Light Measurement Report

Print date: 3-7-2025
Measurement date and time: 3-7-2025 16:02:52 – Measurement no. VFR-250703-1916-MS
Measurement tracking No. and Link: VT250703-003606
Operator:

Laboratory and Equipment

Laboratory Owner and Location	Viso Systems, Copenhagen V, Denmark
Goniospectrometer System and Type	LabSpion – Type C, horizontal
Sensor Name, Calibr. Date and Serial No.	LabSensor Model2 – 11-1-2024 – 3130191315
Spectrometer Manufacturer and Model	Ibsen Photonics, Denmark – Freedom VIS (Custom Viso)

Measurement Conditions

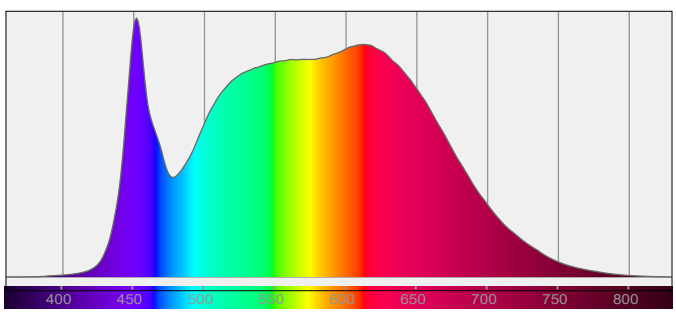
Number of C-planes and Resolution	72 planes – 5°
γ (gamma)-Resolution	5°
Test Distance	2,79 m
Input Power, Power and Displ. Factors	20,8 W – PF 0,85 – DPF 0,98
Input RMS Voltage and Current	230 V – 0,106 A
Frequency of Input Power	50 Hz
Warm-up Time and Variation	Lamp stabilized in 15 min 3 sec – 2,0%

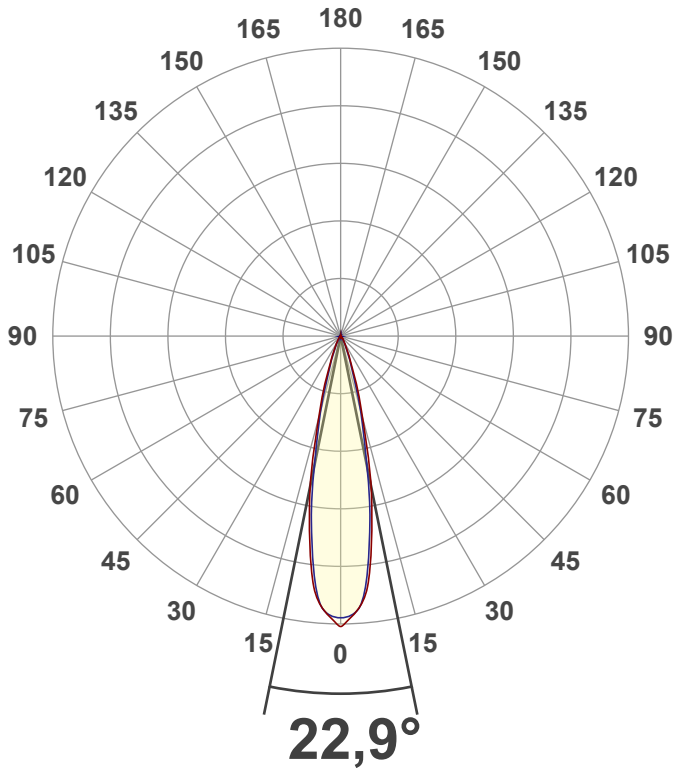
Tested Light Source

Product Name	812034-4000K-20W
Item No. and Manufacturer	812034-4000K-20W – Dutchfulfillment
Product Description (line 1)	3-FASE RAILSPOT | ZOOMABLE | WATT SWITCH | CCT-SWITCH | ZWART

Main Light Measurement Results

Output – Total Lumen (Up% / Down%)	1466 lm – 0,07% / 99,93%
Efficiency	71 lm/W
Peak Intensity and Beam Angle	7756 cd – 22,9°
Correlated Color Temperature, Target/Measured	CCT = 4000 K / 4167 K
Color Rendering Index	CRI 91,9
Color Rendering TM30-18	R_f 90,5 – R_g 96,8
Color Shift, CIE duv and MacAdam Steps	Duv 0,0062 – SDCM 5,8
Flicker	SVM 0,04 – PstLM 0,04





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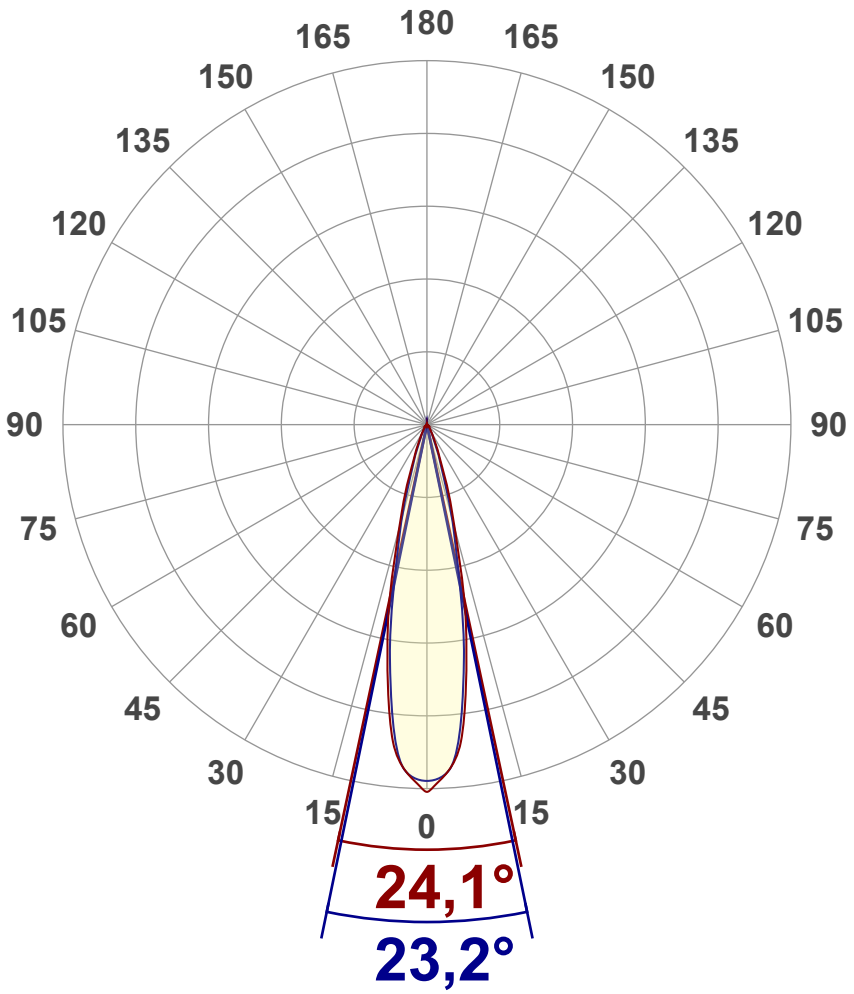
Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	1466 lm
Lumen Up% / Down%	0,07% / 99,93%
Peak Intensity	7756 cd
Beam Angle (50%)	22,9°
Beam Angle (90%)	23,2°
Beam Angle (10%)	23,6°

Cut-off Angle

Average 2,5%	59°

Field Angle

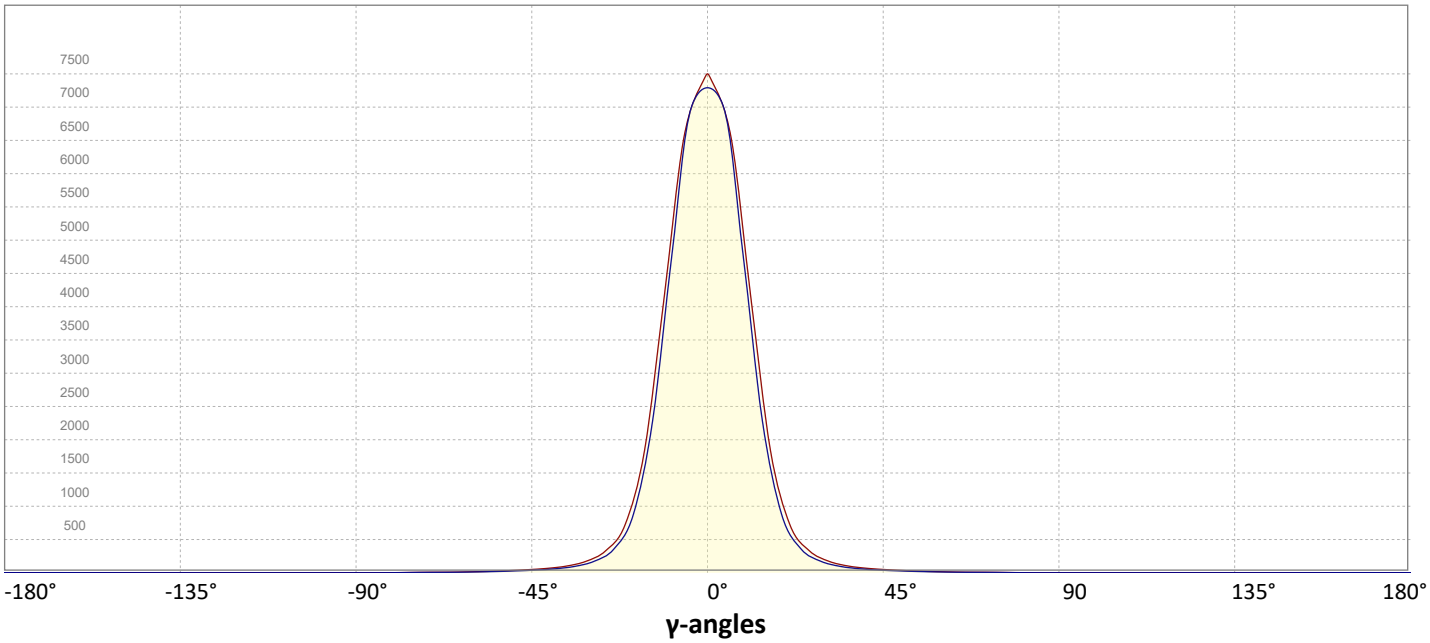
Average 10%	41°

Intensity Ratio

In 120° cone	99,0%
In 90° cone	96,8%

C000-C180
C090-C270

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



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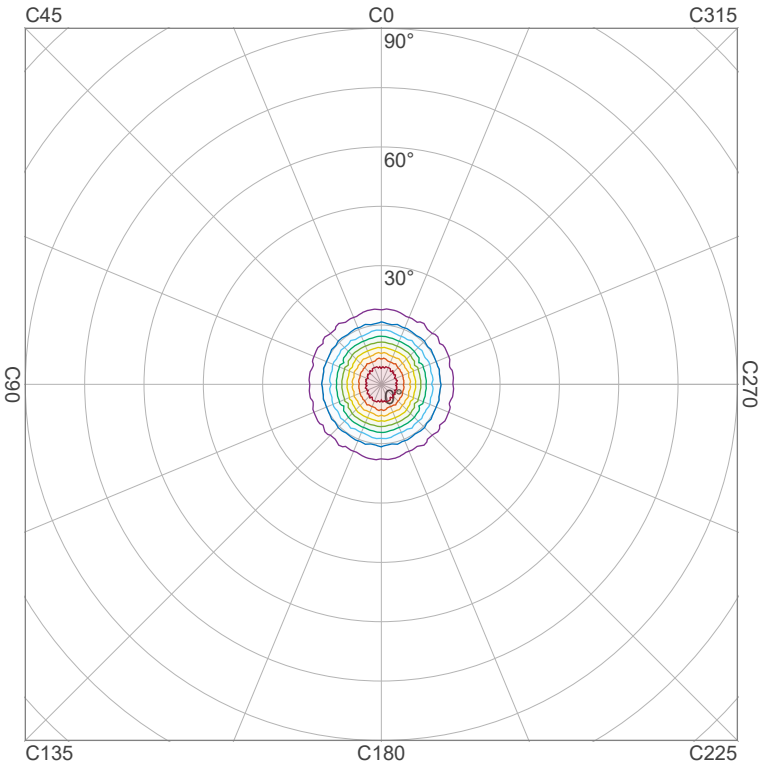
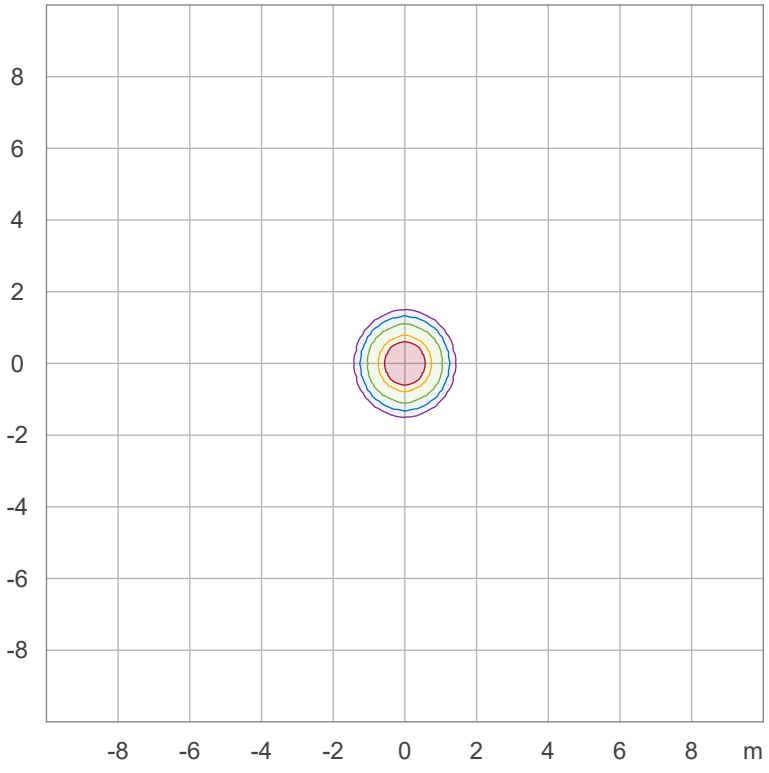
Iso-intensity Diagram (Iso-candela)



	90 %	6817,4 cd
	80 %	6059,9 cd
	70 %	5302,4 cd
	60 %	4544,9 cd
	50 %	3787,4 cd
	40 %	3029,9 cd
	30 %	2272,5 cd
	20 %	1515,0 cd
	10 %	757,5 cd

Peak intensity: 7574,9 cd
Number of c-planes: 72

Iso-illuminance Diagram (Iso-lux)



	50,0 %	420,6 lx
	30,0 %	252,4 lx
	10,0 %	84,1 lx
	5,0 %	42,1 lx
	3,0 %	25,2 lx

Peak illuminance: 841,3 lx
Mounting height: 3,0 m
Number of c-planes: 72

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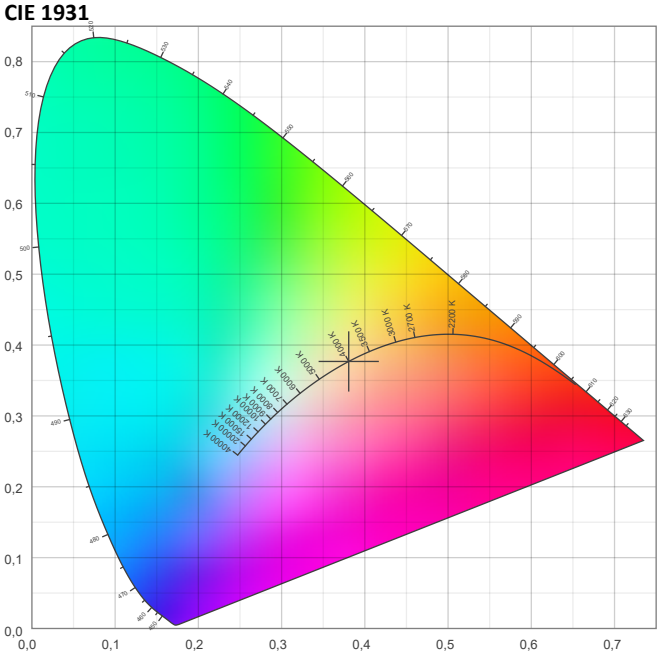
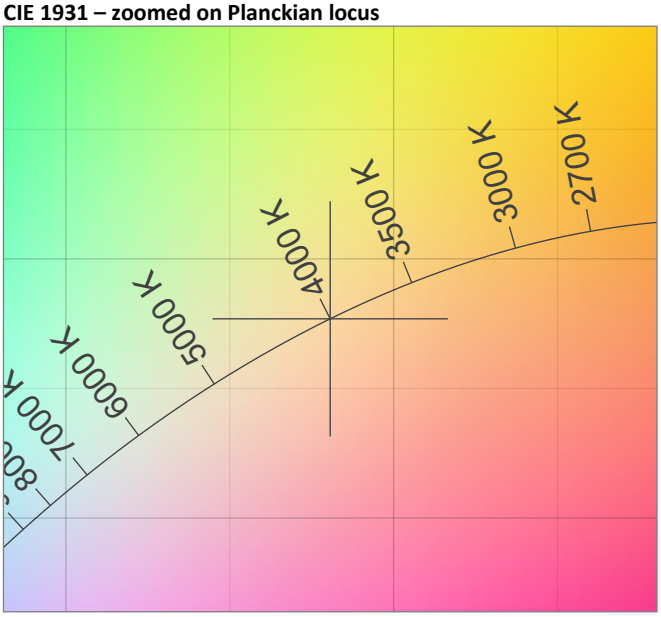
Color details

Correlated Color Temperature, Target	CCT = 4000 K
Correlated Color Temperature, Measured	CCT = 4167 K
Color Rendering Index	CRI 91,9
Color Rendering Index, R9 (red component)	R9 = 61,2
Color Rendering TM30-18	R_f 90,5 – R_g 96,8
Color Quality Scale	CQS = 92,2
MacAdam Steps	SDCM = 5,8
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 = 0,0062
Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0,225;0,502)

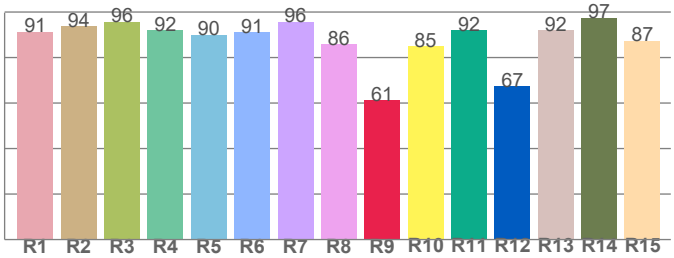
CIE 1931



CIE 1931 – zoomed on Planckian locus



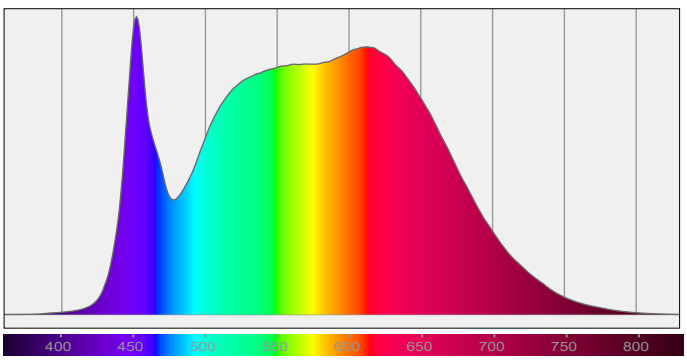
Color Rendering Index per reference color (CIE 1995)



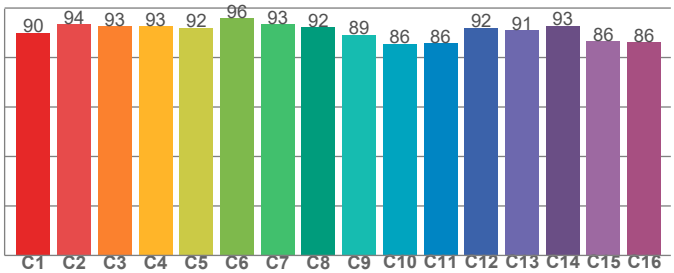
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
91,4	93,7	95,7	92,0	90,0	91,1	95,8	85,8	61,2	84,9	92,1	67,3	91,9	97,4	87,3

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



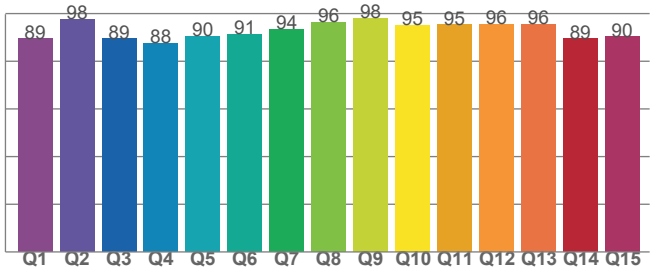
TM30-18 Rf-values per hue bin



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
90,0	93,5	92,6	92,8	92,1	95,9	93,4	92,2	89,2	85,6	85,6	92,0	91,1	92,8	86,5	86,2

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
89,5	97,6	89,4	87,6	90,4	91,2	93,5	96,3	98,1	95,1	95,4	95,6	95,6	89,4	90,2

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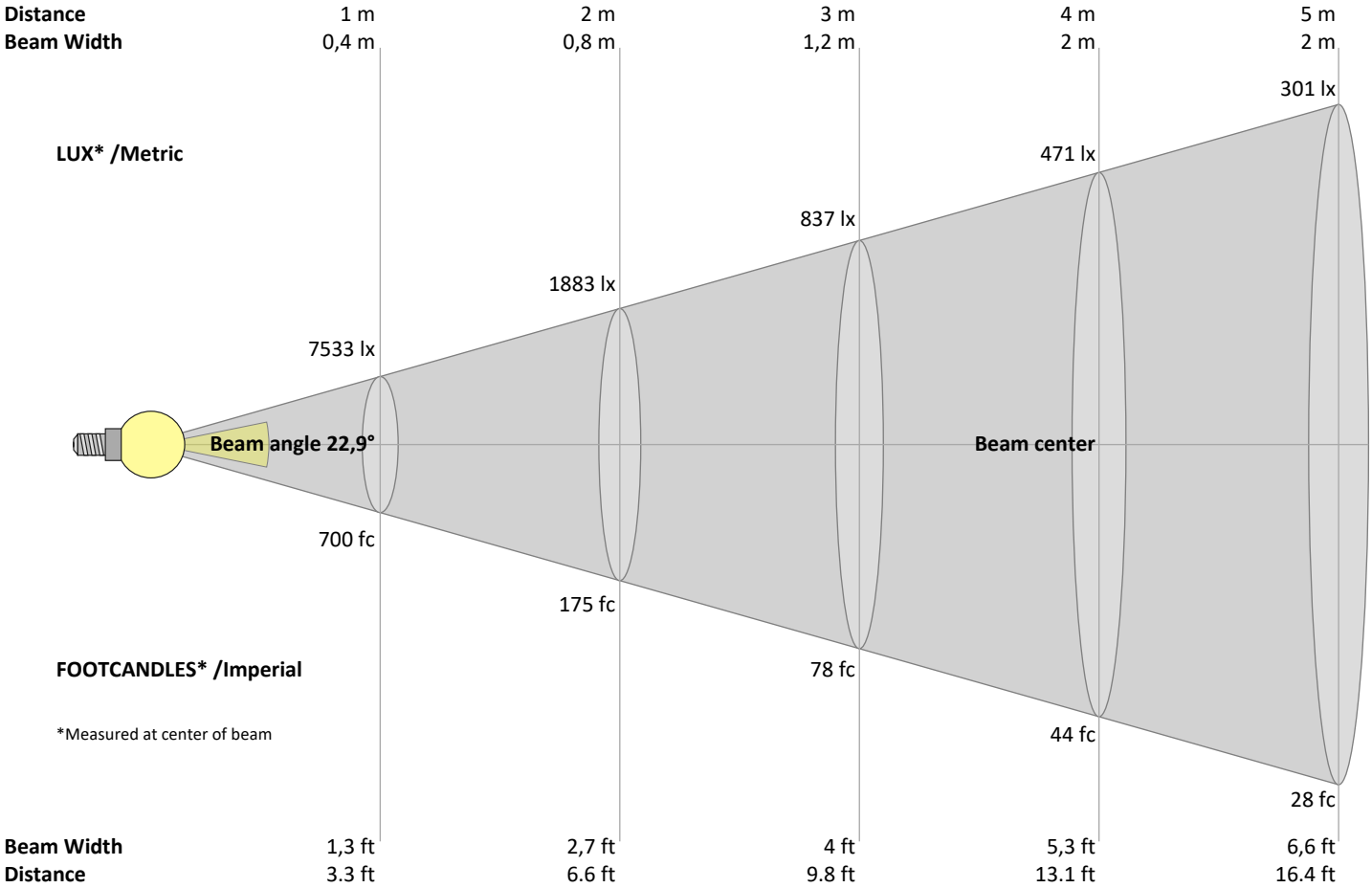
Beam Details



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
7533	1883	837	471	301	209	154	118	93	75	62	52	45	38	33	29	26	23	21	19	lux
699,8	175	77,8	43,7	28	19,4	14,3	10,9	8,6	7	5,8	4,9	4,1	3,6	3,1	2,7	2,4	2,2	1,9	1,7	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
7533	7236	6886	6536	5616	4661	3723	2807	1891	1417	969	650	494	337	269	207	159	131	102	87	cd
100%	96%	91%	87%	75%	62%	49%	37%	25%	19%	13%	9%	7%	4%	4%	3%	2%	2%	1%	1%	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
7533	7017	7017	6145	5269	4327	3316	2304	1730	1159	769	562	355	282	209	157	127	96	81	67	cd
100%	93%	93%	82%	70%	57%	44%	31%	23%	15%	10%	7%	5%	4%	3%	2%	2%	1%	1%	1%	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
7533	7236	6886	6536	5616	4661	3723	2807	1891	1417	969	650	494	337	269	207	159	131	102	87	cd
100%	96%	91%	87%	75%	62%	49%	37%	25%	19%	13%	9%	7%	4%	4%	3%	2%	2%	1%	1%	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
7533	7017	7017	6145	5269	4327	3316	2304	1730	1159	769	562	355	282	209	157	127	96	81	67	cd
100%	93%	93%	82%	70%	57%	44%	31%	23%	15%	10%	7%	5%	4%	3%	2%	2%	1%	1%	1%	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		**Viewed Crosswise** (Viewing direction orthogonal to lamp length axis)					**Viewed Endwise** (Viewing direction parallel to lamp length axis)				
X	**Y**										
2H	2H	14,7	15,1	14,8	15,3	15,5	13,5	13,9	13,6	14,1	14,3
	3H	14,8	15,4	15,2	15,6	15,8	13,7	14,2	14,0	14,4	14,6
	4H	15,0	15,6	15,4	15,8	16,0	13,8	14,4	14,2	14,6	14,8
	6H	15,1	15,6	15,4	15,9	16,2	13,9	14,4	14,2	14,7	15,0
	8H	15,1	15,5	15,4	15,8	16,2	13,9	14,3	14,2	14,6	15,0
	12H	15,0	15,4	15,4	15,8	16,2	13,8	14,2	14,1	14,6	15,0
4H	2H	14,5	15,1	14,9	15,3	15,6	13,5	14,0	13,9	14,3	14,5
	3H	15,1	15,5	15,4	15,8	16,3	14,0	14,4	14,3	14,8	15,2
	4H	15,2	15,6	15,7	16,1	16,6	14,1	14,5	14,5	15,0	15,5
	6H	15,3	15,8	15,8	16,1	16,4	14,2	14,6	14,7	15,0	15,3
	8H	15,3	15,7	15,8	16,0	16,4	14,1	14,6	14,6	14,9	15,3
	12H	15,2	15,5	15,7	15,9	16,4	14,1	14,4	14,6	14,8	15,2
8H	4H	15,2	15,7	15,7	16,0	16,4	14,2	14,6	14,7	14,9	15,3
	6H	15,3	15,6	15,8	16,0	16,6	14,2	14,5	14,8	15,0	15,5
	8H	15,3	15,5	15,8	16,0	16,7	14,3	14,5	14,8	15,0	15,6
	12H	15,3	15,4	15,8	15,9	16,5	14,2	14,4	14,8	14,9	15,5
12H	4H	15,2	15,5	15,7	15,9	16,4	14,1	14,4	14,6	14,8	15,3
	6H	15,3	15,5	15,8	16,0	16,7	14,3	14,5	14,8	15,0	15,6
	8H	15,3	15,4	15,9	15,9	16,5	14,2	14,4	14,8	14,9	15,5

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

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	115	113	111	109	112	111	109	107	107	105	104	103	102	101	99	99	98	96
2	111	107	104	102	109	106	103	100	102	100	98	100	98	96	97	95	94	93
3	107	103	99	96	105	101	98	95	99	96	94	96	94	92	94	92	91	89
4	104	98	94	91	102	97	94	91	95	92	90	94	91	89	92	90	88	87
5	101	95	91	88	99	94	90	87	92	89	86	91	88	86	89	87	85	84
6	98	92	87	84	97	91	87	84	90	86	83	88	85	83	87	85	82	81
7	95	89	84	81	94	88	84	81	87	83	81	86	83	81	85	82	80	79
8	93	86	82	79	92	86	82	79	85	81	79	84	81	78	83	80	78	77
9	90	84	80	77	89	83	79	77	82	79	76	82	79	76	81	78	76	75
10	88	81	77	75	87	81	77	75	80	77	74	80	77	74	79	76	74	73

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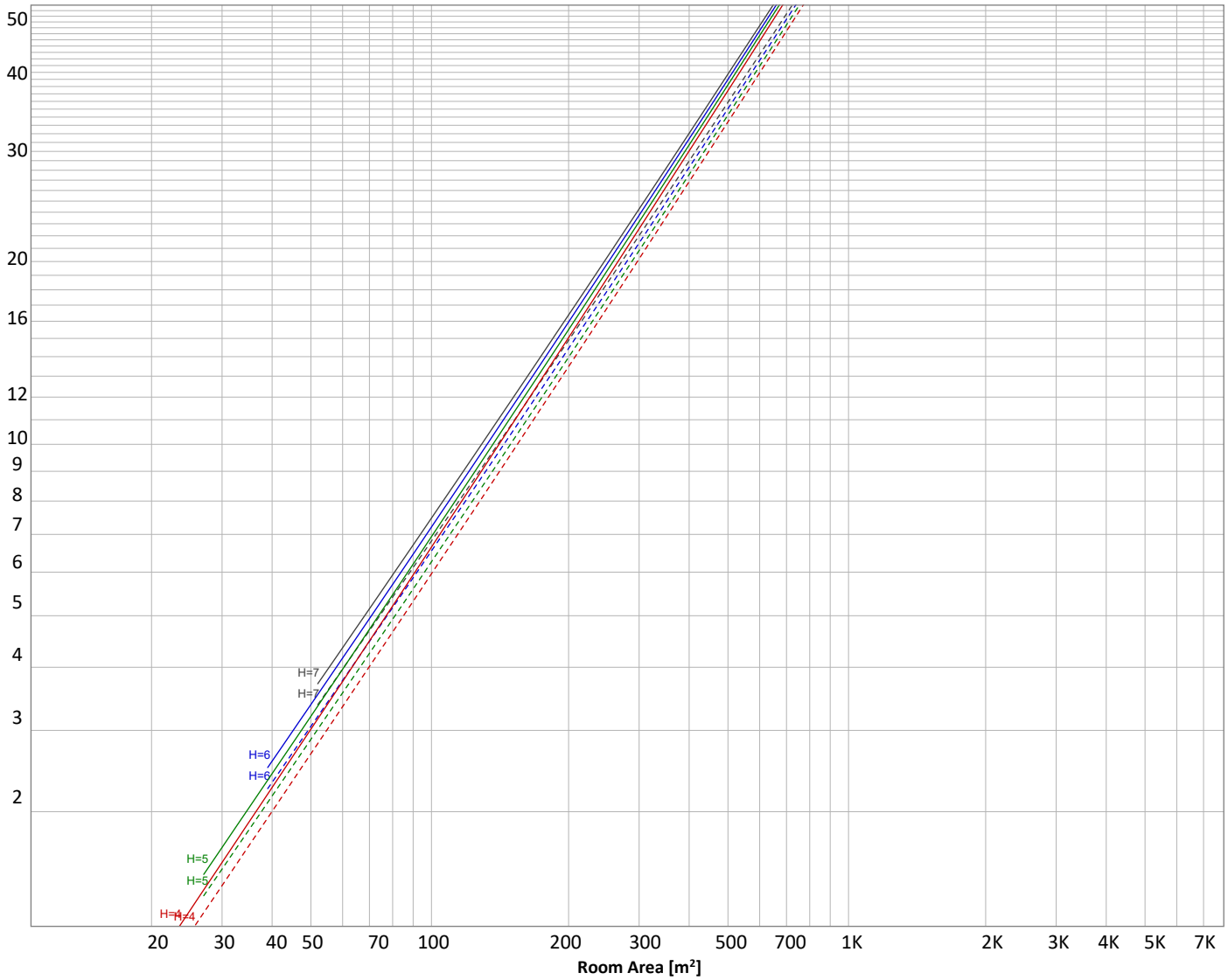
Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 1466 lm		ρ(%)		
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°
574 lm	592 lm	169 lm	64,0 lm	33,6 lm	18,0 lm	8,92 lm	5,00 lm	0,181 lm

90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
0,005 lm	0,005 lm	0,009 lm	0,007 lm	0,016 lm	0,127 lm	0,347 lm	0,427 lm	0,122 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	574 lm	39,2%
10-20°	592 lm	40,4%
20-30°	169 lm	11,5%
30-40°	64 lm	4,4%
40-50°	34 lm	2,3%
50-60°	18 lm	1,2%
60-70°	9 lm	0,6%
70-80°	5 lm	0,3%
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	1466 lm	100,0%

Intensity peaks

Max intensity	7756 cd
Intensity, 90°	0 cd
Intensity, 0°	7533 cd

Zonal Lumen summary

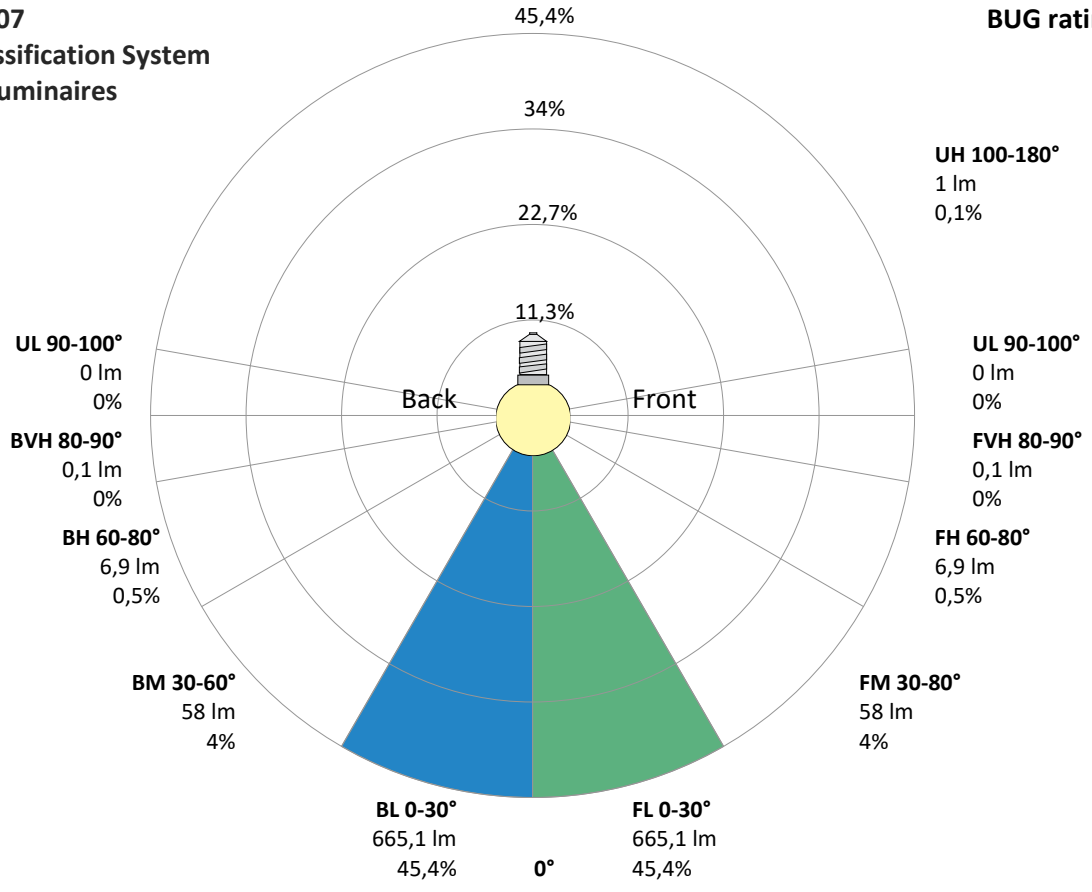
Zone (γ)	Lumen	% Total
0-30°	1336 lm	91,1%
0-40°	1400 lm	95,4%
0-60°	1451 lm	99,0%
60-90°	14 lm	1,0%
70-100°	5 lm	0,4%
90-120°	0 lm	0,0%
0-90°	1465 lm	99,9%
90-180°	1 lm	0,1%
0-180°	1466 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	665 lm	45,4%
Medium(30-60°)	58 lm	4,0%
High(60-80°)	7 lm	0,5%
Very high(80-90°)	0 lm	0,0%
Back light		
Low(0-30°)	665 lm	45,4%
Medium(30-60°)	58 lm	4,0%
High(60-80°)	7 lm	0,5%
Very high(80-90°)	0 lm	0,0%
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 B2 U1 G0



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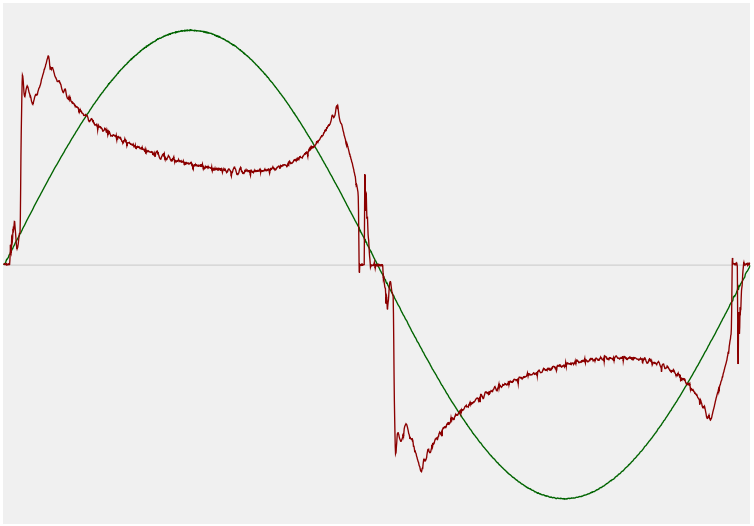
Power Details

Input Power

Power feed to light source	20,8 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,106 A
Volt-Ampere or apparent power = V_{RMS}*I_{RMS}	24,39 VA
Displacement factor of AC power feed	0,98
Power factor of AC current feed	0,85
Total harmonic distortion of the current	56,78%
Total harmonic distortion of the voltage	0,08%

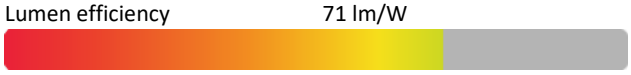
Input Power Curve



Efficiency

Radiated power efficiency 23,5%

Lumen efficiency 71 lm/W



Stabilization Details

Warmup Conditions

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

Color Temperature Change

CCT start	4000 K
CCT shift	+0 K
CCT end	4000 K

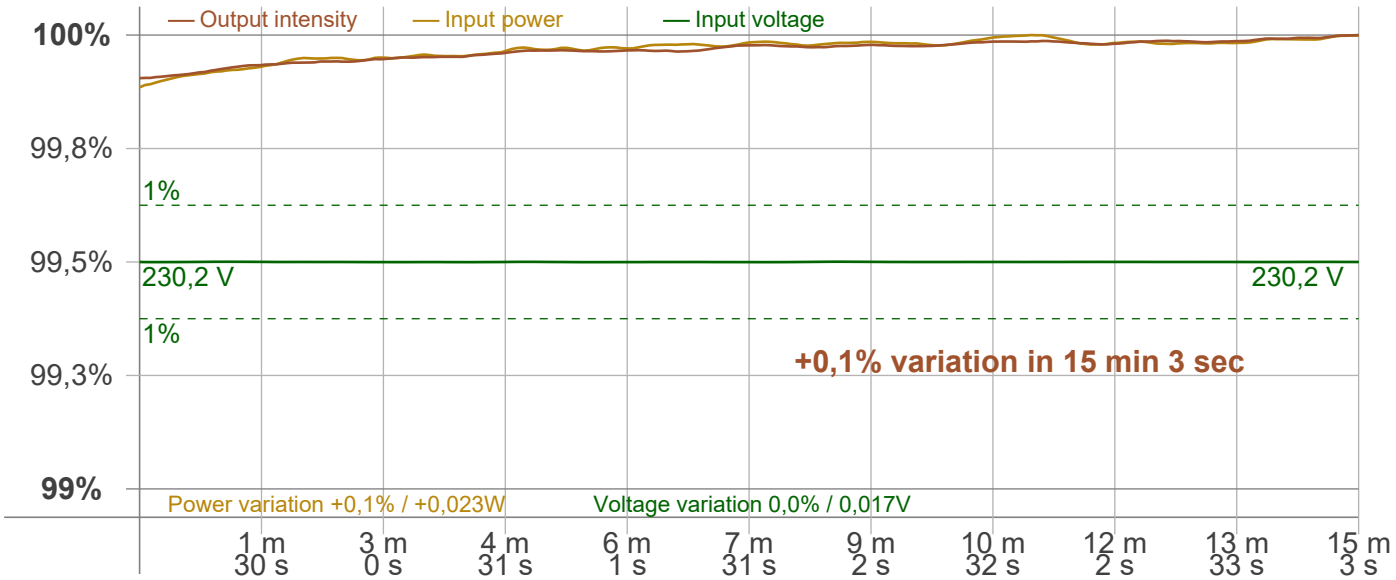
Warmup Result

Total warmup time	Lamp stabilized in 15 min 3 sec
Warmup variation	+0,1%

Output Change

Output start	1465 lm
Output change	+1 lm
Output end	1466 lm

Stabilization Curve



Light Measurement Report

Print date: 3-7-2025
Measurement date and time: 3-7-2025 16:02:52 – Measurement no. VFR-250703-1916-MS
Measurement tracking No. and Link: VT250703-003606
Operator:

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	100,5 Hz
Percent Flicker	1,28 %
Flicker index	0

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

PstLM value (F < 80 Hz)	0,04
SVM value (80 < F < 2000 Hz)	0,04

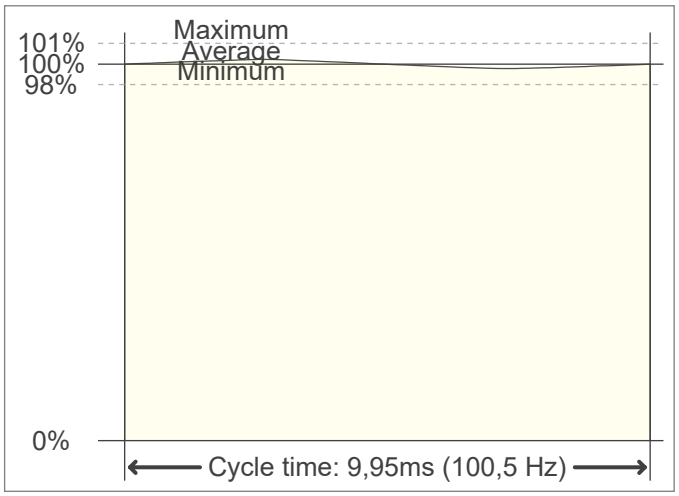
Flicker indices according to California Energy Commission (CEC) 2016b

JA8/10 40 Hz	0,04 %
JA8/10 90 Hz	0,04 %
JA8/10 200 Hz	1,12 %
JA8/10 400 Hz	1,21 %
JA8/10 1000 Hz	1,26 %

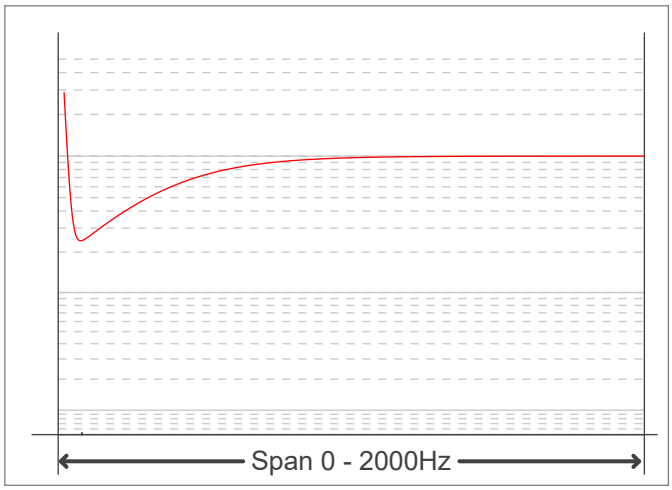
Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp	0,02

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot