Light Measurement Report

Print date: 21-2-2025
Measurement date and time: 20-2-2025 17:10:38 – Measurement no. VFR-250220-0102-MS
Measurement tracking No. and Link: VT250220-007158
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

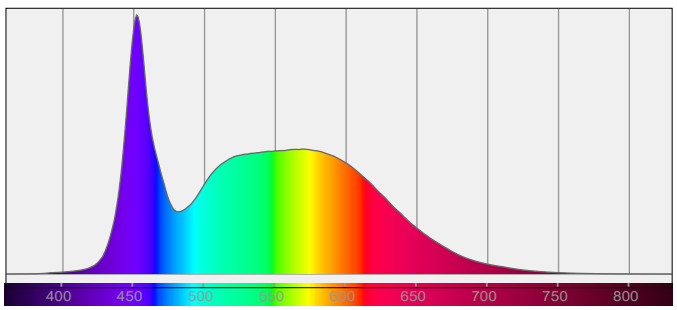
Number of C-planes and Resolution	12 planes – 30°
γ (gamma)-Resolution	5°
Test Distance	12,10 m
Input Power, Power and Displ. Factors	23,8 W – PF 0,95 – DPF 0,96
Input RMS Voltage and Current	230 V – 0,108 A
Frequency of Input Power	50 Hz
Warm-up Time and Variation	Lamp stabilized in 15 min 0 sec – 2,0%

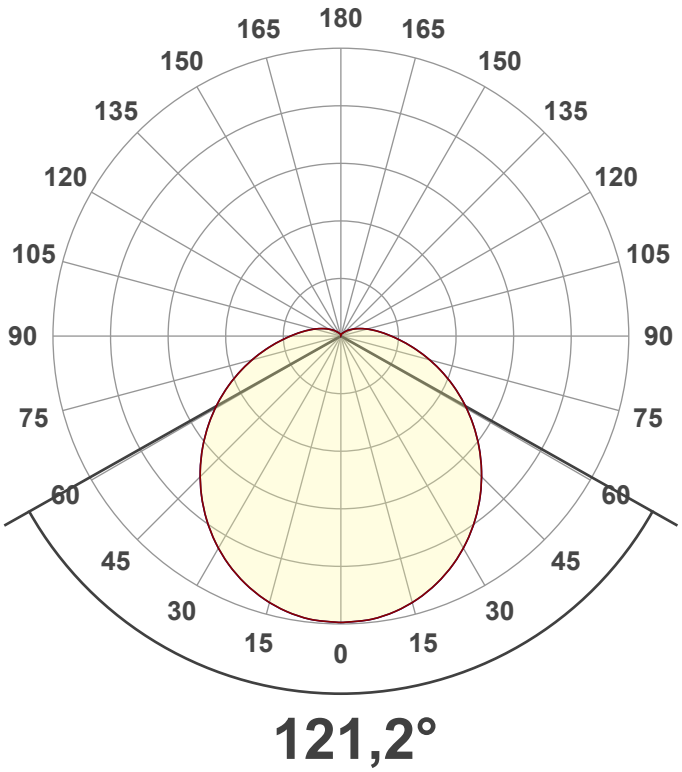
Tested Light Source

Product Name	802301-6000K-25W
Item No. and Manufacturer	802301-6000K-25W – Dutchfulfillment
Product Description (line 1)	LED TL-BUIS | T8 | 150CM | 18W-20W-25W | CCT-SWITCH

Main Light Measurement Results

Output – Total Lumen (Up% / Down%)	3278 lm – 10,41% / 89,59%
Efficiency	138 lm/W
Peak Intensity and Beam Angle	876 cd – 121,2°
Correlated Color Temperature, Target/Measured	CCT = 6000 K / 6165 K
Color Rendering Index	CRI 81,6
Color Rendering TM30-18	R_f 82,5 – R_g 92,8
Color Shift, CIE duv and MacAdam Steps	Duv 0,0043 – SDCM 10,7
Flicker	SVM 2,68 – PstLM 0,13





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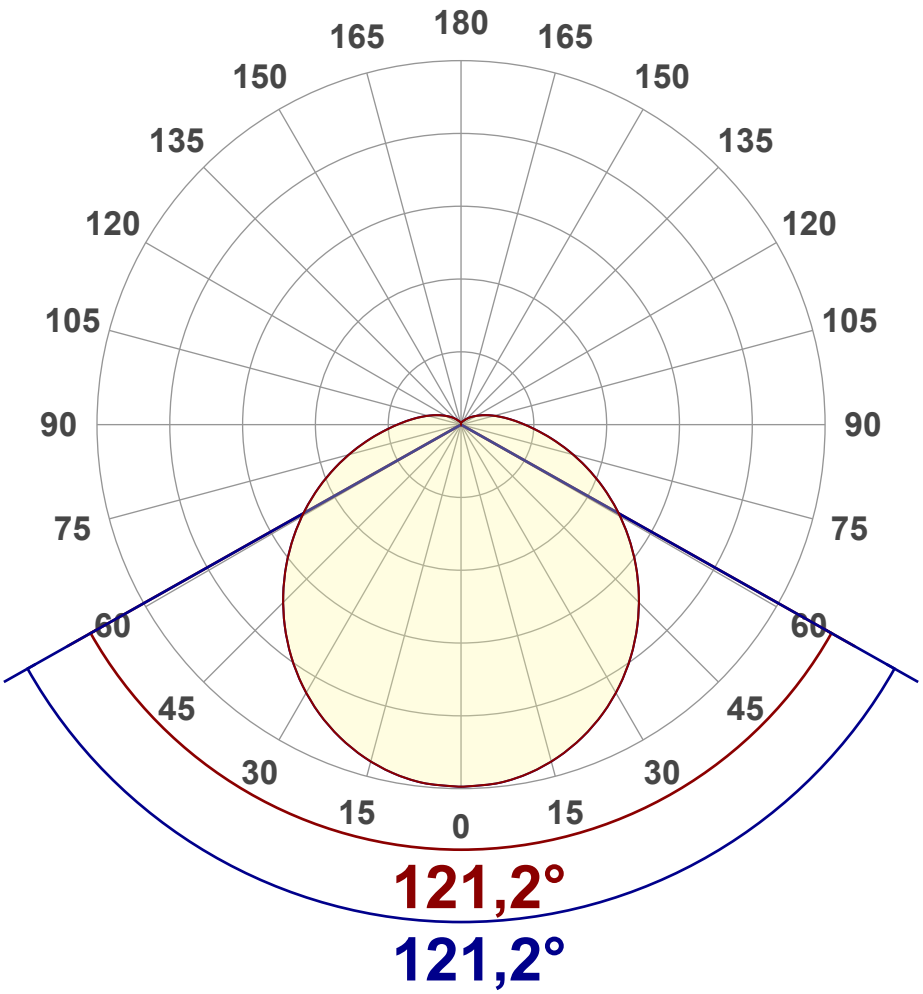
Luminous Intensity diagram Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	3278 lm
Lumen Up% / Down%	10,41% / 89,59%
Peak Intensity	876 cd
Beam Angle (50%)	121,2°
Beam Angle (90%)	121,2°
Beam Angle (10%)	121,2°

Cut-off Angle

Average 2,5%	267,5°

Field Angle

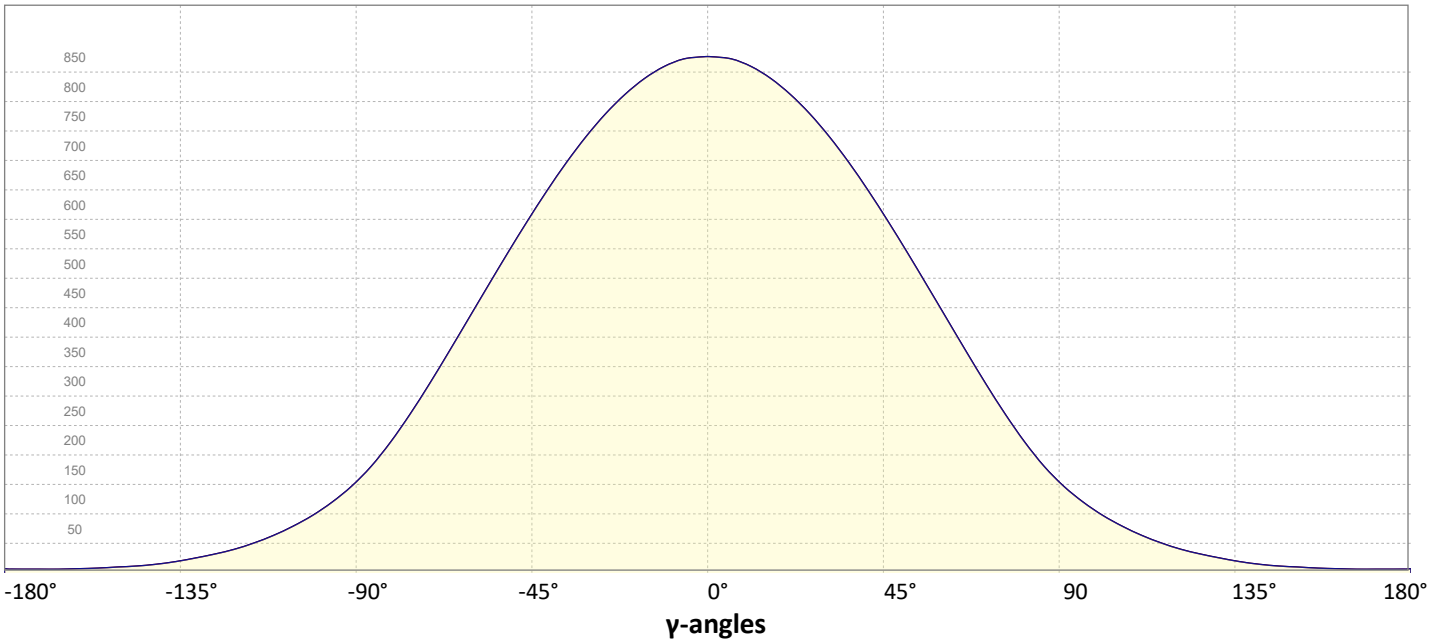
Average 10%	207,6°

Intensity Ratio

In 120° cone	62,4%
In 90° cone	41,5%

C000-C180
C090-C270

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



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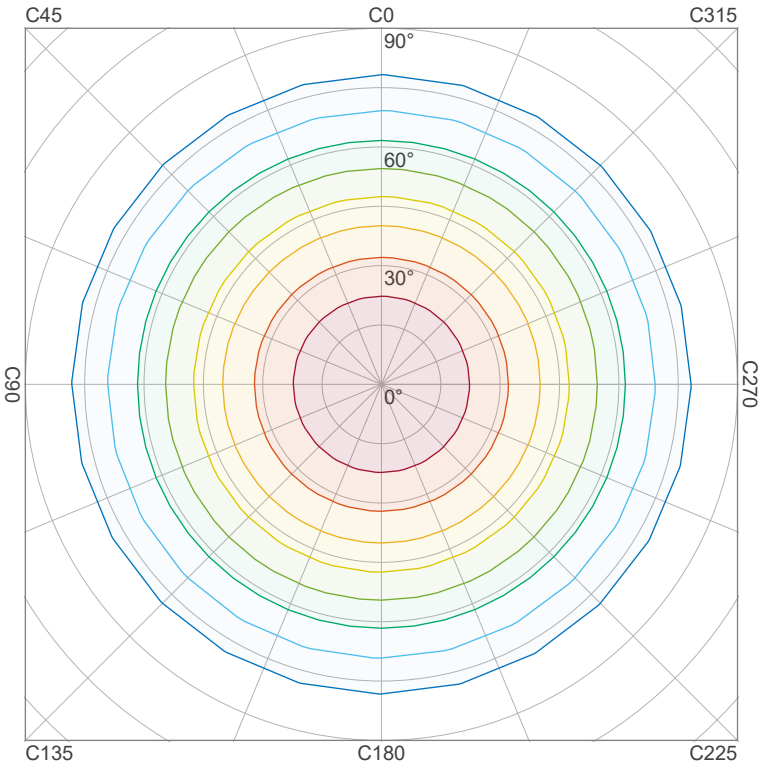
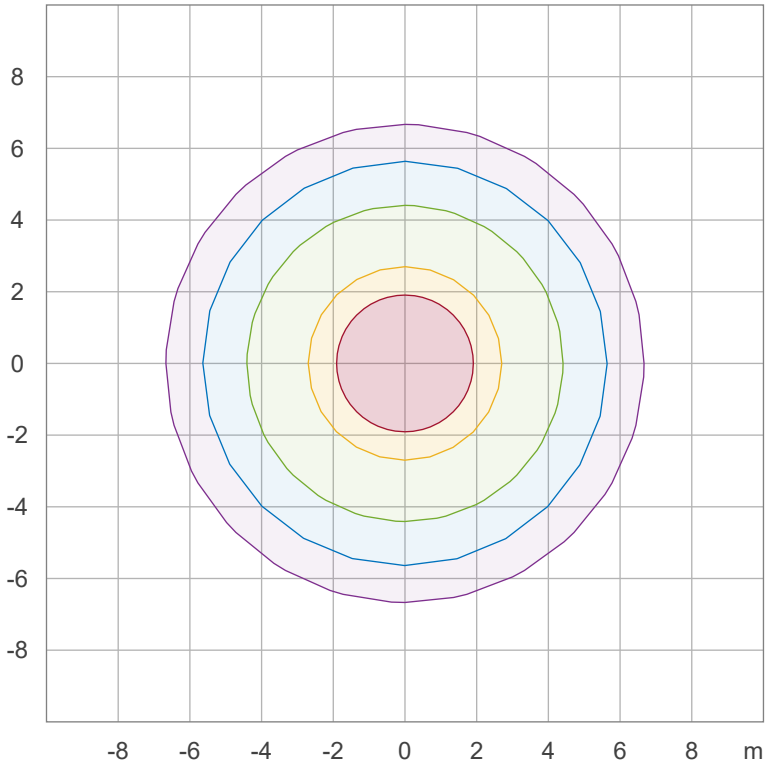
Iso-intensity Diagram (Iso-candela)



	90 %	788,3 cd
	80 %	700,7 cd
	70 %	613,1 cd
	60 %	525,5 cd
	50 %	438,0 cd
	40 %	350,4 cd
	30 %	262,8 cd
	20 %	175,2 cd
	10 %	87,6 cd

Peak intensity: 875,9 cd
Number of c-planes: 12

Iso-illuminance Diagram (Iso-lux)



	50,0 %	48,7 lx
	30,0 %	29,2 lx
	10,0 %	9,7 lx
	5,0 %	4,9 lx
	3,0 %	2,9 lx

Peak illuminance: 97,3 lx
Mounting height: 3,0 m
Number of c-planes: 12

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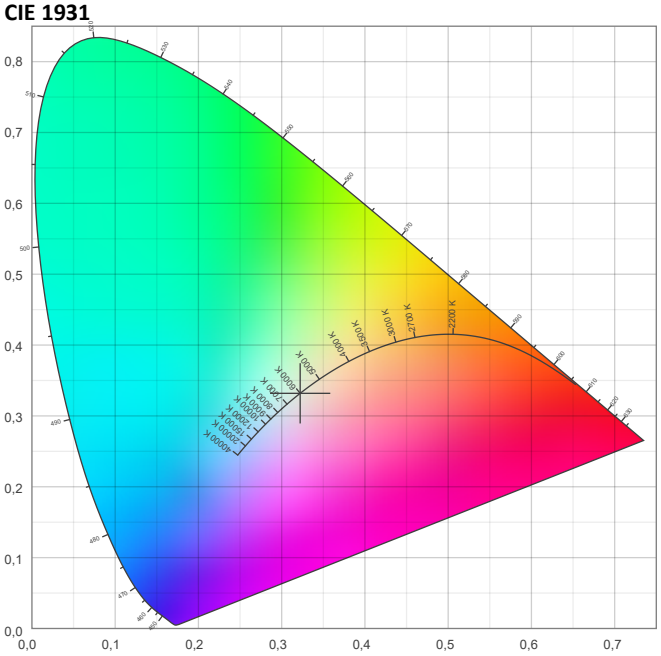
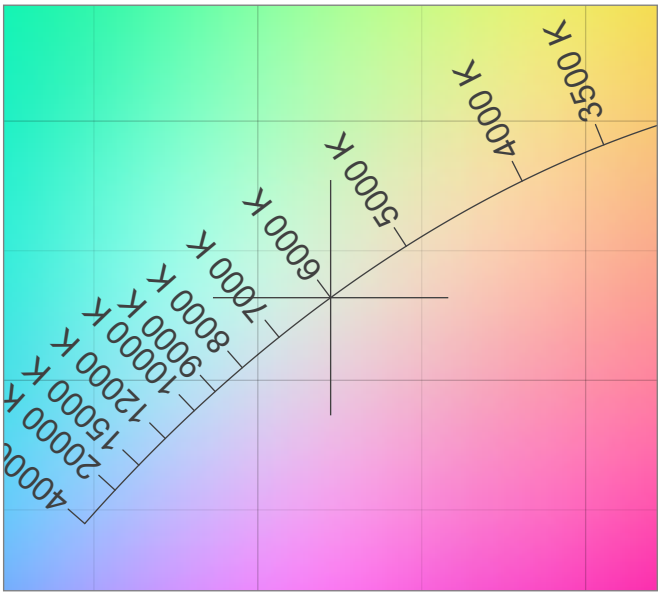
Color details

Correlated Color Temperature, Target	CCT = 6000 K
Correlated Color Temperature, Measured	CCT = 6165 K
Color Rendering Index	CRI 81,6
Color Rendering Index, R9 (red component)	R9 = -5,6
Color Rendering TM30-18	R_f 82,5 – R_g 92,8
Color Quality Scale	CQS = 80,2
MacAdam Steps	SDCM = 10,7
Color coordinates CIE 1931	(x;y) = (0,322;0,332)
Color coordinate CIEs 1960	(u;v) = (0,203;0,314)
Color deviation from BBL	Duv = 0,0043
Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0,203;0,471)

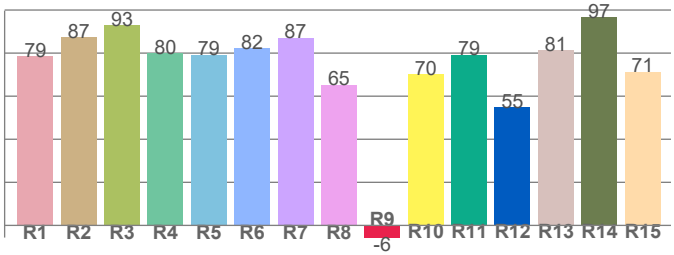
CIE 1931



CIE 1931 – zoomed on Planckian locus



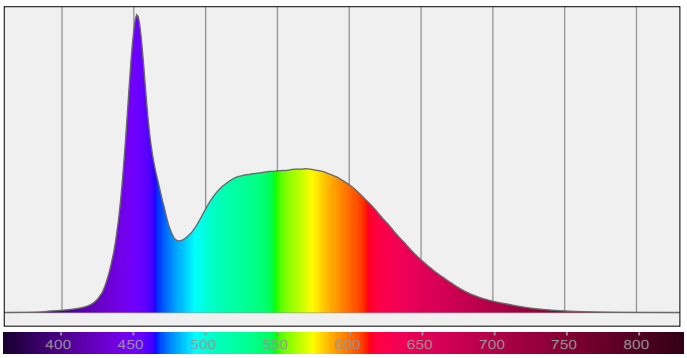
Color Rendering Index per reference color (CIE 1995)



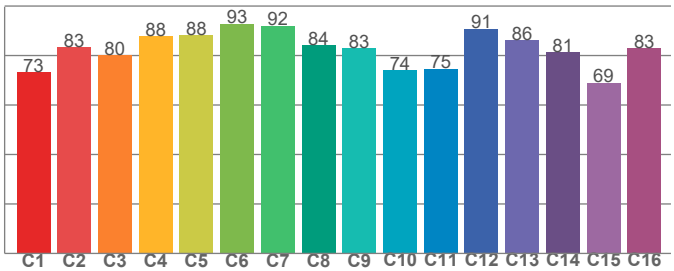
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
78,6	87,3	93,0	80,0	79,3	82,3	87,2	65,2	-5,6	70,2	79,3	54,7	81,2	96,5	71,3

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



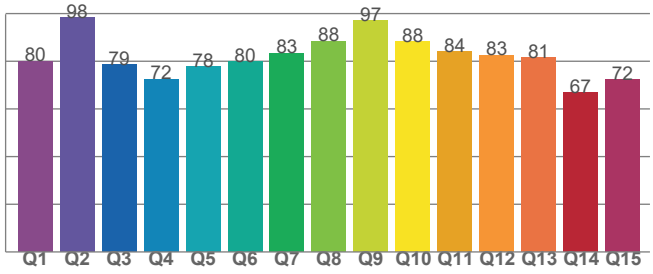
TM30-18 Rf-values per hue bin



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
73,1	83,4	80,2	87,7	88,2	92,8	92,0	84,1	83,0	74,0	74,7	90,9	86,2	81,2	69,0	83,0

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
80,1	98,3	78,6	72,5	77,7	79,8	83,4	88,4	97,1	88,1	84,0	82,5	81,5	66,8	72,3

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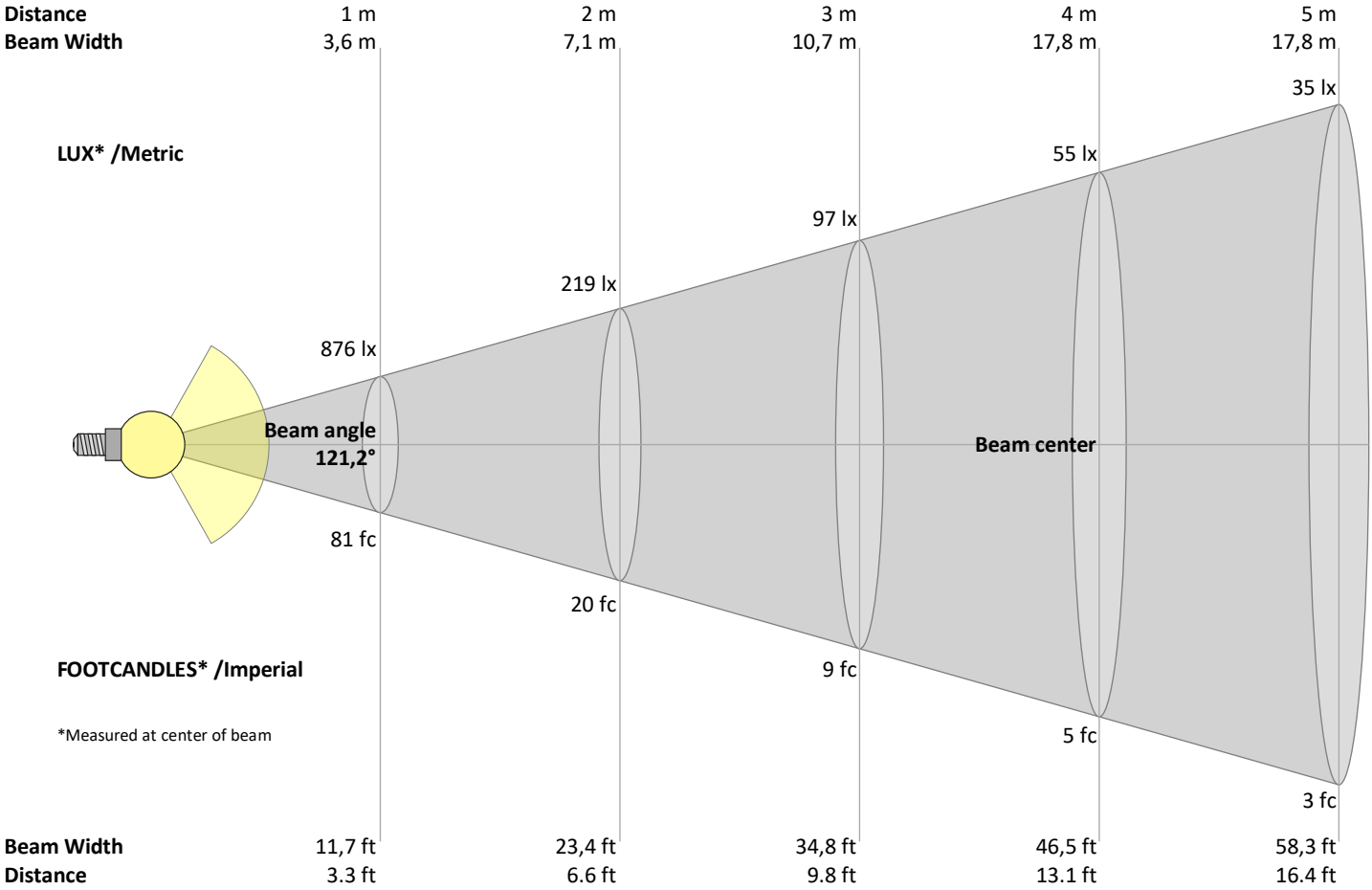
Beam Details



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
876	219	97	55	35	24	18	14	11	9	7	6	5	4	4	3	3	3	2	2	lux
81,4	20,3	9	5,1	3,3	2,3	1,7	1,3	1	0,8	0,7	0,6	0,5	0,4	0,4	0,3	0,3	0,3	0,2	0,2	fc

Intensities in 0° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
876	865	829	772	698	609	512	411	313	224	155	107	73	49	32	20	13	9	7	6	cd
100%	99%	95%	88%	80%	70%	58%	47%	36%	26%	18%	12%	8%	6%	4%	2%	1%	1%	1%	1%	of 0°val

Intensities in 90° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
876	865	829	772	698	609	512	411	313	224	155	107	73	49	32	20	13	9	7	6	cd
100%	99%	95%	88%	80%	70%	58%	47%	36%	26%	18%	12%	8%	6%	4%	2%	1%	1%	1%	1%	of 0°val

Intensities in 180° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
876	865	829	772	698	609	512	411	313	224	155	107	73	49	32	20	13	9	7	6	cd
100%	99%	95%	88%	80%	70%	58%	47%	36%	26%	18%	12%	8%	6%	4%	2%	1%	1%	1%	1%	of 0°val

Intensities in 270° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
876	865	829	772	698	609	512	411	313	224	155	107	73	49	32	20	13	9	7	6	cd
100%	99%	95%	88%	80%	70%	58%	47%	36%	26%	18%	12%	8%	6%	4%	2%	1%	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	22,2	23,4	22,6	23,9	24,4	21,3	22,5	21,7	23,0	23,4
	3H	24,2	25,4	24,8	25,9	26,3	22,9	24,2	23,5	24,6	25,0
	4H	25,3	26,4	25,8	26,9	27,4	23,7	24,9	24,3	25,4	25,8
	6H	26,4	27,5	26,9	27,9	28,5	24,5	25,6	25,0	26,0	26,6
	8H	27,0	28,0	27,5	28,5	29,1	24,9	25,9	25,4	26,4	27,0
	12H	27,7	28,7	28,2	29,2	29,8	25,2	26,2	25,7	26,7	27,3
4H	2H	22,7	23,9	23,3	24,4	24,8	22,0	23,2	22,6	23,7	24,1
	3H	25,0	26,0	25,5	26,5	27,1	24,0	25,0	24,5	25,5	26,1
	4H	26,1	27,2	26,7	27,6	28,3	24,8	25,9	25,4	26,3	27,0
	6H	27,4	28,3	28,0	28,8	29,3	25,7	26,6	26,3	27,1	27,7
	8H	28,1	28,8	28,7	29,4	30,0	26,1	26,9	26,8	27,5	28,0
	12H	28,8	29,5	29,4	30,1	30,7	26,5	27,2	27,1	27,8	28,4
8H	4H	26,4	27,2	27,0	27,7	28,3	25,3	26,1	25,9	26,6	27,2
	6H	27,9	28,5	28,5	29,1	29,8	26,4	27,0	27,0	27,6	28,4
	8H	28,7	29,2	29,3	29,9	30,7	26,9	27,5	27,6	28,2	29,0
	12H	29,6	30,1	30,3	30,7	31,5	27,5	27,9	28,2	28,6	29,4
12H	4H	26,4	27,1	27,1	27,7	28,3	25,4	26,0	26,0	26,6	27,3
	6H	28,0	28,5	28,6	29,2	30,0	26,6	27,1	27,2	27,8	28,6
	8H	28,8	29,3	29,5	29,9	30,7	27,2	27,7	27,9	28,3	29,1

Variations with the observer position for the luminaire spacings, S:		
S = 1.0H	0,1 / 0,0	0,1 / -0,1
S = 1.5H	0,1 / -0,1	0,1 / -0,1
S = 2.0H	0,3 / -0,3	0,2 / -0,3

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	117	117	117	117	113	113	113	113	105	105	105	99	99	99	92	92	92	90
1	104	98	93	89	100	95	90	86	89	85	81	83	80	77	78	75	73	70
2	94	84	77	70	90	82	75	69	76	71	66	71	67	62	67	63	60	57
3	85	74	65	58	82	71	63	56	67	60	54	62	57	52	58	54	50	47
4	78	65	55	48	74	63	54	47	59	51	46	55	49	44	52	47	42	40
5	71	58	48	41	68	56	47	41	53	45	39	49	43	38	47	41	36	34
6	66	52	42	36	63	50	41	35	47	40	34	45	38	33	42	36	32	29
7	61	47	38	31	58	45	37	31	43	35	30	41	34	29	38	33	28	26
8	56	43	34	28	54	41	33	27	39	32	27	37	31	26	35	29	25	23
9	53	39	31	25	51	38	30	25	36	29	24	34	28	23	32	27	23	21
10	49	36	28	22	48	35	27	22	33	26	22	32	25	21	30	25	20	19

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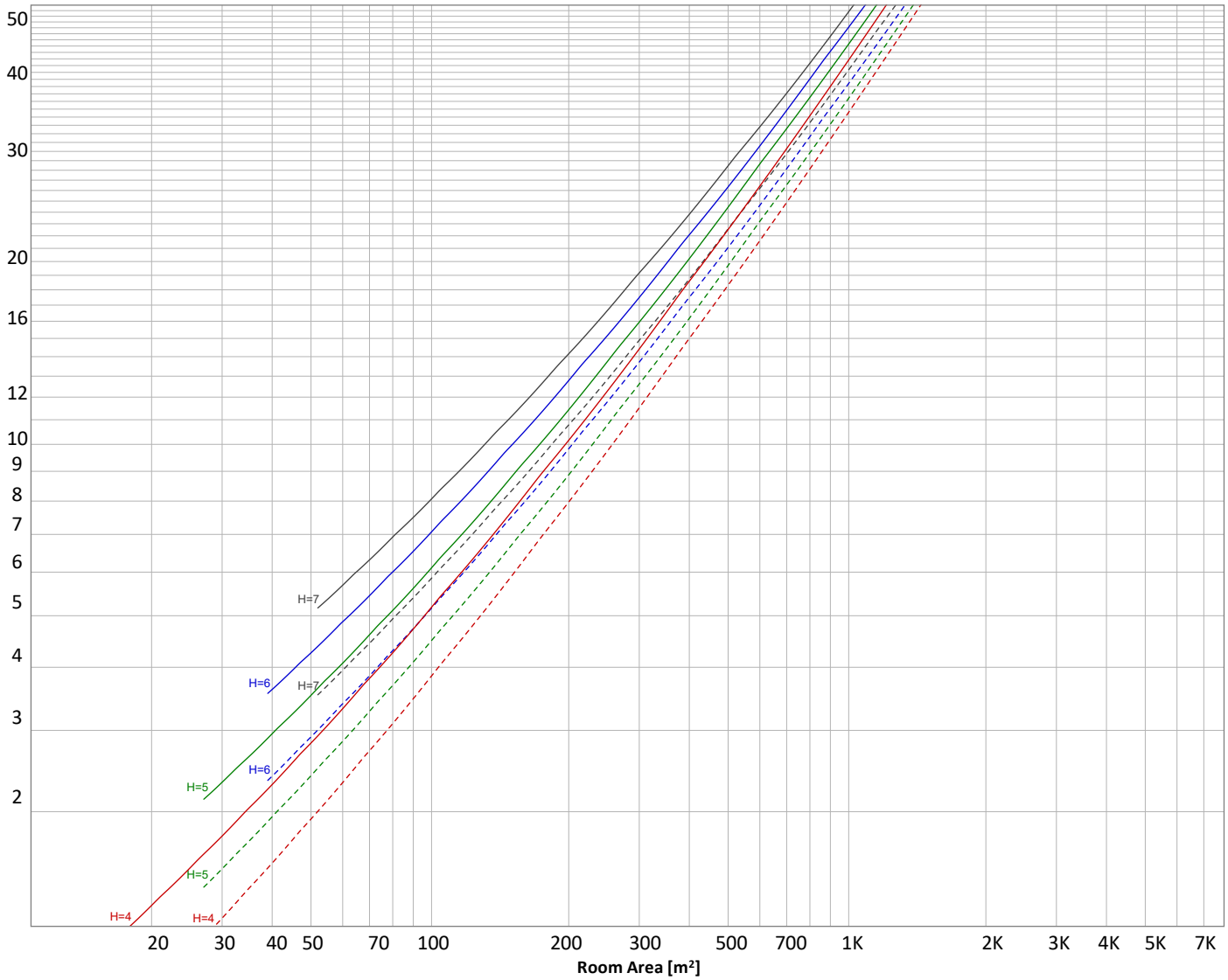
Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 3278 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°
83,0 lm	238 lm	363 lm	442 lm	470 lm	448 lm	385 lm	298 lm	209 lm

90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
138 lm	88,6 lm	53,6 lm	30,5 lm	16,1 lm	7,80 lm	3,94 lm	1,82 lm	0,583 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	83 lm	2,5%
10-20°	238 lm	7,3%
20-30°	363 lm	11,1%
30-40°	442 lm	13,5%
40-50°	470 lm	14,3%
50-60°	448 lm	13,7%
60-70°	385 lm	11,8%
70-80°	298 lm	9,1%
80-90°	209 lm	6,4%
90-100°	138 lm	4,2%
100-110°	89 lm	2,7%
110-120°	54 lm	1,6%
120-130°	31 lm	0,9%
130-140°	16 lm	0,5%
140-150°	8 lm	0,2%
150-160°	4 lm	0,1%
160-170°	2 lm	0,1%
170-180°	1 lm	0,0%
Total	3278 lm	100,0%

Intensity peaks

Max intensity	876 cd
Intensity, 90°	155 cd
Intensity, 0°	876 cd

Zonal Lumen summary

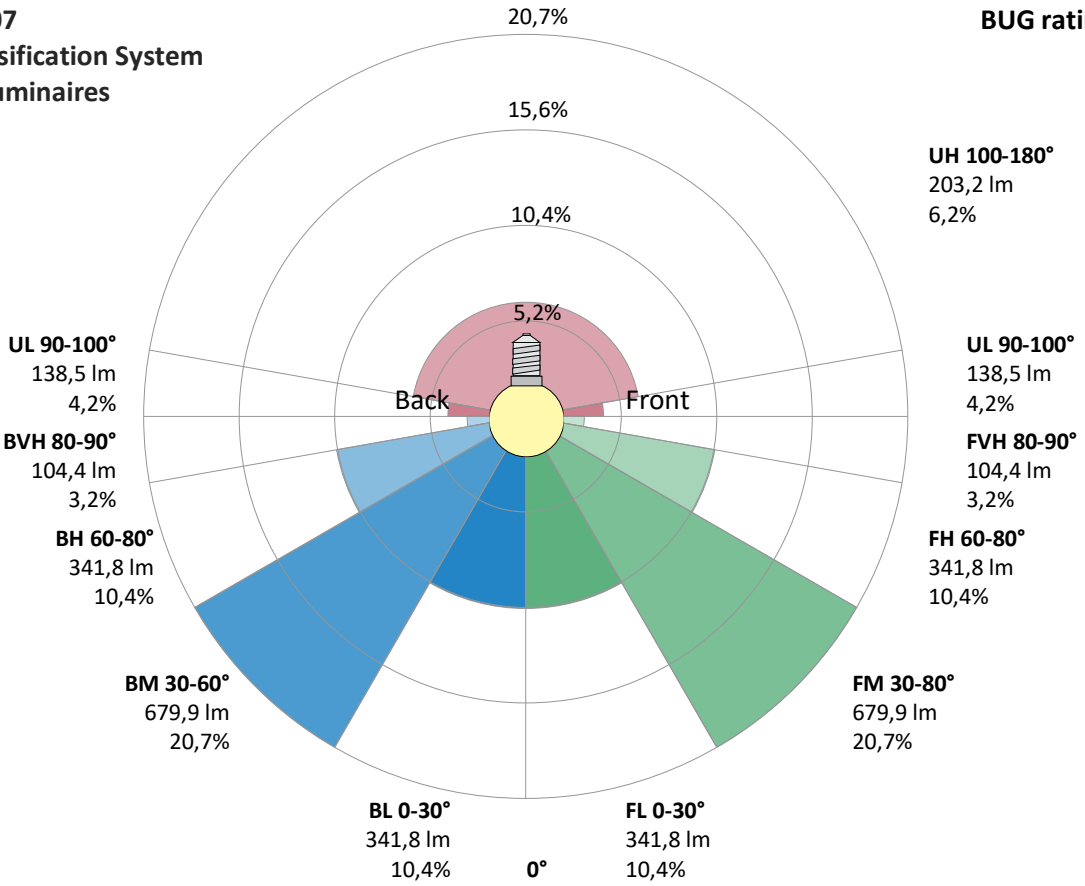
Zone (γ)	Lumen	% Total
0-30°	684 lm	20,9%
0-40°	1126 lm	34,4%
0-60°	2044 lm	62,4%
60-90°	892 lm	27,2%
70-100°	645 lm	19,7%
90-120°	281 lm	8,6%
0-90°	2936 lm	89,6%
90-180°	341 lm	10,4%
0-180°	3278 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	342 lm	10,4%
Medium(30-60°)	680 lm	20,7%
High(60-80°)	342 lm	10,4%
Very high(80-90°)	104 lm	3,2%
Back light		
Low(0-30°)	342 lm	10,4%
Medium(30-60°)	680 lm	20,7%
High(60-80°)	342 lm	10,4%
Very high(80-90°)	104 lm	3,2%
Uplight		
Low(90-100°)	138 lm	4,2%
High(100-180°)	203 lm	6,2%

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

BUG rating B1 U3 G2



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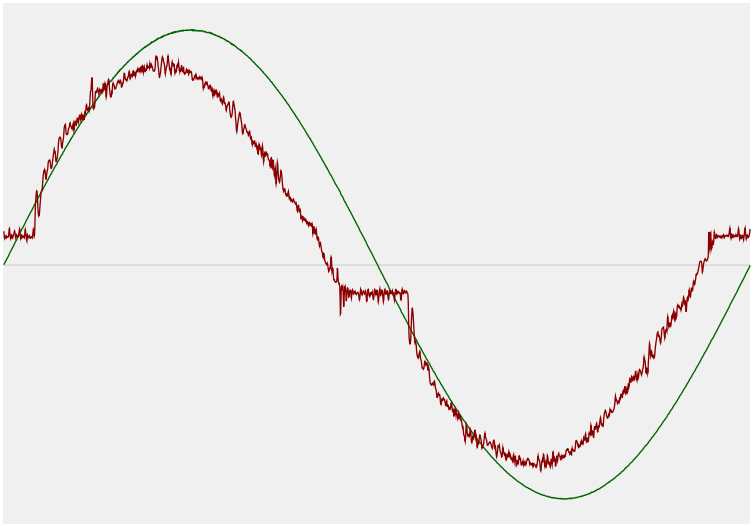
Power Details

Input Power

Power feed to light source	23,8 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,108 A
Volt-Ampere or apparent power = V_{RMS}*I_{RMS}	24,91 VA
Displacement factor of AC power feed	0,96
Power factor of AC current feed	0,95
Total harmonic distortion of the current	13,98%
Total harmonic distortion of the voltage	0,08%

Input Power Curve



Efficiency

Radiated power efficiency 42,9%

Lumen efficiency 138 lm/W

Stabilization Details

Warmup Conditions

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

Color Temperature Change

CCT start	5991 K
CCT shift	+9 K
CCT end	6000 K

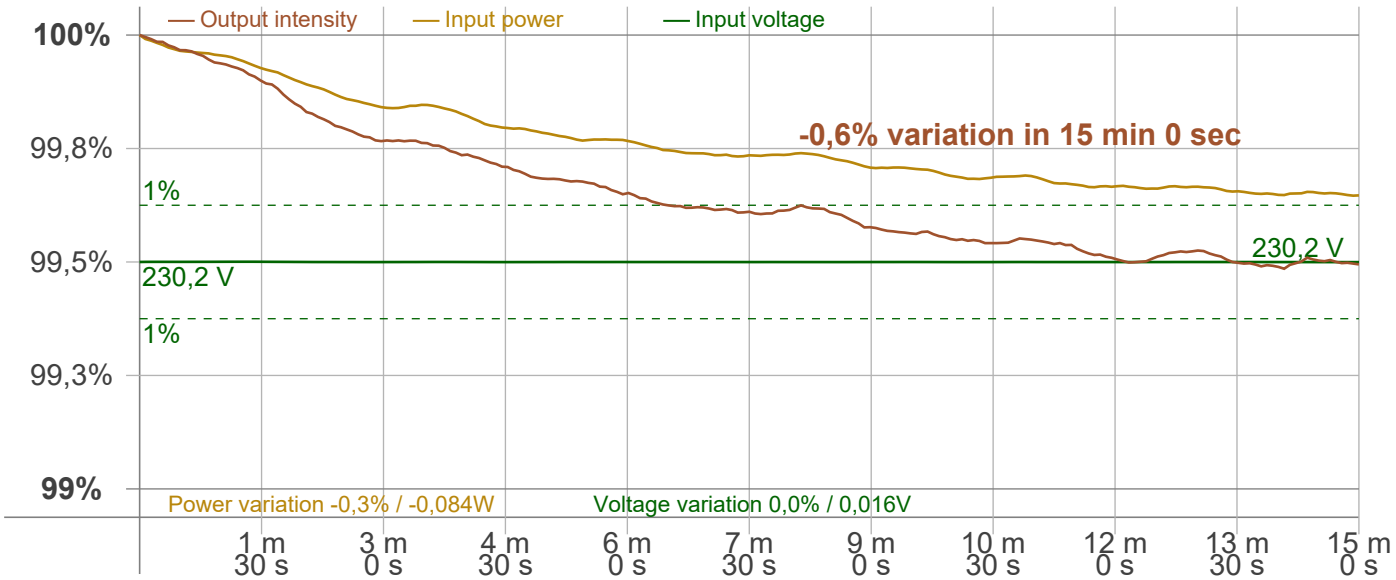
Warmup Result

Total warmup time	Lamp stabilized in 15 min 0 sec
Warmup variation	-0,6%

Output Change

Output start	3294 lm
Output change	-16 lm
Output end	3278 lm

Stabilization Curve



Light Measurement Report

Print date: 21-2-2025
Measurement date and time: 20-2-2025 17:10:38 – Measurement no. VFR-250220-0102-MS
Measurement tracking No. and Link: VT250220-007158
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 Hz
Percent Flicker	68,09 %
Flicker index	0,22

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

PstLM value (F < 80 Hz)	0,13
SVM value (80 < F < 2000 Hz)	2,68

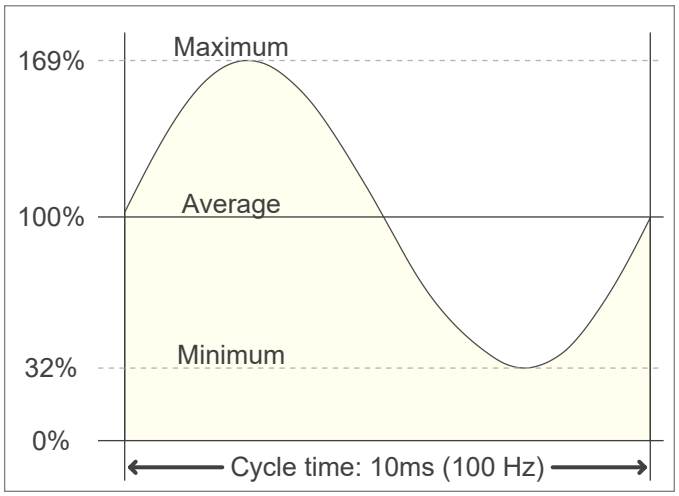
Flicker indices according to California Energy Commission (CEC) 2016b

JA8/10 40 Hz	0,19 %
JA8/10 90 Hz	0,51 %
JA8/10 200 Hz	68,46 %
JA8/10 400 Hz	67,71 %
JA8/10 1000 Hz	68,06 %

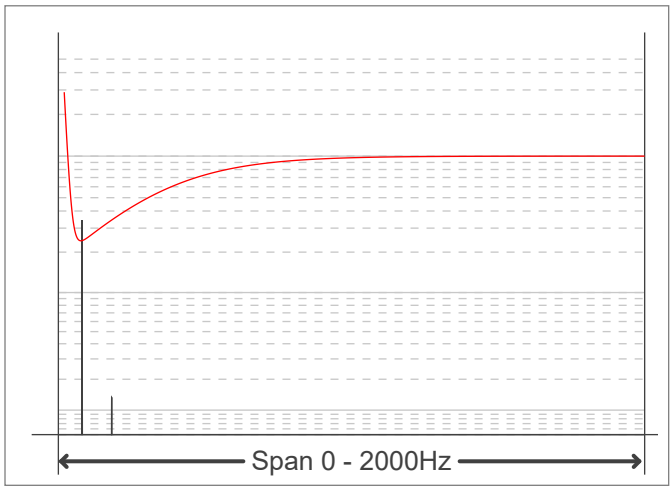
Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp	0,08

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot