Light Measurement Report

Print date: 14-8-2025
Measurement date and time: 14-8-2025 10:56:41 – Measurement no. VFR-250814-2547-MS
Measurement tracking No. and Link: VT250814-009733
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

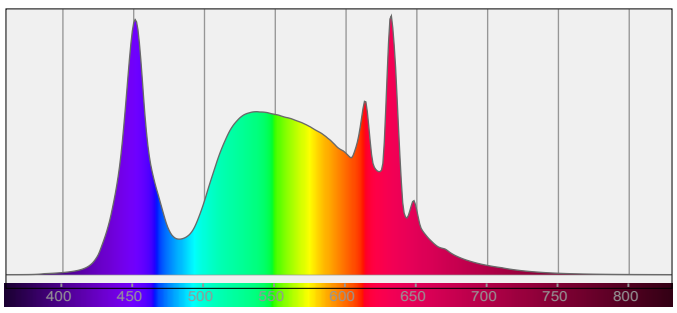
Number of C-planes and Resolution	36 planes – 10°
γ (gamma)-Resolution	2,5°
Test Distance	1,99 m
Input Power, Power and Displ. Factors	15,5 W – PF 0,96 – DPF 0,96
Input RMS Voltage and Current	230 V – 0,071 A
Frequency of Input Power	50 Hz
Warm-up Time and Variation	Lamp stabilized in 15 min 1 sec – 2,0%

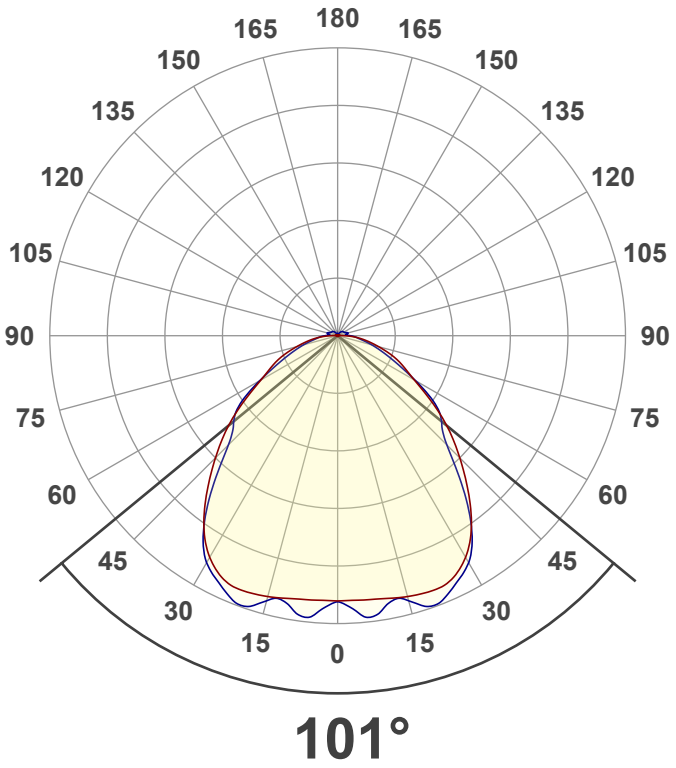
Tested Light Source

Product Name	812959-5000K-16W
Item No. and Manufacturer	812959-5000K-16W – Dutchfulfillment
Product Description (line 1)	3-FASE RAILARMATUUR | TARVOS | 60CM | 12W/16W/20W/24W |
ZWART | CCT SWITCH	

Main Light Measurement Results

Output – Total Lumen (Up% / Down%)	1721 lm – 3,87% / 96,13%
Efficiency	111 lm/W
Peak Intensity and Beam Angle	644 cd – 101°
Correlated Color Temperature, Target/Measured	CCT = 5000 K / 4907 K
Color Rendering Index	CRI 82,4
Color Rendering TM30-18	R_f 83,0 – R_g 99,1
Color Shift, CIE duv and MacAdam Steps	Duv 0,0079 – SDCM 8,0
Flicker	SVM 0 – PstLM 0,01

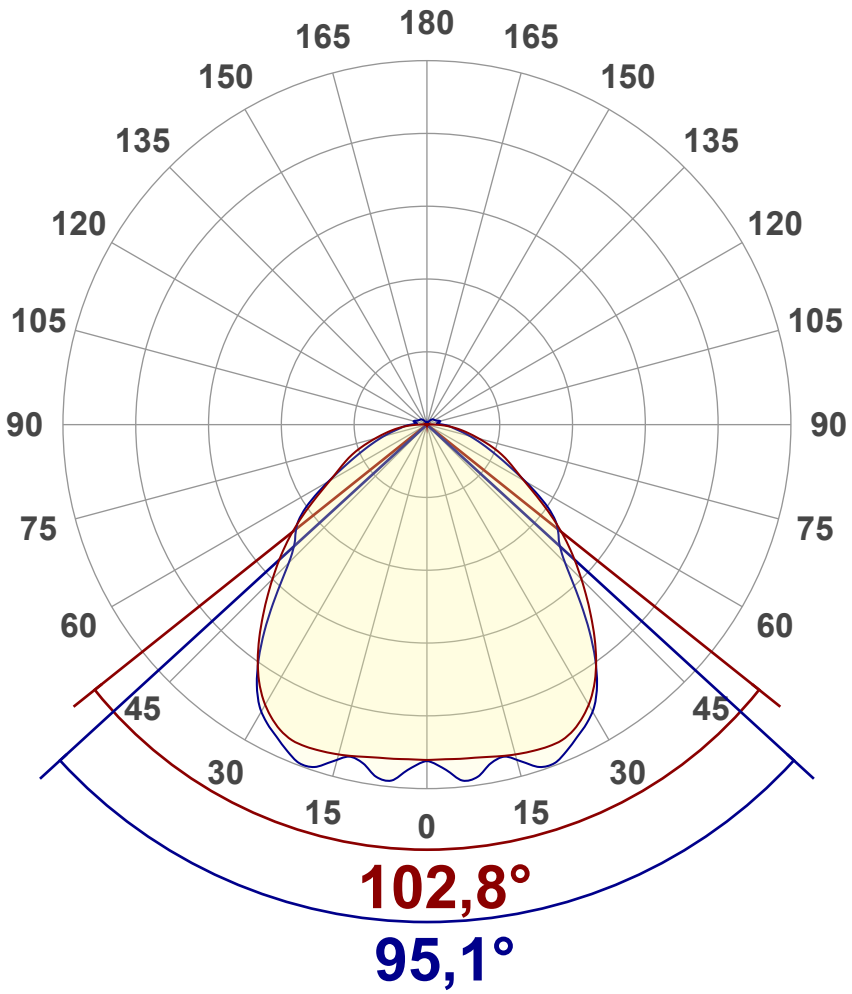




Light Measurement Report

Print date: 14-8-2025
Measurement date and time: 14-8-2025 10:56:41 – Measurement no. VFR-250814-2547-MS
Measurement tracking No. and Link: VT250814-009733
Operator:

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



Main Values

Output (total Lumen)	1721 lm
Lumen Up% / Down%	3,87% / 96,13%
Peak Intensity	644 cd
Beam Angle (50%)	101°
Beam Angle (90%)	95,1°
Beam Angle (10%)	103,1°

Cut-off Angle

Average 2,5%	217,4°

Field Angle

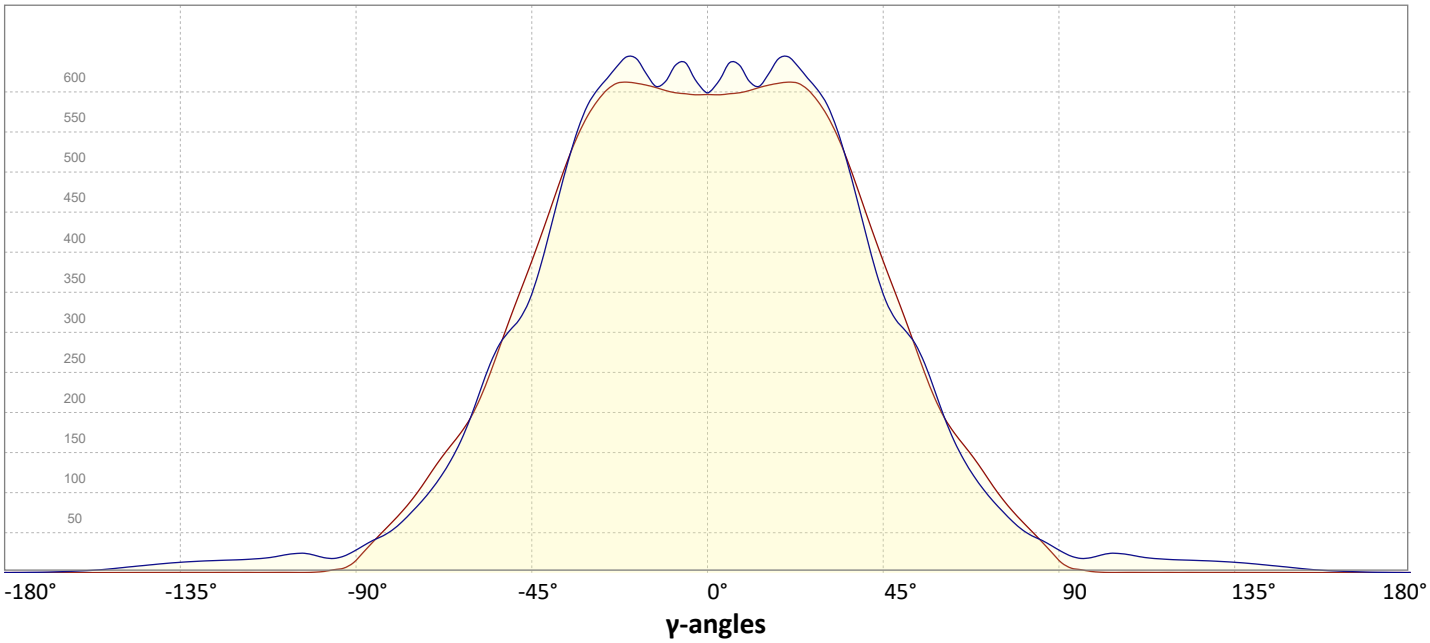
Average 10%	158,5°

Intensity Ratio

In 120° cone	78,5%
In 90° cone	56,4%

C000-C180
C090-C270

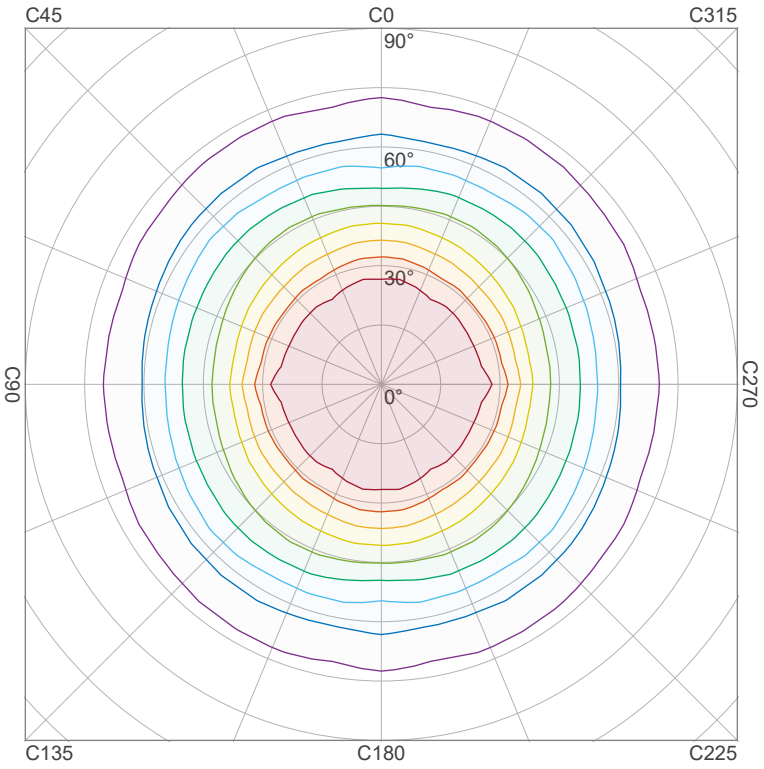
Linear distribution diagram - Intensity (candela) vs γ-angle



Light Measurement Report

Print date: 14-8-2025
Measurement date and time: 14-8-2025 10:56:41 – Measurement no. VFR-250814-2547-MS
Measurement tracking No. and Link: VT250814-009733
Operator:

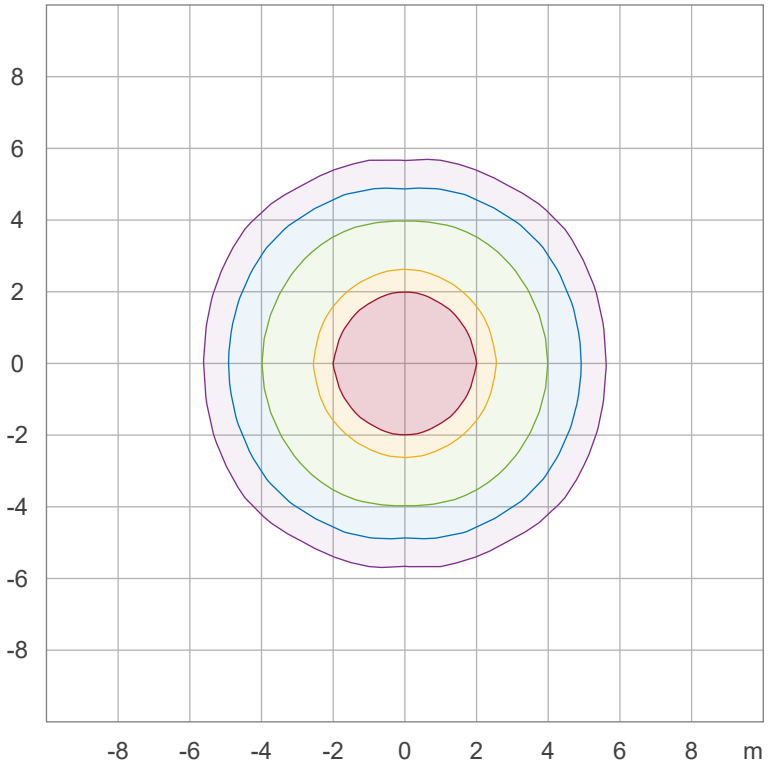
Iso-intensity Diagram (Iso-candela)



90 %	578,8 cd
80 %	514,5 cd
70 %	450,2 cd
60 %	385,9 cd
50 %	321,6 cd
40 %	257,2 cd
30 %	192,9 cd
20 %	128,6 cd
10 %	64,3 cd

Peak intensity: 643,1 cd
Number of c-planes: 36

Iso-illuminance Diagram (Iso-lux)



50,0 %	34,8 lx
30,0 %	20,9 lx
10,0 %	7,0 lx
5,0 %	3,5 lx
3,0 %	2,1 lx

Peak illuminance: 69,5 lx
Mounting height: 3,0 m
Number of c-planes: 36

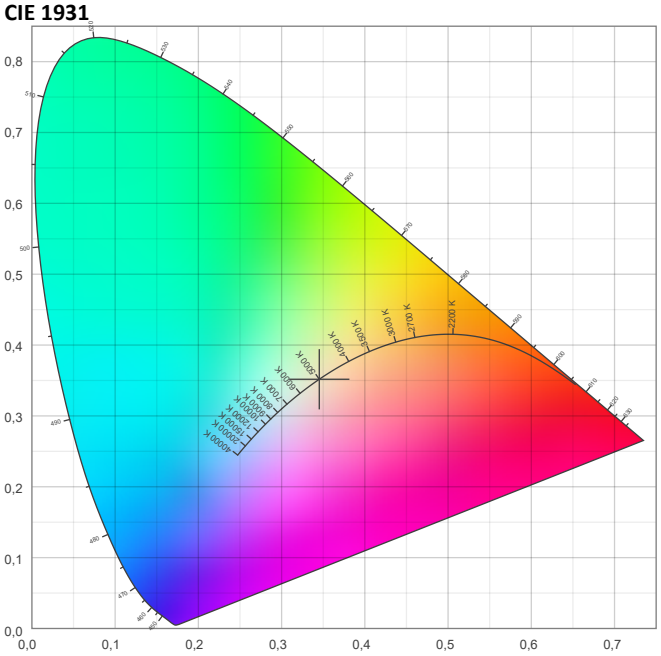
Light Measurement Report

Print date: 14-8-2025
Measurement date and time: 14-8-2025 10:56:41 – Measurement no. VFR-250814-2547-MS
Measurement tracking No. and Link: VT250814-009733
Operator:

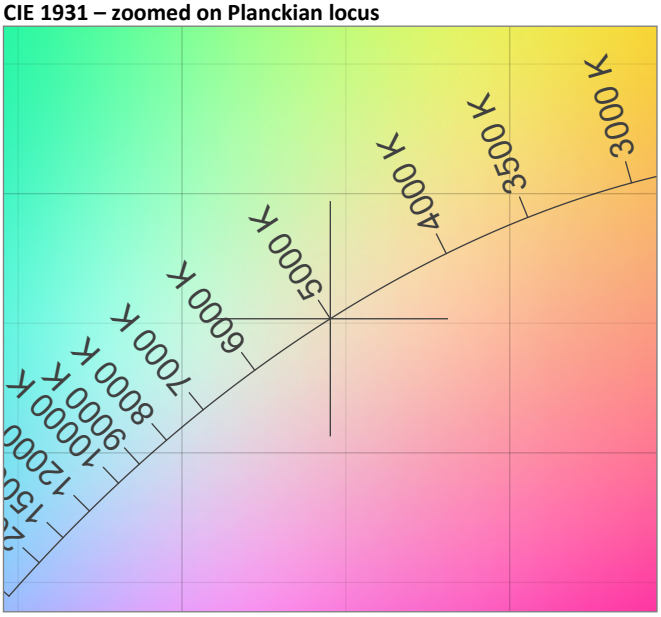
Color details

Correlated Color Temperature, Target	CCT = 5000 K
Correlated Color Temperature, Measured	CCT = 4907 K
Color Rendering Index	CRI 82,4
Color Rendering Index, R9 (red component)	R9 = 36,0
Color Rendering TM30-18	R_f 83,0 – R_g 99,1
Color Quality Scale	CQS = 83,9
MacAdam Steps	SDCM = 8,0
Color coordinates CIE 1931	(x;y) = (0,345;0,352)
Color coordinate CIEs 1960	(u;v) = (0,211;0,323)
Color deviation from BBL	Duv = 0,0079
Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0,211;0,485)

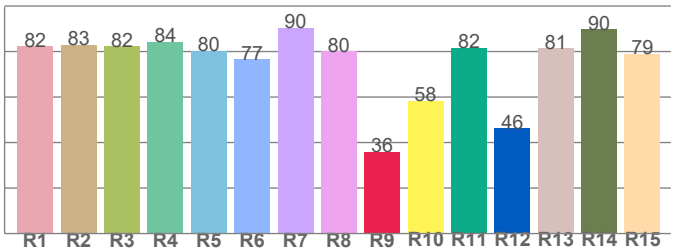
CIE 1931



CIE 1931 – zoomed on Planckian locus



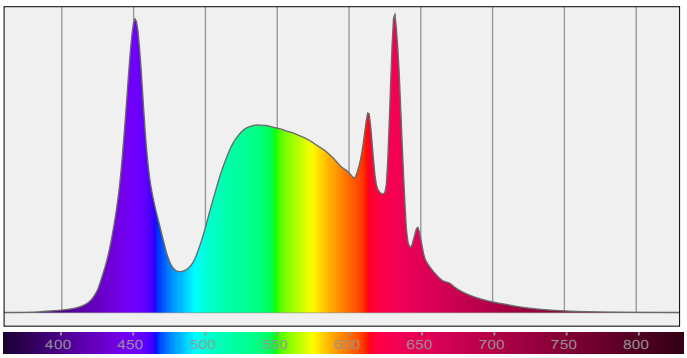
Color Rendering Index per reference color (CIE 1995)



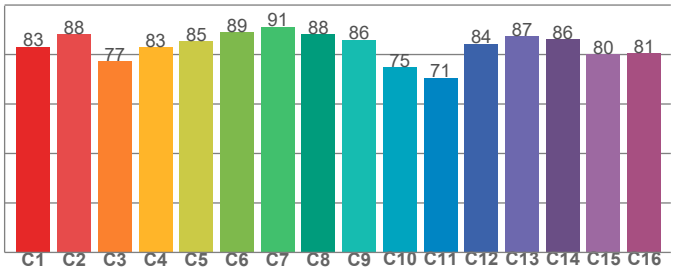
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
82,3	83,0	82,4	84,3	80,4	76,6	90,4	80,0	36,0	58,4	81,7	46,2	81,4	89,7	79,1

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



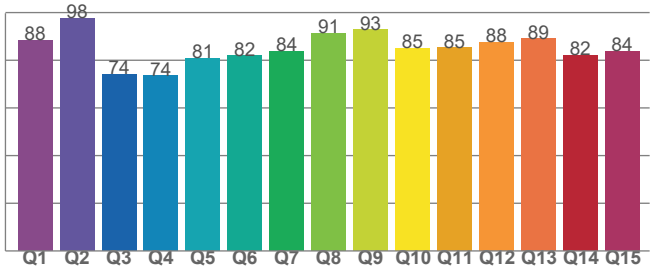
TM30-18 Rf-values per hue bin



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
83,1	88,3	77,4	82,9	85,4	88,9	91,3	88,2	86,0	74,9	70,6	84,4	87,3	86,1	80,1	80,6

Color Quality Scale by reference color



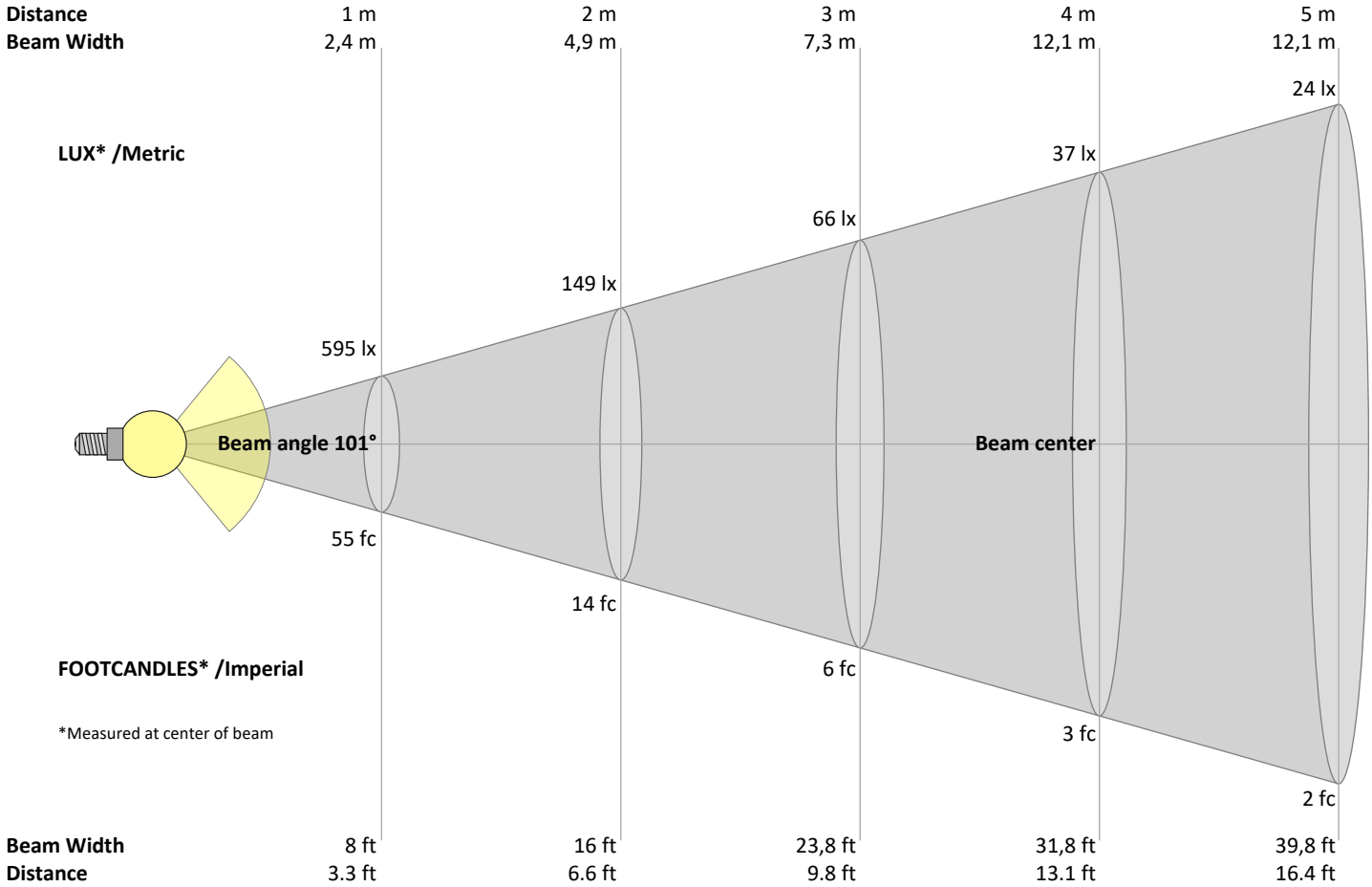
CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
88,3	97,7	74,2	73,6	80,9	82,0	83,9	91,3	92,8	85,0	85,3	87,6	89,0	82,0	83,8

Light Measurement Report

Print date: 14-8-2025
Measurement date and time: 14-8-2025 10:56:41 – Measurement no. VFR-250814-2547-MS
Measurement tracking No. and Link: VT250814-009733
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
595	149	66	37	24	17	12	9	7	6	5	4	4	3	3	2	2	2	2	1	lux
55,3	13,8	6,1	3,5	2,2	1,5	1,1	0,9	0,7	0,6	0,5	0,4	0,3	0,3	0,2	0,2	0,2	0,2	0,2	0,1	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
595	597	601	608	612	605	575	524	457	389	325	258	200	163	131	96	67	42	16	4	cd
100%	100%	101%	102%	103%	102%	97%	88%	77%	65%	55%	43%	34%	27%	22%	16%	11%	7%	3%	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
595	631	619	618	643	621	589	524	433	349	306	267	203	147	109	80	56	42	28	19	cd
100%	106%	104%	104%	108%	104%	99%	88%	73%	59%	51%	45%	34%	25%	18%	13%	9%	7%	5%	3%	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
595	597	601	608	612	605	575	524	457	389	325	258	200	163	131	96	67	42	16	4	cd
100%	100%	101%	102%	103%	102%	97%	88%	77%	65%	55%	43%	34%	27%	22%	16%	11%	7%	3%	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
595	631	619	618	643	621	589	524	433	349	306	267	203	147	109	80	56	42	28	19	cd
100%	106%	104%	104%	108%	104%	99%	88%	73%	59%	51%	45%	34%	25%	18%	13%	9%	7%	5%	3%	of 0°val

Light Measurement Report

Print date: 14-8-2025
Measurement date and time: 14-8-2025 10:56:41 – Measurement no. VFR-250814-2547-MS
Measurement tracking No. and Link: VT250814-009733
Operator:

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	22,0	23,2	22,3	23,5	23,8	22,1	23,3	22,4	23,6	23,9
	3H	23,0	24,2	23,5	24,5	24,8	23,1	24,3	23,6	24,6	24,9
	4H	23,5	24,6	23,9	24,9	25,3	23,6	24,7	24,0	25,0	25,3
	6H	23,9	24,9	24,3	25,2	25,7	24,0	25,0	24,4	25,4	25,8
	8H	24,1	25,0	24,5	25,4	25,9	24,2	25,2	24,6	25,6	26,0
	12H	24,2	25,1	24,6	25,5	26,0	24,5	25,4	24,9	25,8	26,3
4H	2H	22,5	23,6	23,0	24,0	24,3	22,6	23,7	23,1	24,0	24,4
	3H	23,8	24,8	24,3	25,2	25,7	23,9	24,8	24,3	25,2	25,7
	4H	24,3	25,2	24,8	25,7	26,3	24,4	25,2	24,9	25,7	26,3
	6H	24,8	25,6	25,4	26,1	26,5	24,9	25,7	25,4	26,1	26,5
	8H	25,0	25,8	25,6	26,2	26,7	25,2	25,9	25,7	26,3	26,8
	12H	25,2	25,8	25,8	26,3	26,9	25,5	26,1	26,0	26,6	27,1
8H	4H	24,6	25,3	25,1	25,7	26,2	24,6	25,3	25,1	25,7	26,2
	6H	25,2	25,8	25,8	26,3	26,9	25,3	25,8	25,8	26,3	27,0
	8H	25,6	26,0	26,1	26,6	27,3	25,7	26,1	26,2	26,7	27,4
	12H	25,8	26,2	26,5	26,8	27,5	26,1	26,6	26,8	27,1	27,8
12H	4H	24,6	25,2	25,1	25,7	26,2	24,6	25,2	25,1	25,7	26,2
	6H	25,3	25,8	25,9	26,4	27,1	25,3	25,8	25,9	26,4	27,1
	8H	25,7	26,1	26,3	26,6	27,3	25,8	26,2	26,4	26,8	27,4

Variations with the observer position for the luminaire spacings, S:		
S = 1.0H	0,1 / -0,1	0,1 / -0,1
S = 1.5H	0,2 / -0,4	0,2 / -0,3
S = 2.0H	0,6 / -0,8	0,6 / -0,7

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	118	118	118	118	115	115	115	115	109	109	109	104	104	104	98	98	98	96
1	108	103	99	95	105	101	97	93	96	93	90	91	89	86	87	85	83	81
2	99	91	84	79	96	89	82	77	84	79	75	81	76	73	77	74	71	68
3	90	80	72	66	88	78	71	65	75	69	64	72	66	62	69	64	60	58
4	83	71	63	56	80	70	62	56	67	60	55	64	58	54	62	57	52	50
5	77	64	55	49	74	63	55	49	60	53	48	58	52	47	56	50	46	44
6	71	58	49	43	69	57	49	43	55	47	42	53	46	41	51	45	41	39
7	66	53	44	38	64	52	44	38	50	43	37	48	42	37	46	41	36	34
8	61	48	40	34	60	47	39	34	46	39	33	44	38	33	43	37	33	31
9	57	44	36	31	56	43	36	31	42	35	30	41	34	30	39	34	30	28
10	54	41	33	28	52	40	33	28	39	32	27	38	32	27	37	31	27	25

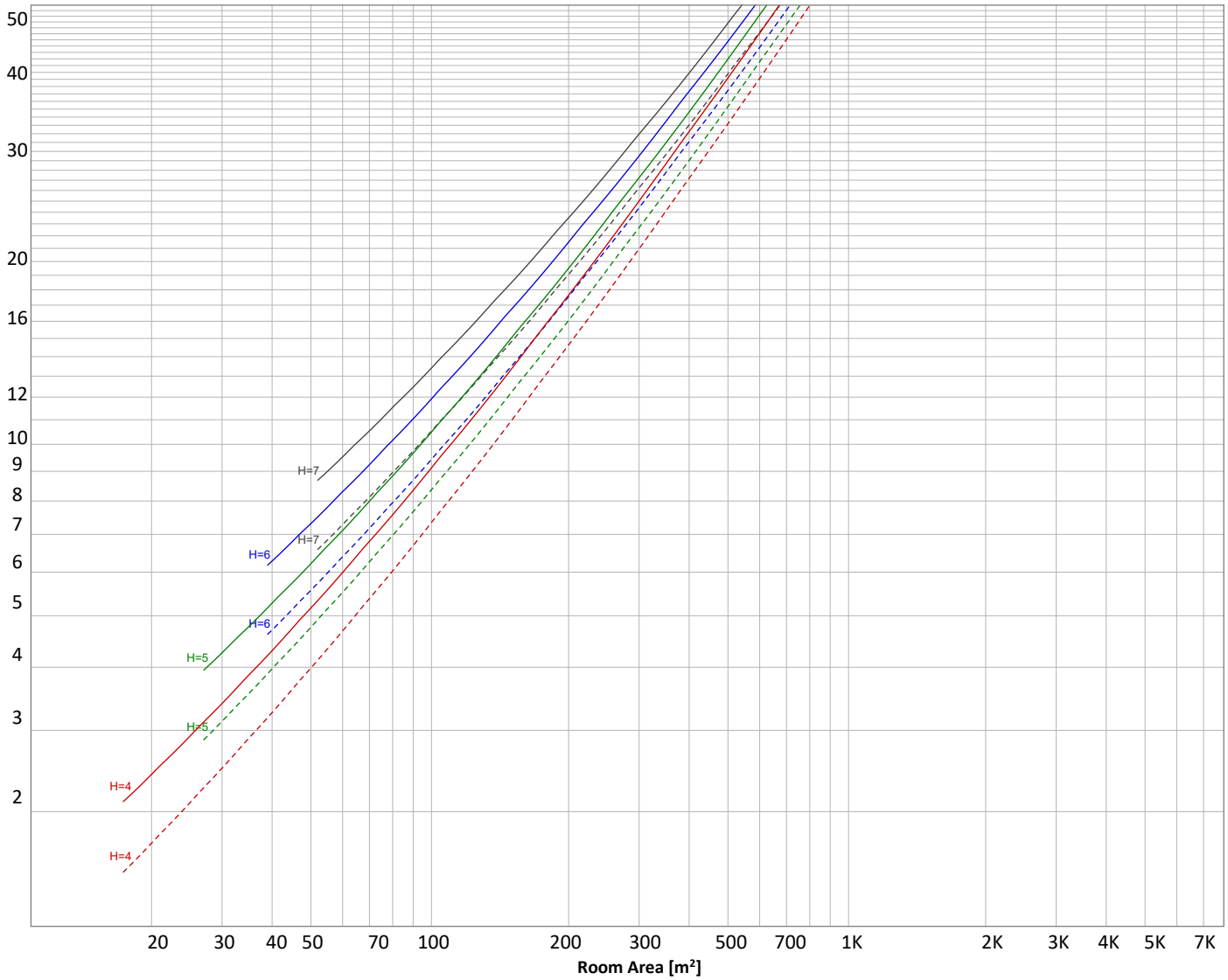
Light Measurement Report

Print date: 14-8-2025
Measurement date and time: 14-8-2025 10:56:41 – Measurement no. VFR-250814-2547-MS
Measurement tracking No. and Link: VT250814-009733
Operator:

Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 1721 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°
56,9 lm	172 lm	276 lm	317 lm	287 lm	243 lm	164 lm	93,0 lm	46,4 lm

90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
18,7 lm	17,1 lm	12,2 lm	8,85 lm	5,66 lm	2,79 lm	1,04 lm	0,258 lm	0,042 lm

Light Measurement Report

Print date: 14-8-2025
Measurement date and time: 14-8-2025 10:56:41 – Measurement no. VFR-250814-2547-MS
Measurement tracking No. and Link: VT250814-009733
Operator:

Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	57 lm	3,3%
10-20°	172 lm	10,0%
20-30°	276 lm	16,0%
30-40°	317 lm	18,4%
40-50°	287 lm	16,7%
50-60°	243 lm	14,1%
60-70°	164 lm	9,5%
70-80°	93 lm	5,4%
80-90°	46 lm	2,7%
90-100°	19 lm	1,1%
100-110°	17 lm	1,0%
110-120°	12 lm	0,7%
120-130°	9 lm	0,5%
130-140°	6 lm	0,3%
140-150°	3 lm	0,2%
150-160°	1 lm	0,1%
160-170°	0 lm	0,0%
170-180°	0 lm	0,0%
Total	1721 lm	100,0%

Intensity peaks

Max intensity	644 cd
Intensity, 90°	16 cd
Intensity, 0°	595 cd

Zonal Lumen summary

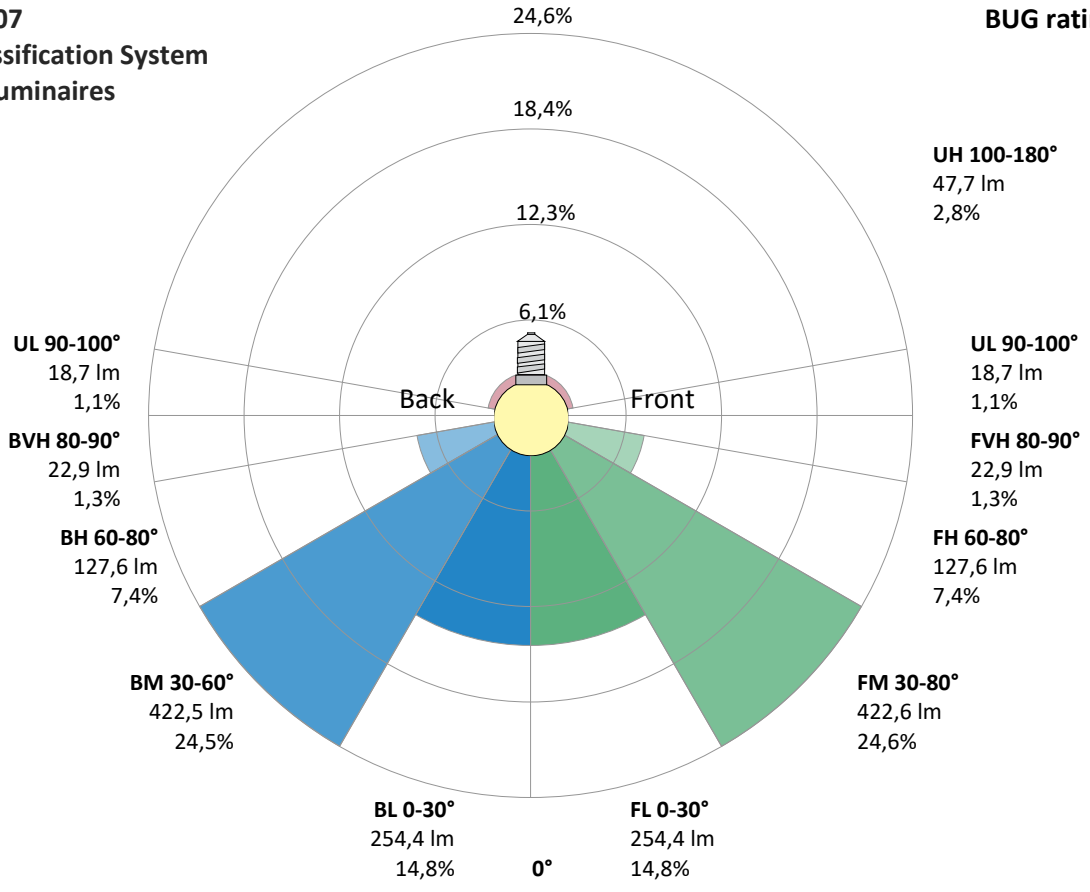
Zone (γ)	Lumen	% Total
0-30°	505 lm	29,3%
0-40°	822 lm	47,7%
0-60°	1351 lm	78,5%
60-90°	303 lm	17,6%
70-100°	158 lm	9,2%
90-120°	48 lm	2,8%
0-90°	1655 lm	96,1%
90-180°	67 lm	3,9%
0-180°	1721 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	254 lm	14,8%
Medium(30-60°)	423 lm	24,6%
High(60-80°)	128 lm	7,4%
Very high(80-90°)	23 lm	1,3%
Back light		
Low(0-30°)	254 lm	14,8%
Medium(30-60°)	423 lm	24,5%
High(60-80°)	128 lm	7,4%
Very high(80-90°)	23 lm	1,3%
Uplight		
Low(90-100°)	19 lm	1,1%
High(100-180°)	48 lm	2,8%

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

BUG rating B1 U2 G1



Light Measurement Report

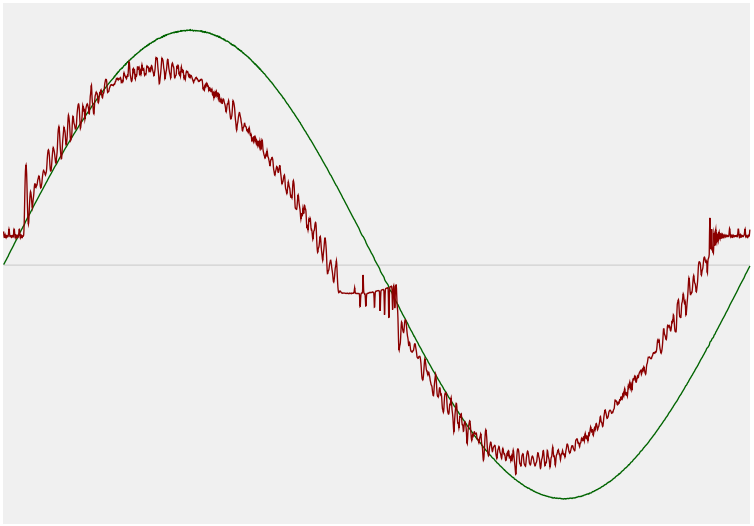
Print date: 14-8-2025
Measurement date and time: 14-8-2025 10:56:41 – Measurement no. VFR-250814-2547-MS
Measurement tracking No. and Link: VT250814-009733
Operator:

Power Details

Input Power

Power feed to light source	15,5 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,071 A
Volt-Ampere or apparent power = V_{RMS}*I_{RMS}	16,27 VA
Displacement factor of AC power feed	0,96
Power factor of AC current feed	0,96
Total harmonic distortion of the current	10,52%
Total harmonic distortion of the voltage	0,13%

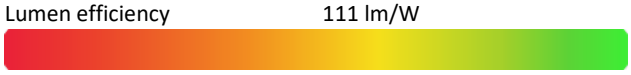
Input Power Curve



Efficiency

Radiated power efficiency 32,3%

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	4999 K
CCT shift	+1 K
CCT end	5000 K

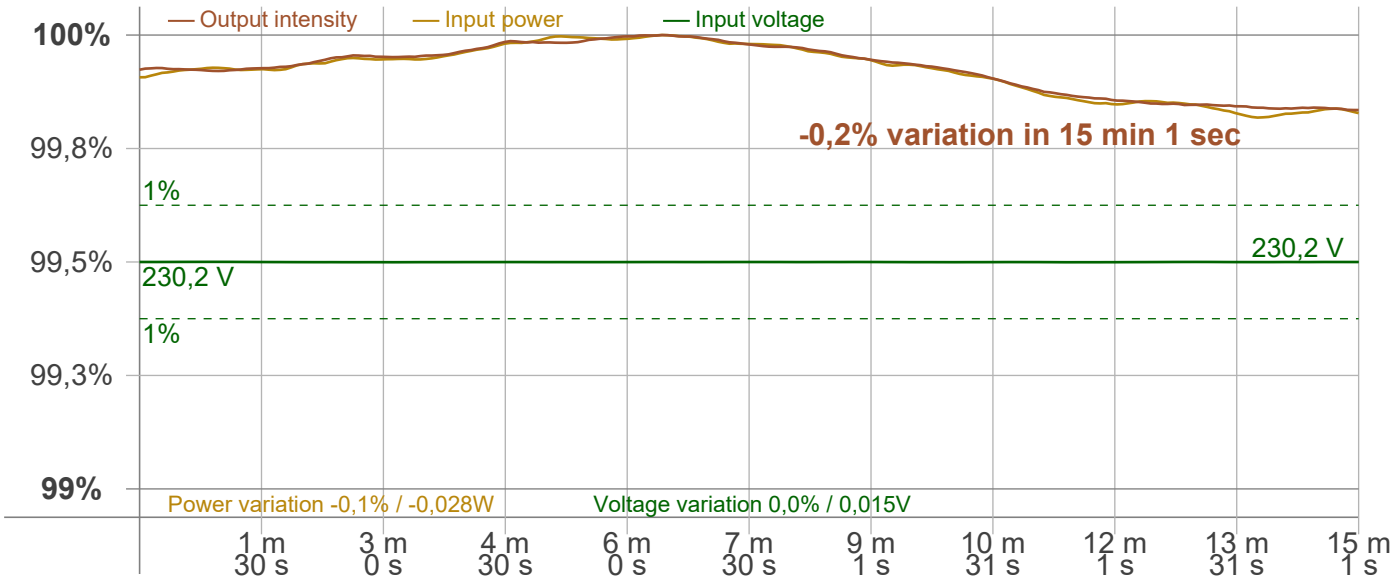
Warmup Result

Total warmup time	Lamp stabilized in 15 min 1 sec
Warmup variation	-0,2%

Output Change

Output start	1722 lm
Output change	-1 lm
Output end	1721 lm

Stabilization Curve



Light Measurement Report

Print date: 14-8-2025
Measurement date and time: 14-8-2025 10:56:41 – Measurement no. VFR-250814-2547-MS
Measurement tracking No. and Link: VT250814-009733
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	97,09 Hz
Percent Flicker	0,13 %
Flicker index	0

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

JA8/10 40 Hz	0,02 %
JA8/10 90 Hz	0,02 %
JA8/10 200 Hz	0,12 %
JA8/10 400 Hz	0,13 %
JA8/10 1000 Hz	0,13 %

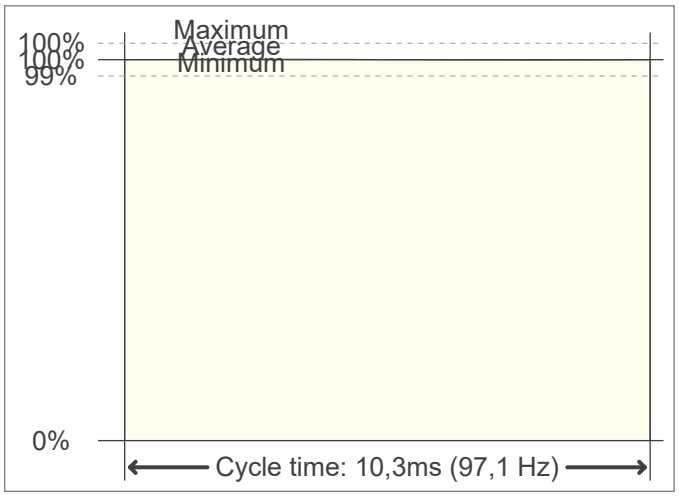
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

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

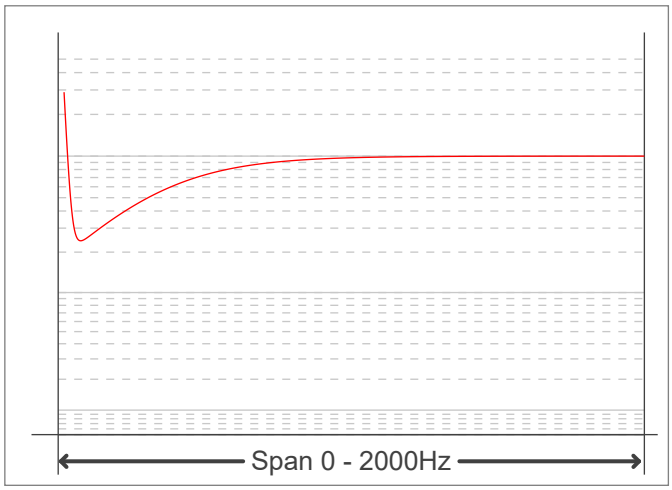
Flicker indices according to Lighting Research Center (2015)

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