

Light Measurement Report

Print date: 29-1-2025

Measurement date and time: 29-1-2025 10:32:39 – Measurement no. VFR-250129-3207-MS

Measurement tracking No. and Link: [VT250129-000839](#)

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

72 planes – 5°

5°

2,00 m

11,9 W – PF 0,87 – DPF 0,97

230 V – 0,060 A

50 Hz

Lamp stabilized in 23 min 24 sec – 2,0%

Tested Light Source

Product Name

Item No. and Manufacturer

Product Description (line 1)

ARA12D-2700K

ARA12D-2700K – Dutchfulfillment

LED | AR111 | GU10 | SPOT | 24° | DIMBAAR | 12W

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

1049 lm – 0,13% / 99,87%

88 lm/W

4273 cd – 15,4°

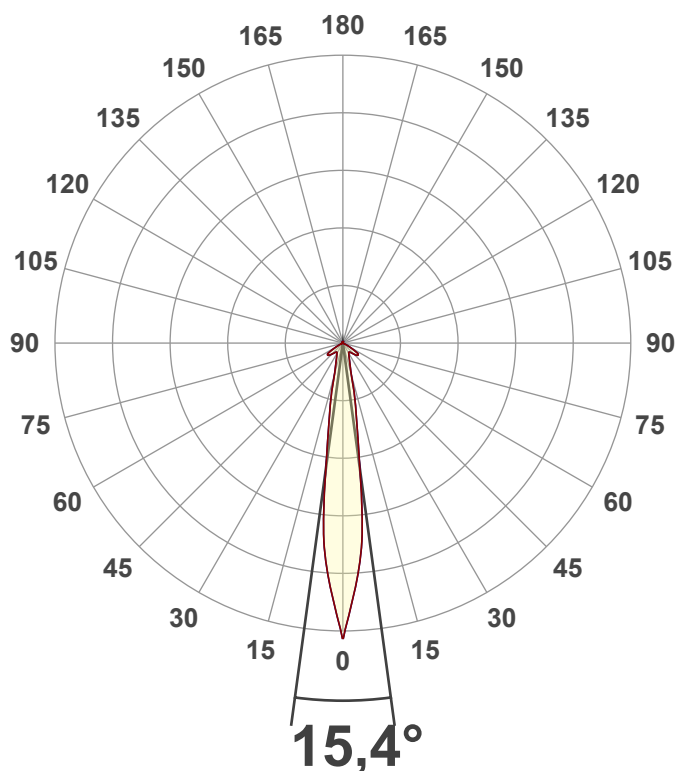
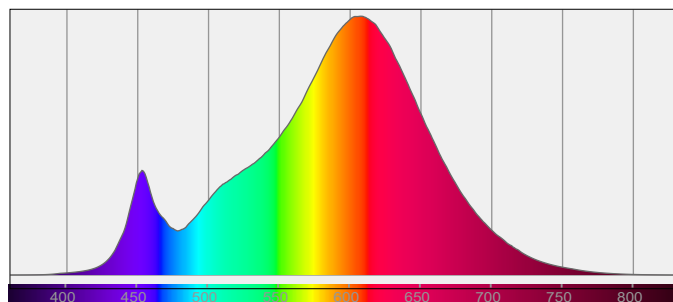
CCT = 2700 K / 2726 K

CRI 82,8

R_f 85,4 – R_g 96,0

Duv -0,0015 – SDCM 2,1

SVM 0,39 – PstLM 0,14



Light Measurement Report

Print date: 29-1-2025

Measurement date and time: 29-1-2025 10:32:39 – Measurement no. VFR-250129-3207-MS

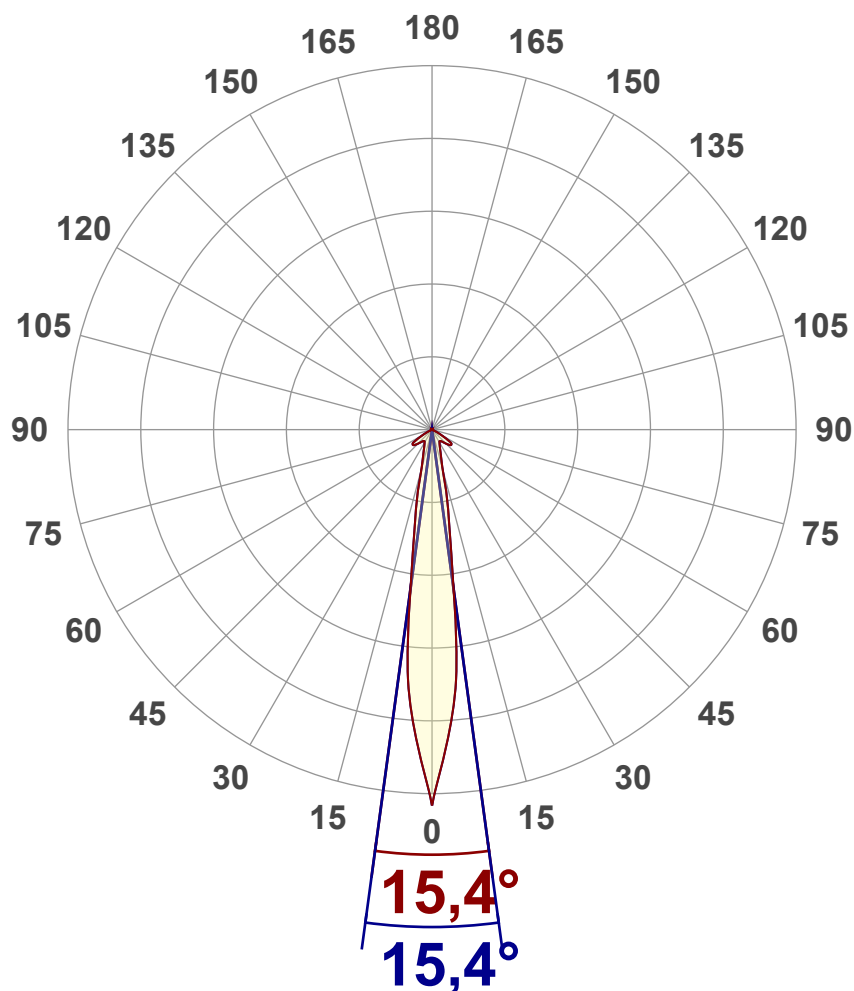
Measurement tracking No. and Link: [VT250129-000839](#)

Operator:



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	1049 lm
Lumen Up% / Down%	0,13% / 99,87%
Peak Intensity	4273 cd
Beam Angle (50%)	15,4°
Beam Angle (90%)	15,4°
Beam Angle (10%)	15,4°

Cut-off Angle

Average 2,5%	121,6°
--------------	--------

Field Angle

Average 10%	32,3°
-------------	-------

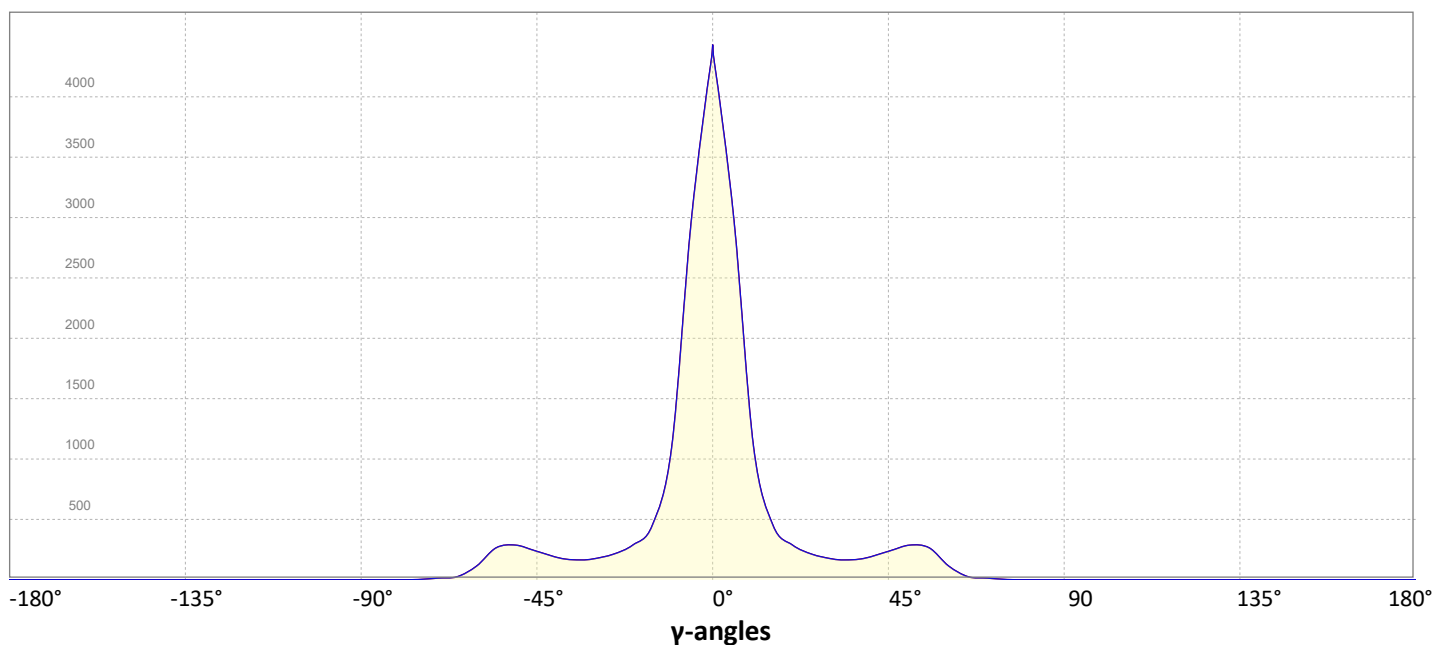
Intensity Ratio

In 120° cone	94,9%
In 90° cone	64,5%

C000-C180

C090-C270

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

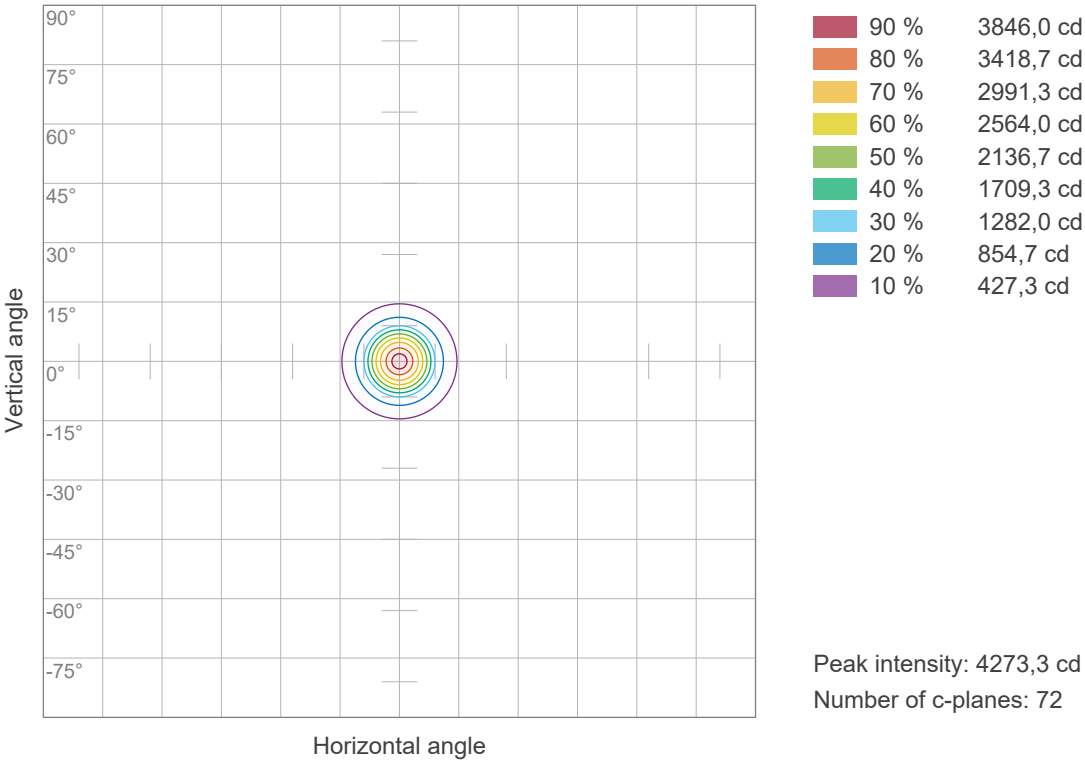


Light Measurement Report

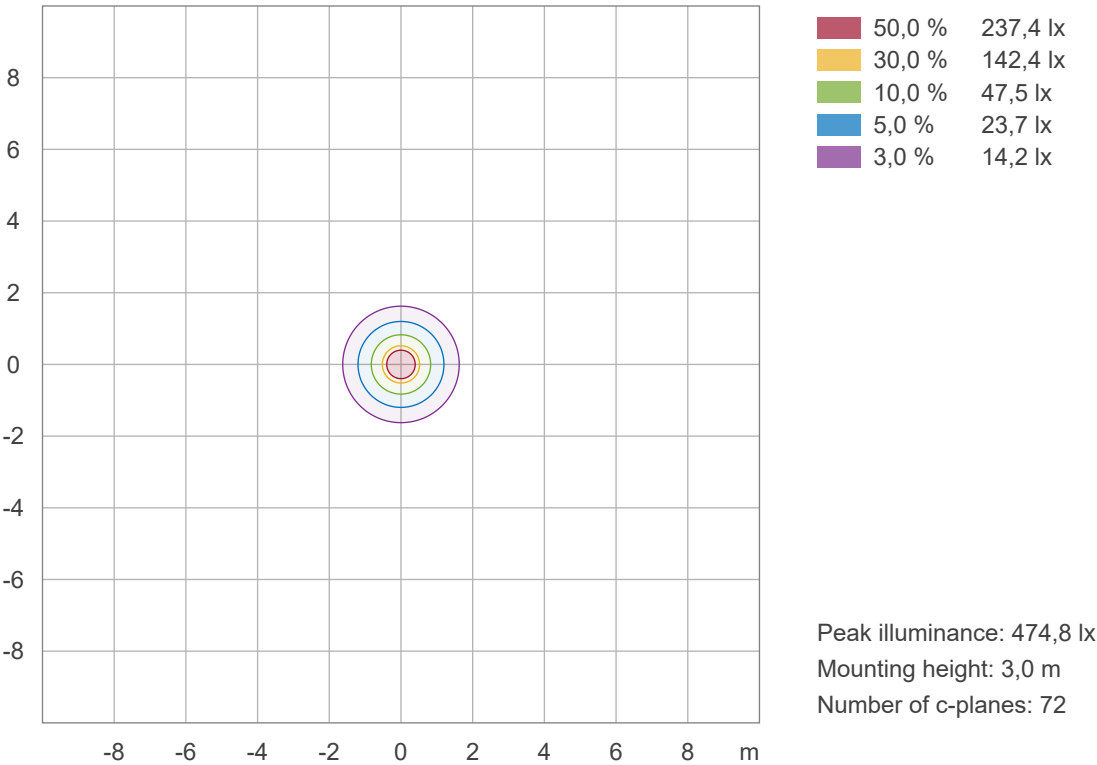
Print date: 29-1-2025
Measurement date and time: 29-1-2025 10:32:39 – Measurement no. VFR-250129-3207-MS
Measurement tracking No. and Link: [VT250129-000839](#)
Operator:



Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



Light Measurement Report

Print date: 29-1-2025

Measurement date and time: 29-1-2025 10:32:39 – Measurement no. VFR-250129-3207-MS

Measurement tracking No. and Link: [VT250129-000839](https://vfr-250129-000839)

Operator:

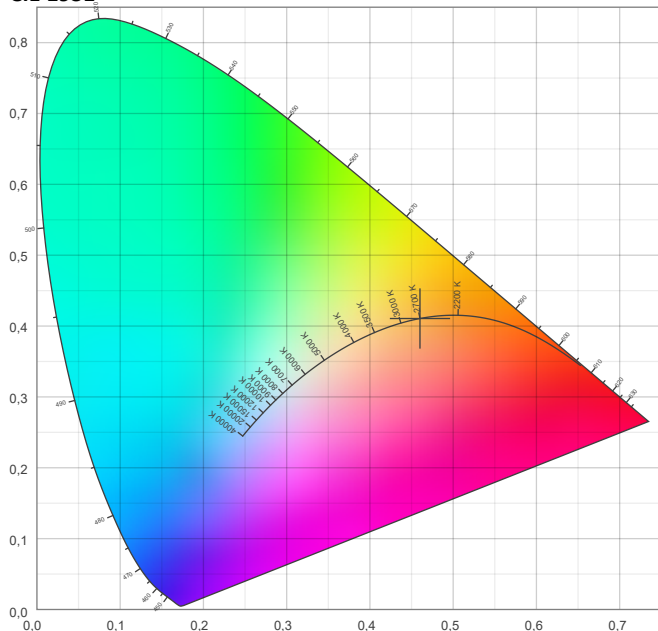


Color details

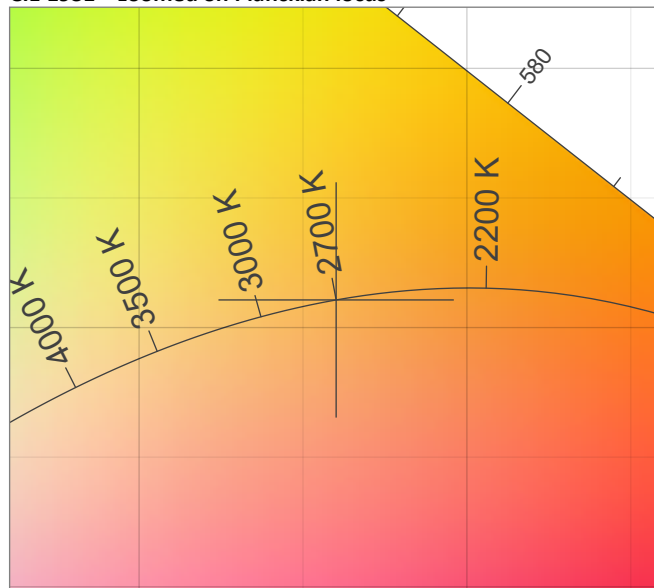
Correlated Color Temperature, Target CCT = 2700 K
Correlated Color Temperature, Measured CCT = 2726 K
Color Rendering Index CRI 82,8
Color Rendering Index, R9 (red component) R9 = 9,7
Color Rendering TM30-18 R_f 85,4 – R_g 96,0
Color Quality Scale CQS = 82,1

MacAdam Steps
Color coordinates CIE 1931 (x;y) = (0,460;0,411)
Color coordinate CIEs 1960 (u;v) = (0,263;0,352)
Color deviation from BBL Duv = -0,0015
Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,263;0,527)

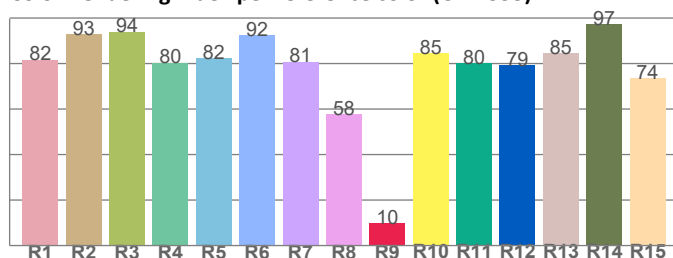
CIE 1931



CIE 1931 – zoomed on Planckian locus



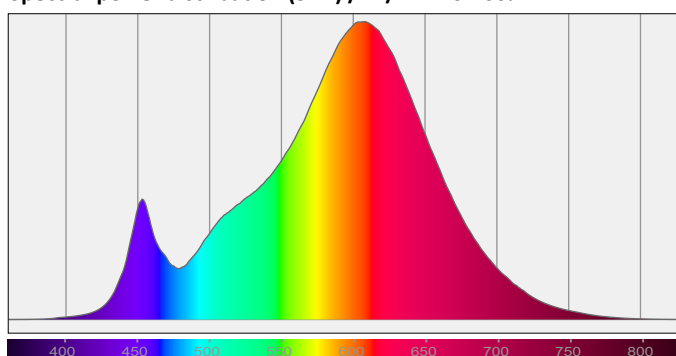
Color Rendering Index per reference color (CIE 1995)



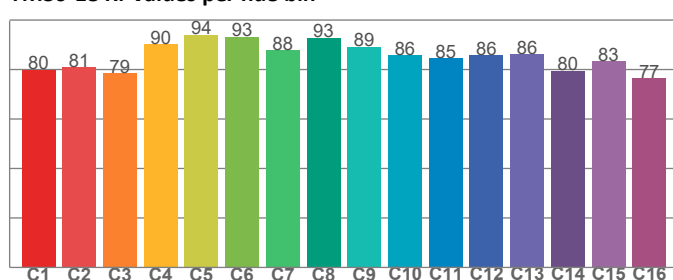
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
81,7	92,9	93,9	80,4	82,3	92,5	80,8	57,7	9,7	84,6	80,3	79,2	84,5	97,4	73,6

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



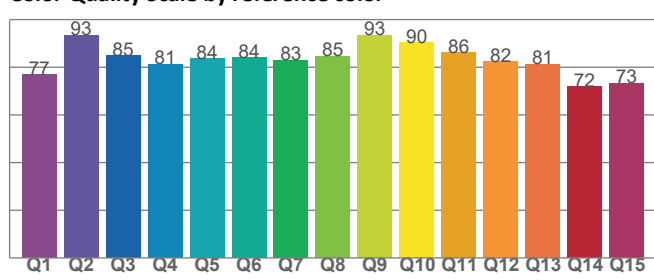
TM30-18 R_f -values per hue bin



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
79,9	81,0	78,6	90,2	94,1	93,2	87,8	92,8	89,2	85,7	84,6	85,9	86,3	79,5	83,4	76,5

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
76,9	93,5	84,9	81,3	83,6	84,0	82,9	84,5	93,4	90,2	86,1	82,4	81,3	71,8	73,3

Light Measurement Report

Print date: 29-1-2025

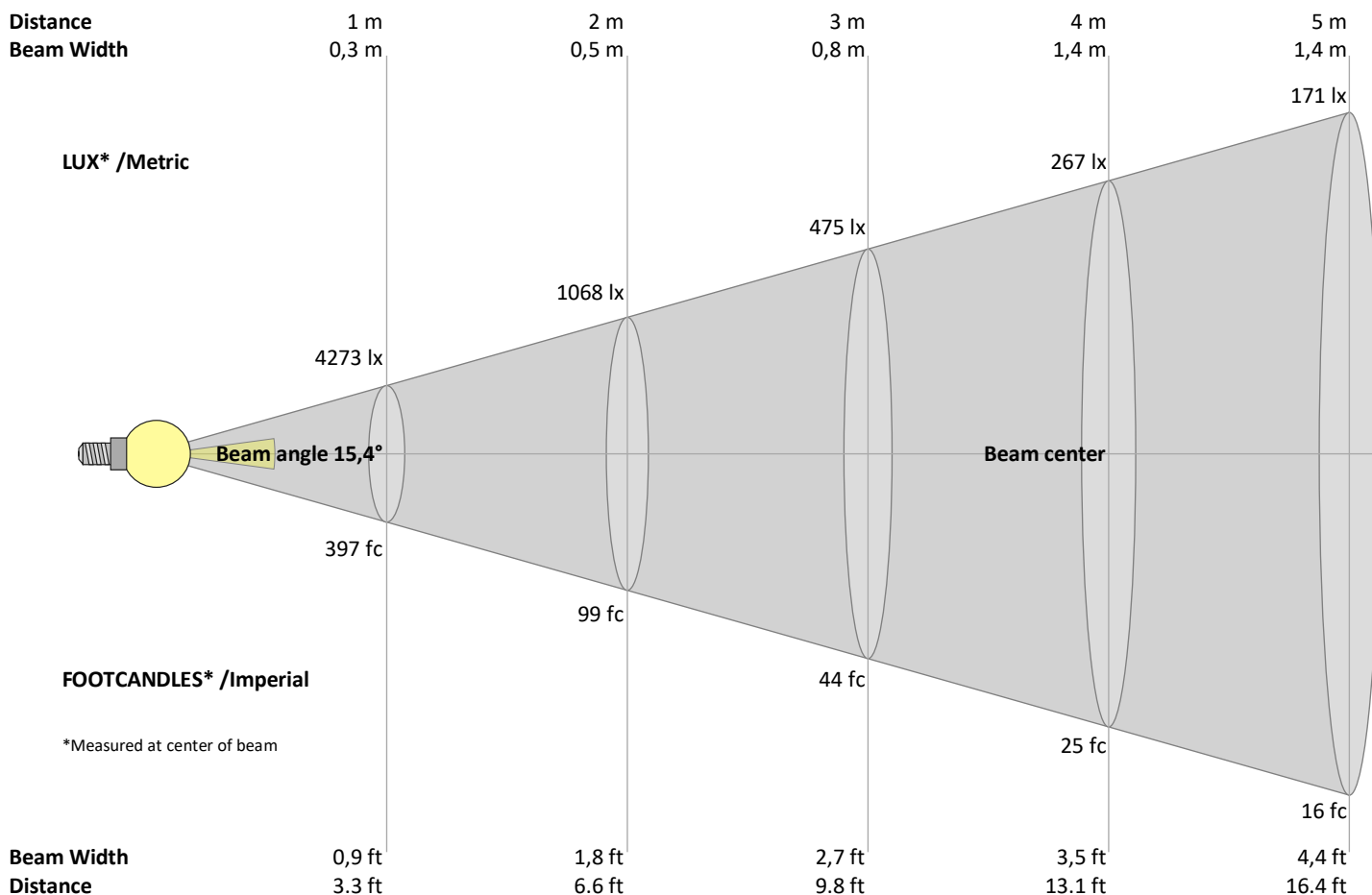
Measurement date and time: 29-1-2025 10:32:39 – Measurement no. VFR-250129-3207-MS

Measurement tracking No. and Link: [VT250129-000839](https://vfr-250129-000839)

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
4273	1068	475	267	171	119	87	67	53	43	35	30	25	22	19	17	15	13	12	11	lux
397	99,3	44,1	24,8	15,9	11	8,1	6,2	4,9	4	3,3	2,8	2,3	2	1,8	1,6	1,4	1,2	1,1	1	fc

Intensities in 0° c-plane

0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	γ
4273	4138	3877	3616	3356	3095	2774	2400	2026	1652	1277	1032	902	771	641	511	432	400	367	335	cd
100%	97%	91%	85%	79%	72%	65%	56%	47%	39%	30%	24%	21%	18%	15%	12%	10%	9%	9%	8%	of 0°val

Intensities in 90° c-plane

0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	γ
4273	4138	3877	3616	3356	3095	2774	2400	2026	1652	1277	1032	902	771	641	511	432	400	367	335	cd
100%	97%	91%	85%	79%	72%	65%	56%	47%	39%	30%	24%	21%	18%	15%	12%	10%	9%	9%	8%	of 0°val

Intensities in 180° c-plane

0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	γ
4273	4138	3877	3616	3356	3095	2774	2400	2026	1652	1277	1032	902	771	641	511	432	400	367	335	cd
100%	97%	91%	85%	79%	72%	65%	56%	47%	39%	30%	24%	21%	18%	15%	12%	10%	9%	9%	8%	of 0°val

Intensities in 270° c-plane

0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	γ
4273	4138	3877	3616	3356	3095	2774	2400	2026	1652	1277	1032	902	771	641	511	432	400	367	335	cd
100%	97%	91%	85%	79%	72%	65%	56%	47%	39%	30%	24%	21%	18%	15%	12%	10%	9%	9%	8%	of 0°val

Light Measurement Report

Print date: 29-1-2025

Measurement date and time: 29-1-2025 10:32:39 – Measurement no. VFR-250129-3207-MS

Measurement tracking No. and Link: [VT250129-000839](#)

Operator:



Light Planning – UGR table

Uncorrected, comprehensive UGR table according to 117-1995

Reflectances											
p Ceiling		70	70	50	50	30	70	70	50	50	30
p Walls		50	30	50	30	30	50	30	50	30	30
p 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	25,9	26,8	26,1	27,1	27,3	25,9	26,8	26,1	27,1	27,3
	3H	25,7	26,7	26,1	26,9	27,1	25,7	26,7	26,1	26,9	27,1
	4H	25,6	26,6	26,1	26,8	27,1	25,6	26,6	26,1	26,8	27,1
	6H	25,6	26,4	25,9	26,7	27,1	25,6	26,4	25,9	26,7	27,1
	8H	25,6	26,3	25,9	26,7	27,1	25,6	26,3	25,9	26,7	27,1
	12H	25,5	26,3	25,9	26,6	27,0	25,5	26,3	25,9	26,6	27,0
4H	2H	26,0	26,9	26,4	27,1	27,4	26,0	26,9	26,4	27,1	27,4
	3H	25,9	26,7	26,3	27,0	27,4	25,9	26,7	26,3	27,0	27,4
	4H	25,8	26,5	26,2	26,9	27,4	25,8	26,5	26,2	26,9	27,4
	6H	25,7	26,4	26,2	26,7	27,1	25,7	26,4	26,2	26,7	27,1
	8H	25,7	26,3	26,2	26,6	27,0	25,7	26,3	26,2	26,6	27,0
	12H	25,6	26,1	26,1	26,5	27,0	25,6	26,1	26,1	26,5	27,0
8H	4H	25,7	26,3	26,2	26,6	27,0	25,7	26,3	26,2	26,6	27,0
	6H	25,6	26,0	26,1	26,5	27,0	25,6	26,0	26,1	26,5	27,0
	8H	25,6	26,0	26,1	26,5	27,1	25,6	26,0	26,1	26,5	27,1
	12H	25,5	25,9	26,1	26,4	27,0	25,5	25,9	26,1	26,4	27,0
12H	4H	25,6	26,1	26,1	26,5	27,0	25,6	26,1	26,1	26,5	27,0
	6H	25,6	26,0	26,1	26,5	27,1	25,6	26,0	26,1	26,5	27,1
	8H	25,5	25,9	26,1	26,4	27,0	25,5	25,9	26,1	26,4	27,0
Variations with the observer position for the luminaire spacings, S:											
S = 1.0H		1,0 / -0,9					1,0 / -0,9				
S = 1.5H		2,8 / -5,1					2,8 / -5,1				
S = 2.0H		4,3 / -10,8					4,3 / -10,8				

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	112	109	106	103	109	106	104	101	102	100	98	99	97	95	95	94	92	90
2	105	98	93	89	102	97	92	88	93	89	86	90	87	84	87	85	82	81
3	98	90	83	78	95	88	82	78	85	80	76	83	79	75	80	77	74	72
4	91	82	75	70	89	81	74	69	78	73	68	76	71	68	74	70	67	65
5	86	75	68	63	84	74	68	63	72	67	62	71	65	61	69	64	61	59
6	81	70	63	58	79	69	62	57	67	61	57	66	61	56	64	60	56	54
7	76	65	58	53	75	65	58	53	63	57	53	62	56	52	61	56	52	50
8	72	61	54	50	71	61	54	50	60	54	49	58	53	49	57	53	49	47
9	69	58	51	47	68	57	51	47	56	51	47	56	50	46	55	50	46	45
10	66	55	49	44	65	55	48	44	54	48	44	53	48	44	52	47	44	42

Light Measurement Report

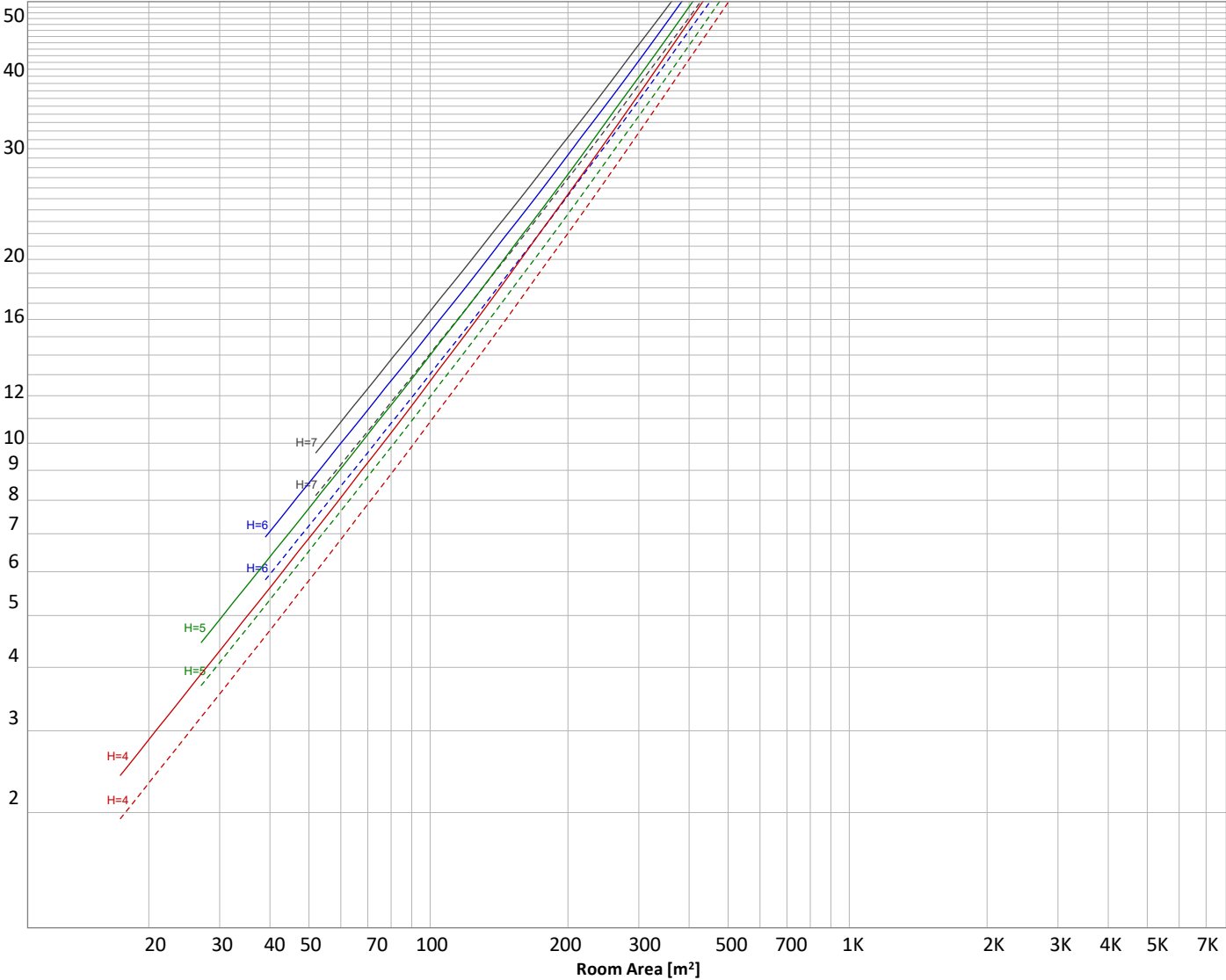
Print date: 29-1-2025
Measurement date and time: 29-1-2025 10:32:39 – Measurement no. VFR-250129-3207-MS
Measurement tracking No. and Link: [VT250129-000839](#)
Operator:



Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 1049 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°
230 lm	158 lm	103 lm	107 lm	184 lm	214 lm	47,3 lm	5,17 lm	0,189 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
0,190 lm	0,181 lm	0,218 lm	0,179 lm	0,166 lm	0,133 lm	0,123 lm	0,114 lm	0,034 lm

Light Measurement Report

Print date: 29-1-2025

Measurement date and time: 29-1-2025 10:32:39 – Measurement no. VFR-250129-3207-MS

Measurement tracking No. and Link: [VT250129-000839](#)

Operator:



Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	230 lm	21,9%
10-20°	158 lm	15,0%
20-30°	103 lm	9,8%
30-40°	107 lm	10,2%
40-50°	184 lm	17,5%
50-60°	214 lm	20,4%
60-70°	47 lm	4,5%
70-80°	5 lm	0,5%
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	1049 lm	100,0%

Intensity peaks

Max intensity	4273 cd
Intensity, 90°	0 cd
Intensity, 0°	4273 cd

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	490 lm	46,7%
0-40°	598 lm	57,0%
0-60°	995 lm	94,9%
60-90°	53 lm	5,0%
70-100°	6 lm	0,5%
90-120°	1 lm	0,1%
0-90°	1048 lm	99,9%
90-180°	1 lm	0,1%
0-180°	1049 lm	100,0%

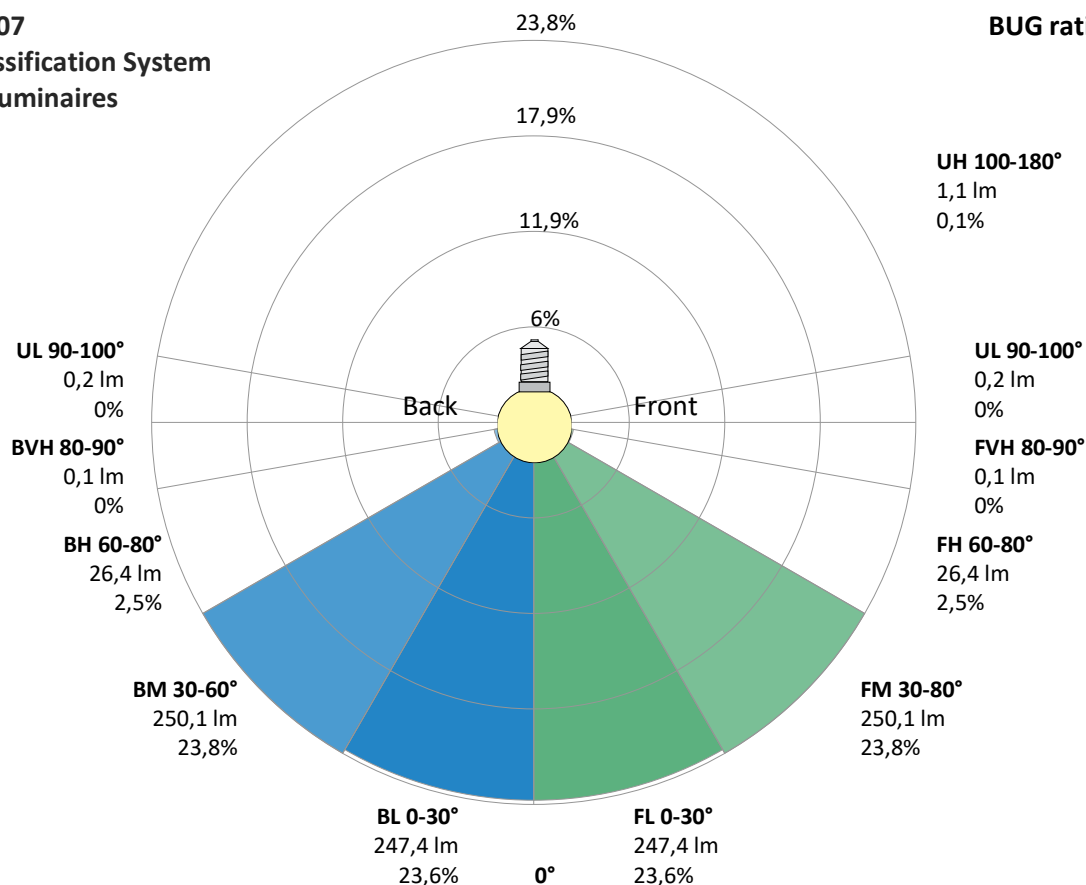
BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	247 lm	23,6%
Medium(30-60°)	250 lm	23,8%
High(60-80°)	26 lm	2,5%
Very high(80-90°)	0 lm	0,0%
Back light		
Low(0-30°)	247 lm	23,6%
Medium(30-60°)	250 lm	23,8%
High(60-80°)	26 lm	2,5%
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 B1 U1 G0



Light Measurement Report

Print date: 29-1-2025
Measurement date and time: 29-1-2025 10:32:39 – Measurement no. VFR-250129-3207-MS
Measurement tracking No. and Link: [VT250129-000839](#)
Operator:

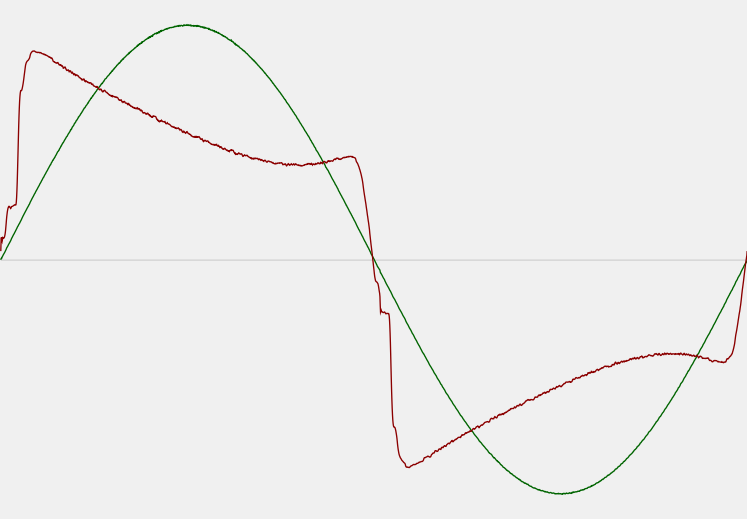


Power Details

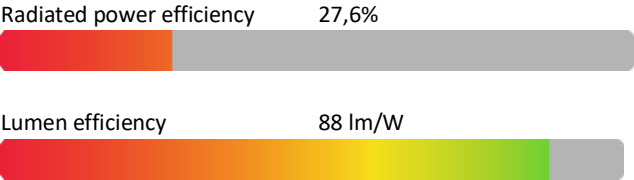
Input Power

Power feed to light source	11,9 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,060 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	13,74 VA
Displacement factor of AC power feed	0,97
Power factor of AC current feed	0,87
Total harmonic distortion of the current	46,2%
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	2694 K
CCT shift	+6 K
CCT end	2700 K

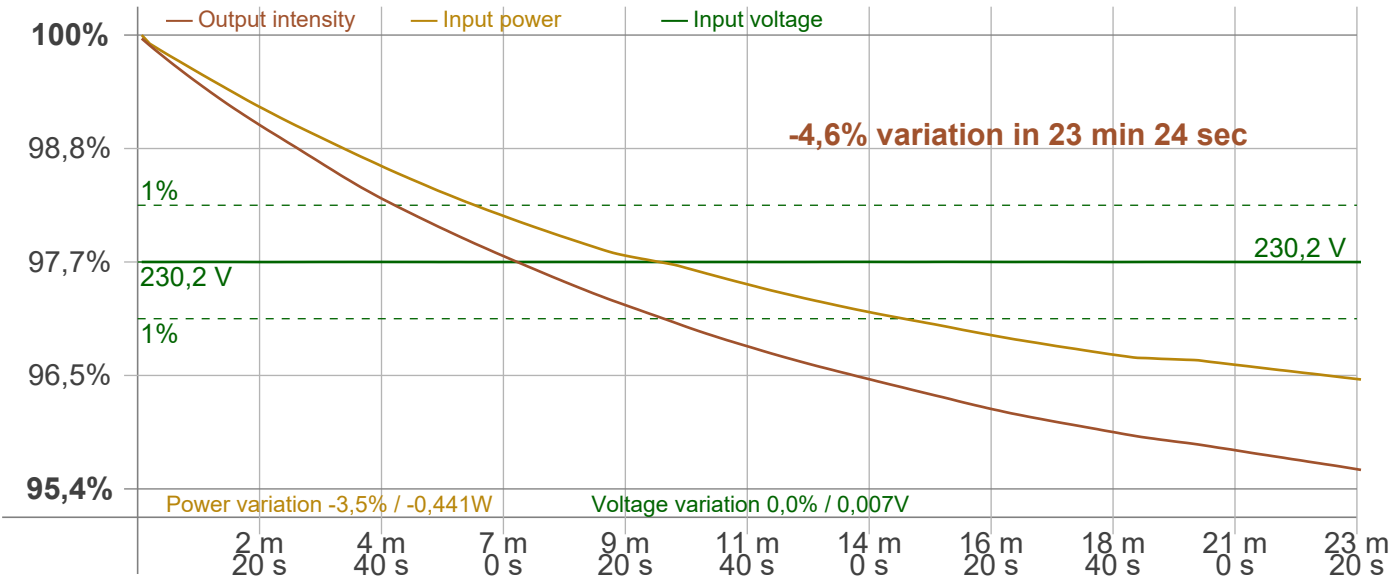
Warmup Result

Total warmup time	Lamp stabilized in 23 min 24 sec
Warmup variation	-4,6%

Output Change

Output start	1099 lm
Output change	-50 lm
Output end	1049 lm

Stabilization Curve



Light Measurement Report

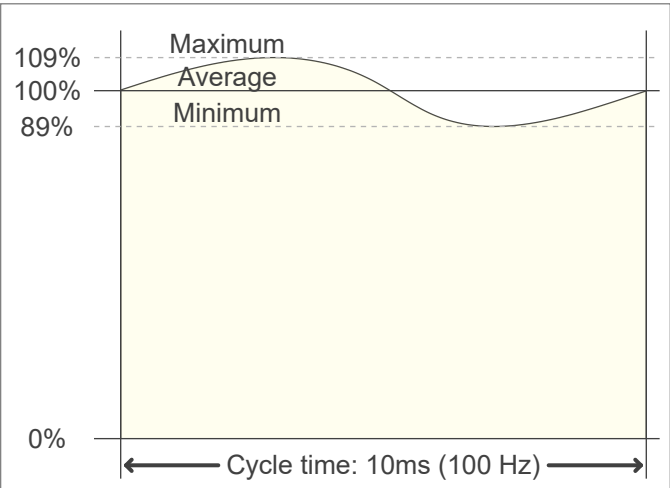
Print date: 29-1-2025
Measurement date and time: 29-1-2025 10:32:39 – Measurement no. VFR-250129-3207-MS
Measurement tracking No. and Link: [VT250129-000839](#)
Operator:



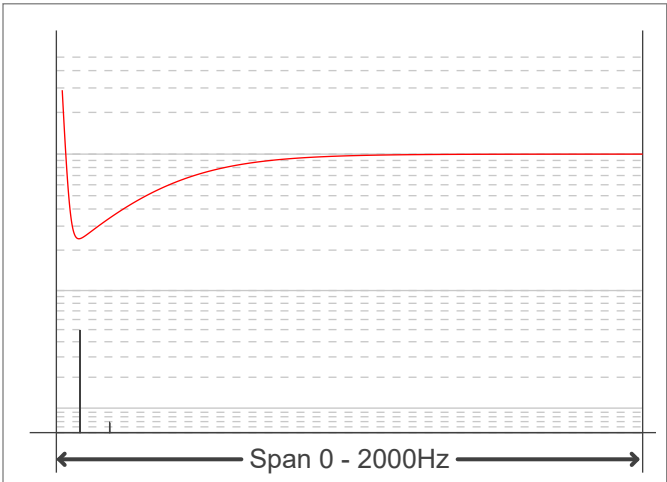
Flicker /TLA details

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 Hz	JA8/10 40 Hz	0,16 %
Percent Flicker	10,1 %	JA8/10 90 Hz	0,17 %
Flicker index	0,03	JA8/10 200 Hz	10,18 %
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)		JA8/10 400 Hz	10,14 %
PstLM value (F < 80 Hz)	0,14	JA8/10 1000 Hz	10,1 %
SVM value (80 < F < 2000 Hz)	0,39	Flicker indices according to Lighting Research Center (2015)	
		Perception metric, Assist Mp	0,11

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot

