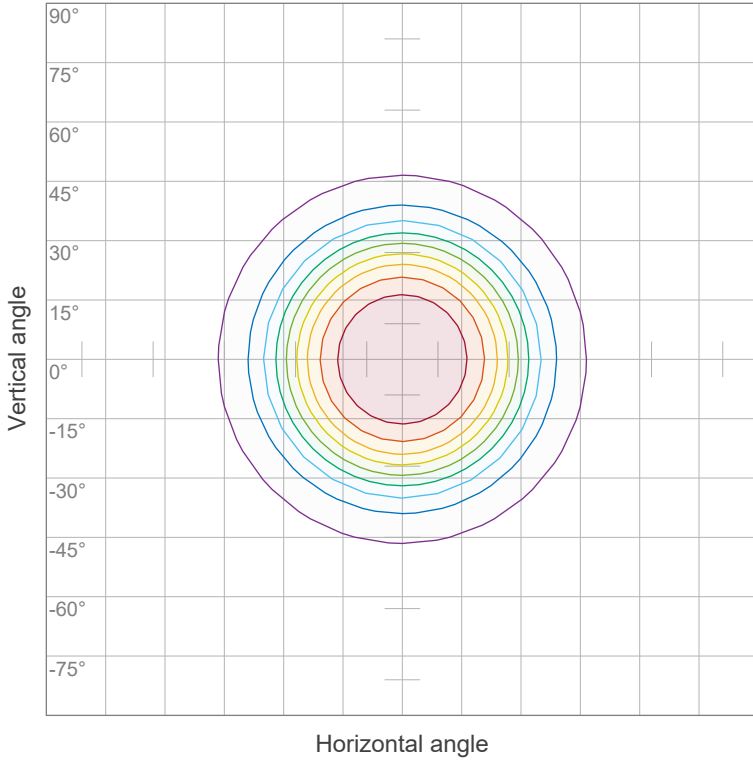
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Operator:



Iso-intensity Diagram (Iso-candela)

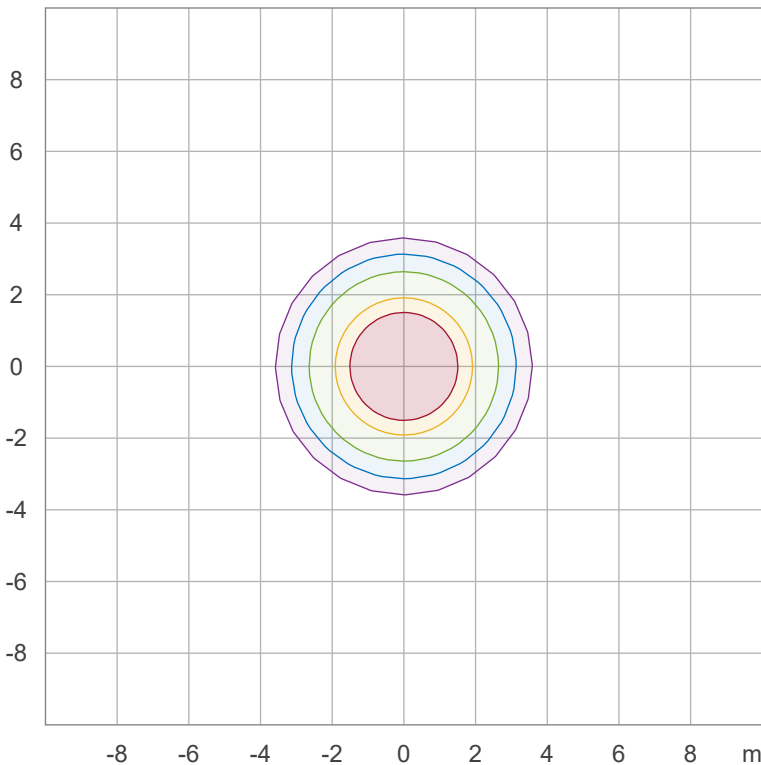


90 %	7252,0 cd
80 %	6446,3 cd
70 %	5640,5 cd
60 %	4834,7 cd
50 %	4028,9 cd
40 %	3223,1 cd
30 %	2417,3 cd
20 %	1611,6 cd
10 %	805,8 cd

Peak intensity: 8057,8 cd

Number of c-planes: 12

Iso-illuminance Diagram (Iso-lux)



50,0 %	447,7 lx
30,0 %	268,6 lx
10,0 %	89,5 lx
5,0 %	44,8 lx
3,0 %	26,9 lx

Peak illuminance: 895,3 lx

Mounting height: 3,0 m

Number of c-planes: 12

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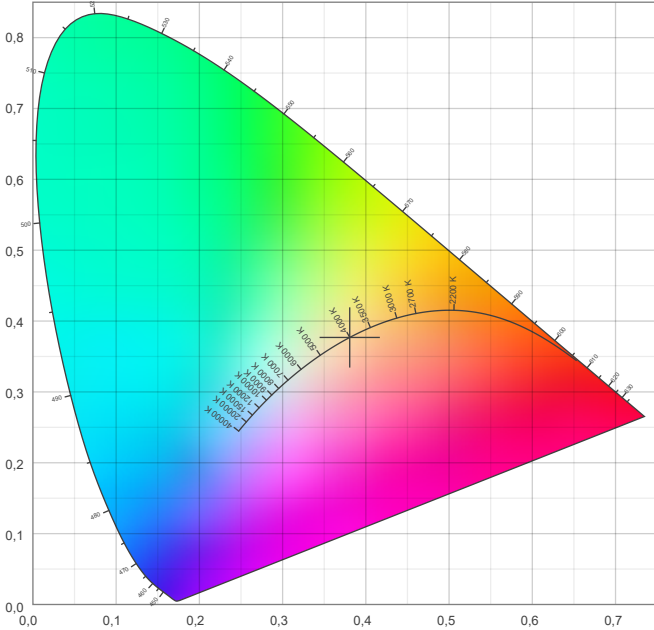


Color details

Correlated Color Temperature, Target CCT = 4000 K
 Correlated Color Temperature, Measured CCT = 3973 K
 Color Rendering Index CRI 80,7
 Color Rendering Index, R9 (red component) R9 = 27,6
 Color Rendering TM30-18 R_f 80,3 – R_g 100,0
 Color Quality Scale CQS = 80,6

MacAdam Steps SDCM = 1,8
 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 = 0,0020
 Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,225;0,502)

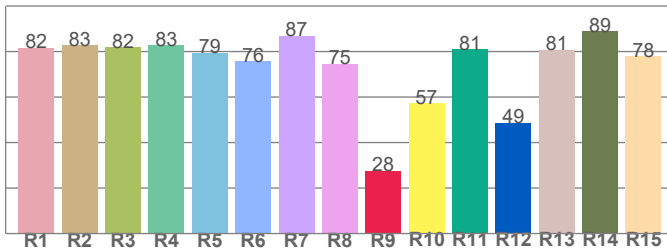
CIE 1931



CIE 1931 – zoomed on Planckian locus



Color Rendering Index per reference color (CIE 1995)



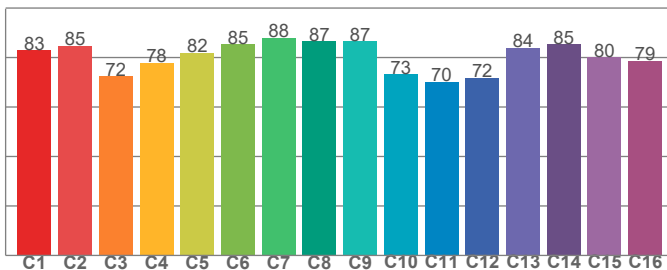
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
81,6	82,8	81,9	82,7	79,5	75,7	86,9	74,6	27,6	57,3	81,0	48,7	80,8	89,0	77,8

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



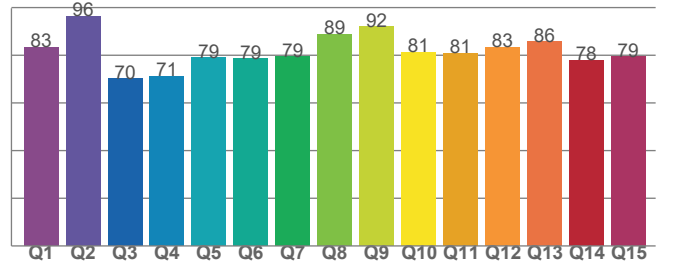
TM30-18 Rf-values per hue bin



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
83,0	84,7	72,4	77,9	81,9	85,3	88,0	86,6	86,5	73,3	70,3	71,8	84,0	85,3	80,0	78,6

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
83,5	96,4	70,2	71,2	78,9	78,6	79,4	88,8	91,9	81,3	80,9	83,3	85,7	77,9	79,4

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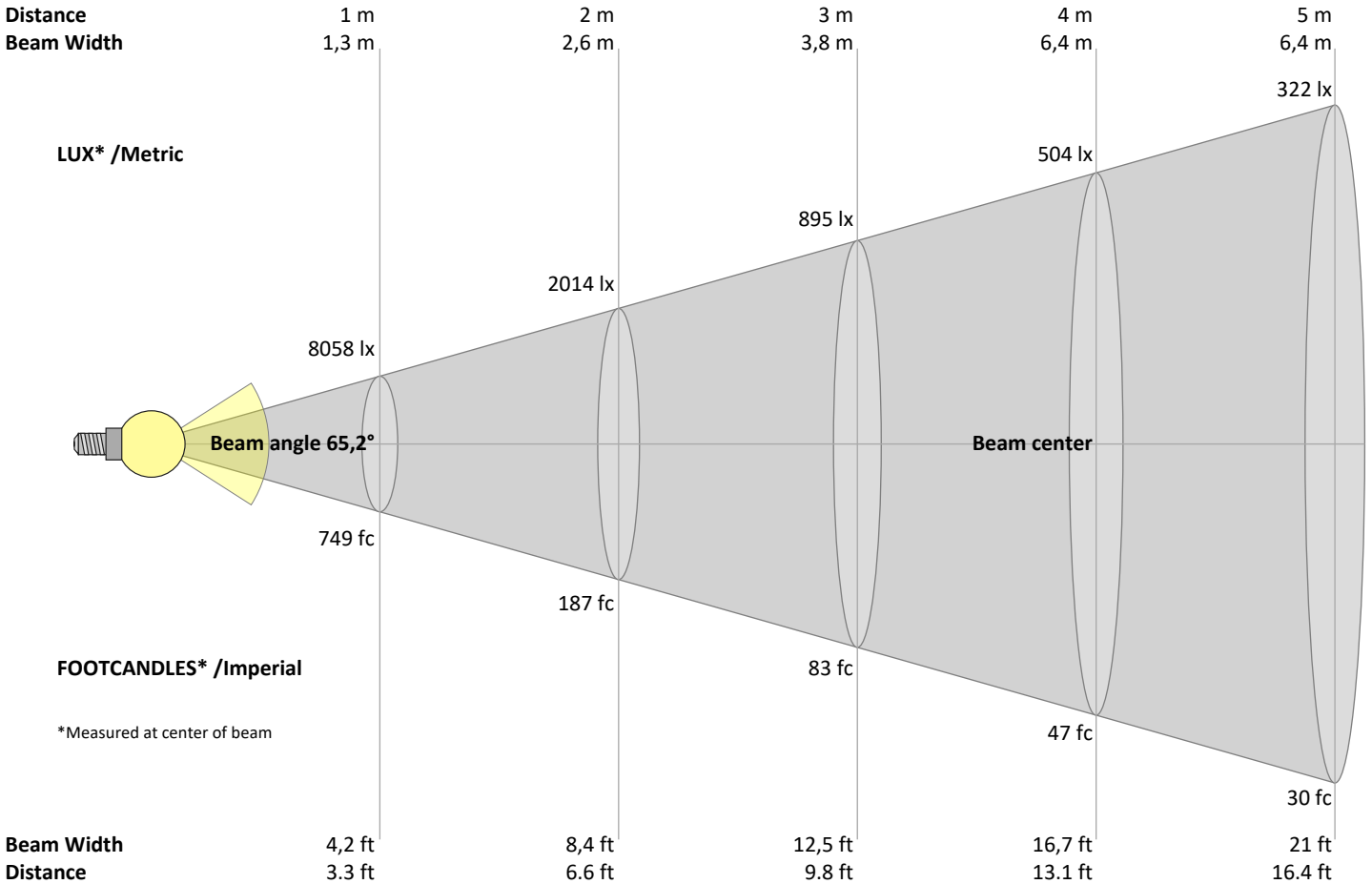
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Operator:



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
8058	2014	895	504	322	224	164	126	99	81	67	56	48	41	36	31	28	25	22	20	lux
748,6	187,1	83,2	46,8	29,9	20,8	15,3	11,7	9,2	7,5	6,2	5,2	4,4	3,8	3,3	2,9	2,6	2,3	2,1	1,9	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
8058	8037	7904	7590	6995	6025	4738	3364	2191	1381	918	686	569	490	410	318	221	129	73	60	cd
100%	100%	98%	94%	87%	75%	59%	42%	27%	17%	11%	9%	7%	6%	5%	4%	3%	2%	1%	1%	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
8058	8037	7904	7590	6995	6025	4738	3364	2191	1381	918	686	569	490	410	318	221	129	73	60	cd
100%	100%	98%	94%	87%	75%	59%	42%	27%	17%	11%	9%	7%	6%	5%	4%	3%	2%	1%	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
8058	8037	7904	7590	6995	6025	4738	3364	2191	1381	918	686	569	490	410	318	221	129	73	60	cd
100%	100%	98%	94%	87%	75%	59%	42%	27%	17%	11%	9%	7%	6%	5%	4%	3%	2%	1%	1%	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
8058	8037	7904	7590	6995	6025	4738	3364	2191	1381	918	686	569	490	410	318	221	129	73	60	cd
100%	100%	98%	94%	87%	75%	59%	42%	27%	17%	11%	9%	7%	6%	5%	4%	3%	2%	1%	1%	of 0°val

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Light Planning – UGR table

Uncorrected, comprehensive UGR table according to 117-1995

Reflectances		70	70	50	50	30	70	70	50	50	30
	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	21,9	22,8	22,2	23,1	23,4	21,3	22,2	21,5	22,5	22,7
	3H	22,9	23,8	23,3	24,1	24,4	22,0	23,0	22,4	23,2	23,5
	4H	23,5	24,4	23,9	24,7	25,0	22,4	23,3	22,9	23,6	23,9
	6H	24,1	24,9	24,5	25,2	25,6	22,8	23,6	23,2	23,9	24,3
	8H	24,3	25,1	24,7	25,4	25,9	22,9	23,7	23,3	24,0	24,5
	12H	24,5	25,3	24,9	25,7	26,1	23,0	23,7	23,4	24,1	24,6
4H	2H	22,0	22,9	22,5	23,3	23,6	21,5	22,4	21,9	22,7	23,0
	3H	23,4	24,1	23,8	24,5	25,0	22,6	23,4	23,0	23,7	24,2
	4H	24,1	24,8	24,5	25,2	25,8	23,1	23,8	23,6	24,2	24,8
	6H	24,8	25,4	25,3	25,8	26,2	23,5	24,2	24,1	24,6	25,0
	8H	25,1	25,7	25,6	26,1	26,5	23,7	24,3	24,2	24,7	25,1
	12H	25,3	25,8	25,9	26,3	26,8	23,8	24,3	24,3	24,8	25,3
8H	4H	24,2	24,8	24,8	25,2	25,7	23,3	24,0	23,9	24,4	24,8
	6H	25,1	25,5	25,6	26,0	26,6	23,9	24,4	24,5	24,9	25,5
	8H	25,5	25,8	26,0	26,4	27,1	24,2	24,6	24,8	25,1	25,8
	12H	25,8	26,1	26,5	26,7	27,3	24,4	24,7	25,0	25,2	25,9
12H	4H	24,2	24,7	24,7	25,2	25,7	23,3	23,8	23,9	24,3	24,8
	6H	25,1	25,5	25,7	26,1	26,7	24,0	24,4	24,6	25,0	25,6
	8H	25,5	25,8	26,2	26,4	27,0	24,3	24,6	24,9	25,2	25,8

Variations with the observer position for the luminaire spacings, S:

S = 1.0H	0,6 / -0,4	0,8 / -0,6
S = 1.5H	1,5 / -0,6	1,9 / -0,8
S = 2.0H	2,5 / -0,8	3,0 / -1,0

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	118	118	118	118	115	115	115	115	109	109	109	104	104	104	99	99	99	97
1	111	107	104	101	108	104	101	99	100	97	95	95	94	92	91	90	89	86
2	103	97	92	87	101	95	90	86	91	87	84	88	84	81	84	82	79	77
3	97	88	82	77	94	87	81	76	84	79	75	81	77	73	78	74	72	70
4	91	81	74	69	88	80	73	68	77	72	67	75	70	66	72	68	65	63
5	85	75	68	62	83	74	67	62	71	66	61	69	64	60	67	63	59	58
6	80	69	62	57	78	68	61	57	66	60	56	64	59	55	63	58	55	53
7	75	64	57	52	74	63	57	52	62	56	51	60	55	51	59	54	50	49
8	71	60	53	48	70	59	53	48	58	52	48	56	51	47	55	50	47	45
9	67	56	49	45	66	55	49	44	54	48	44	53	48	44	52	47	43	42
10	64	53	46	42	62	52	46	41	51	45	41	50	45	41	49	44	41	39

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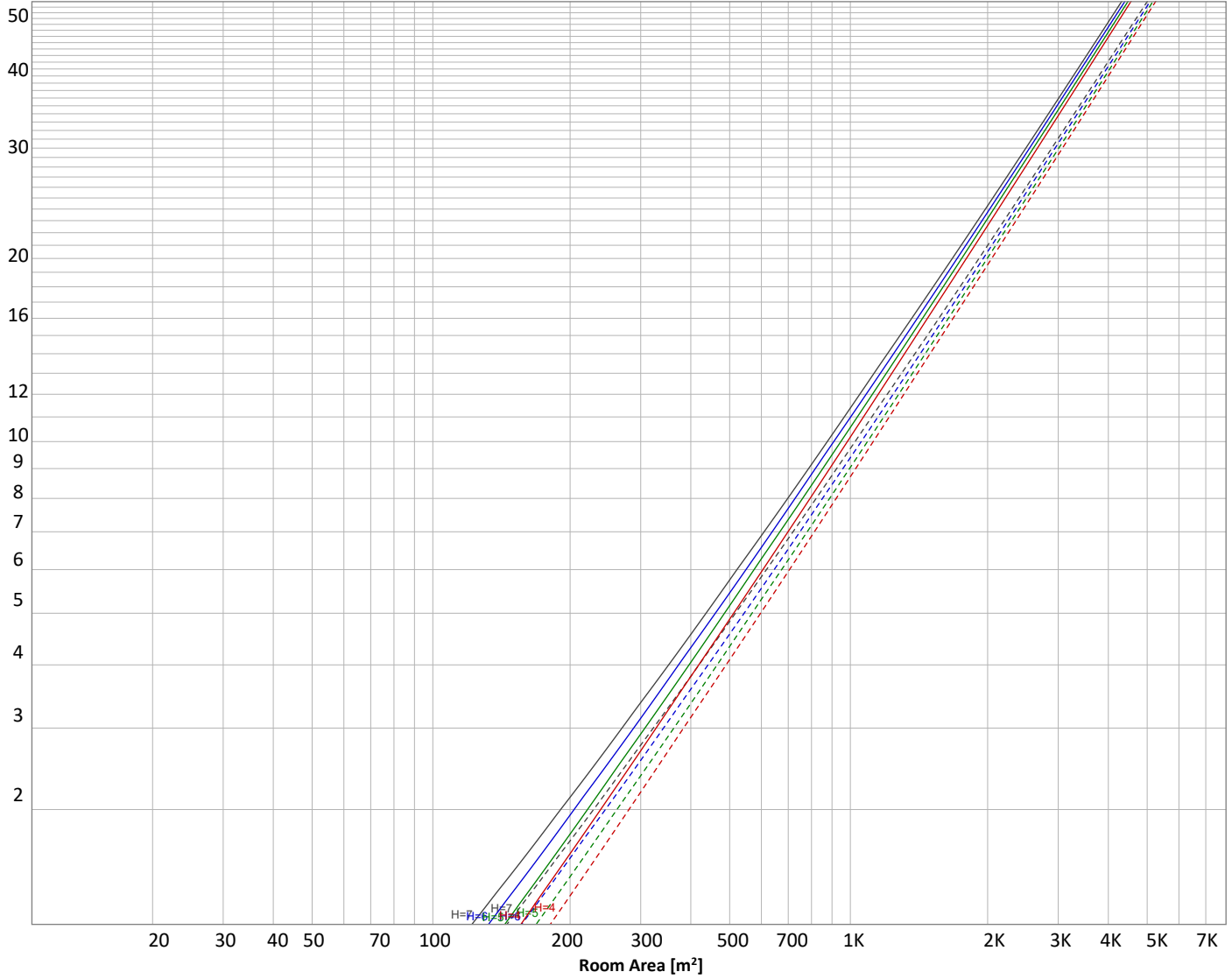
Operator:



Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 10722 lm			
H _{down} = Lamp distance from ceiling =	0.00 m		ρ(%)	
H _{work} = Work area height from floor =	0.00 m	Line type	Ceiling reflectance	Wall reflectance
E _{work} = Average lux on work area =	100 lx	-----	70	50
		—————	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°
764 lm	2129 lm	2742 lm	2098 lm	1081 lm	620 lm	484 lm	335 lm	146 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
65,4 lm	64,8 lm	58,0 lm	48,2 lm	36,4 lm	25,0 lm	14,8 lm	7,57 lm	2,54 lm

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Outdoor Light Planning

Lumen per Zone

Zone (y)	Lumen	% Total
0-10°	{LUM00-10} lm	#VALUE!
10-20°	{LUM10-20} lm	#VALUE!
20-30°	{LUM20-30} lm	#VALUE!
30-40°	{LUM30-40} lm	#VALUE!
40-50°	{LUM40-50} lm	#VALUE!
50-60°	{LUM50-60} lm	#VALUE!
60-70°	{LUM60-70} lm	#VALUE!
70-80°	{LUM70-80} lm	#VALUE!
80-90°	{LUM80-90} lm	#VALUE!
90-100°	{LUM90-100} lm	#VALUE!
100-110°	{LUM100-110} lm	#VALUE!
110-120°	{LUM110-120} lm	#VALUE!
120-130°	{LUM120-130} lm	#VALUE!
130-140°	{LUM130-140} lm	#VALUE!
140-150°	{LUM140-150} lm	#VALUE!
150-160°	{LUM150-160} lm	#VALUE!
160-170°	{LUM160-170} lm	#VALUE!
170-180°	{LUM170-180} lm	#VALUE!
Total	0 lm	#VALUE!

Intensity peaks

Max intensity	{PEAK} cd
Intensity, 90°	{INT90} cd
Intensity, 0°	{INT0} cd

Zonal Lumen summary

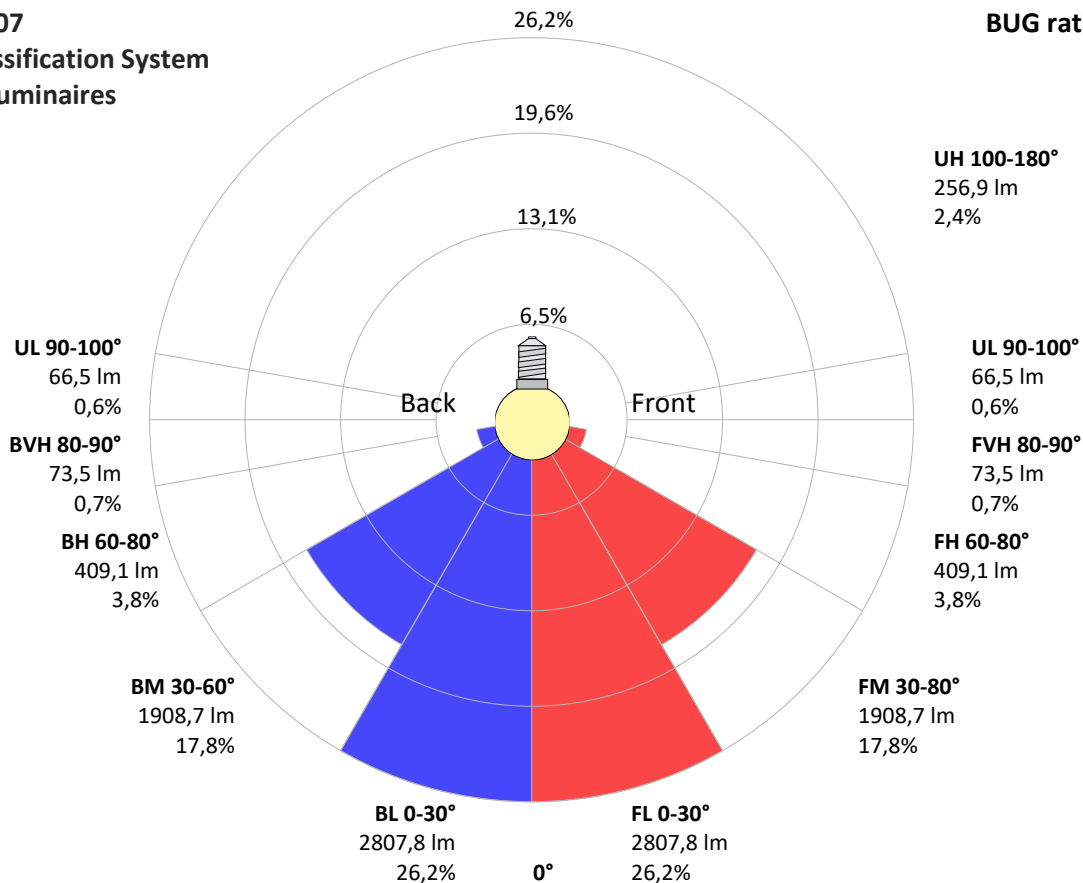
Zone (y)	Lumen	% Total
0-30°	{LUM00-30} lm	#VALUE!
0-40°	{LUM00-40} lm	#VALUE!
0-60°	{LUM00-60} lm	#VALUE!
60-90°	{LUM60-90} lm	#VALUE!
70-100°	{LUM70-100} lm	#VALUE!
90-120°	{LUM90-120} lm	#VALUE!
0-90°	{LUM00-90} lm	#VALUE!
90-180°	{LUM90-180} lm	#VALUE!
0-180°	{LUM00-180} lm	#VALUE!

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	{BUG0} lm	#VALUE!
Medium(30-60°)	{BUG1} lm	#VALUE!
High(60-80°)	{BUG2} lm	#VALUE!
Very high(80-90°)	{BUG3} lm	#VALUE!
Back light		
Low(0-30°)	{BUG4} lm	#VALUE!
Medium(30-60°)	{BUG5} lm	#VALUE!
High(60-80°)	{BUG6} lm	#VALUE!
Very high(80-90°)	{BUG7} lm	#VALUE!
Uplight		
Low(90-100°)	{BUG8} lm	#VALUE!
High(100-180°)	{BUG9} lm	#VALUE!

IESNA TM-15-07 Luminaire Classification System For Outdoor Luminaires

BUG rating B4 U3 G1



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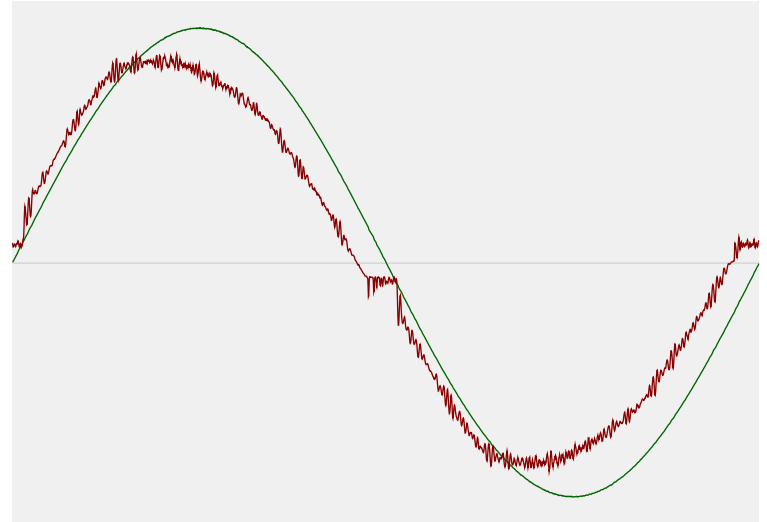


Power Details

Input Power

Power feed to light source	58,4 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,261 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	59,95 VA
Displacement factor of AC power feed	0,98
Power factor of AC current feed	0,97
Total harmonic distortion of the current	6,34%
Total harmonic distortion of the voltage	0,13%

Input Power Curve



Efficiency

Radiated power efficiency	52,7%
Lumen efficiency	184 lm/W

Stabilization Details

Warmup Conditions

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

Color Temperature Change

CCT start	4006 K
CCT shift	-6 K
CCT end	4000 K

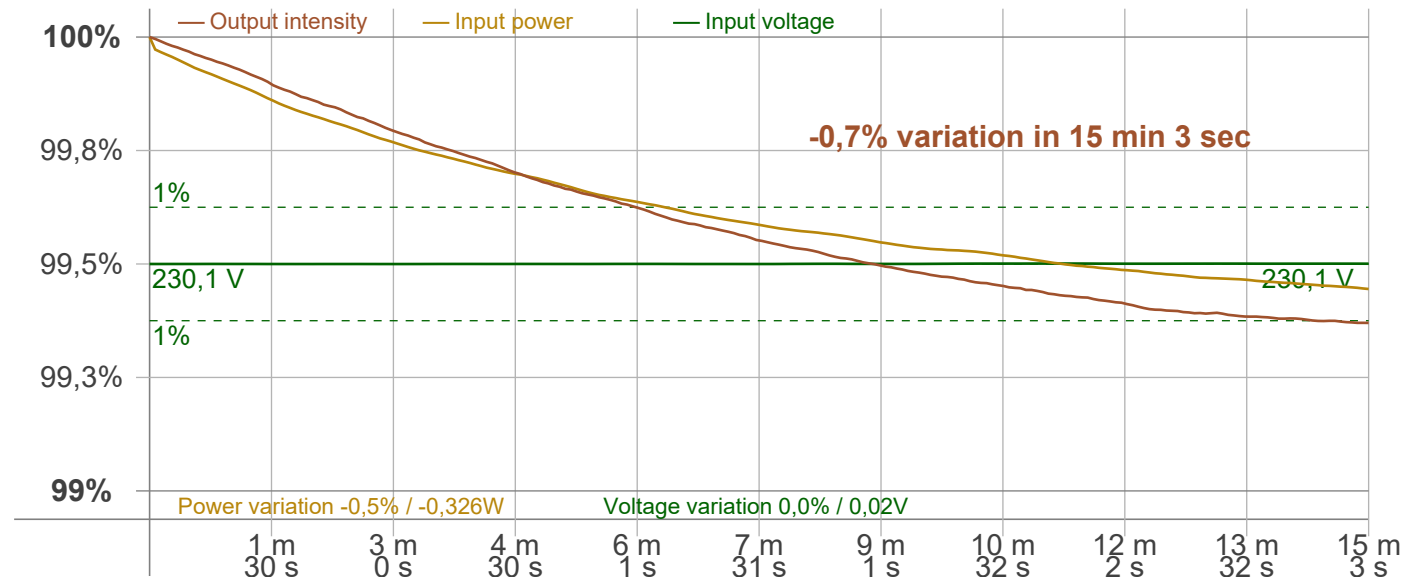
Warmup Result

Total warmup time	Lamp stabilized in 15 min 3 sec
Warmup variation	-0,7%

Output Change

Output start	10791 lm
Output change	-70 lm
Output end	10722 lm

Stabilization Curve



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Flicker /TLA details

Flicker Meter Type: Viso Systems LabFlicker
 Frequency of input power: 50 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: 102,04 Hz
 Percent Flicker: 0,15 %
 Flicker index: 0

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

JA8/10 40 Hz: 0,01 %
 JA8/10 90 Hz: 0,02 %
 JA8/10 200 Hz: 0,13 %
 JA8/10 400 Hz: 0,14 %
 JA8/10 1000 Hz: 0,14 %

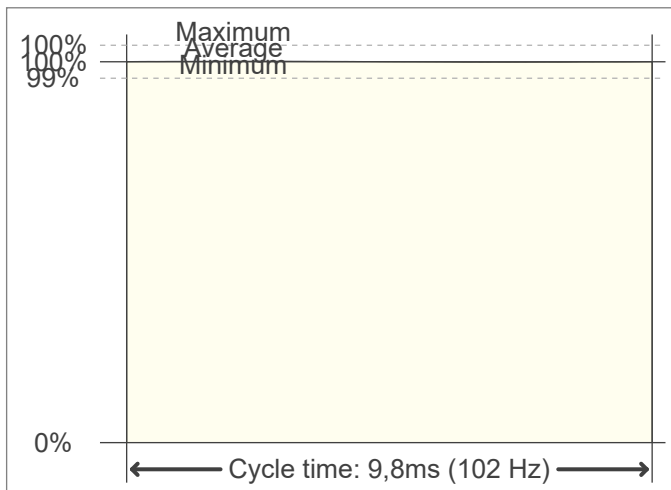
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

PstLM value (F < 80 Hz): 0,01
 SVM value (80 < F < 2000 Hz): 0

Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp: 0,01

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot

