Light Measurement Report

Print date: 18-11-2024
Measurement date and time: 18-11-2024 14:12:10 – Measurement no. VFR-241118-2059-MS
Measurement tracking No. and Link: VT241118-001432
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

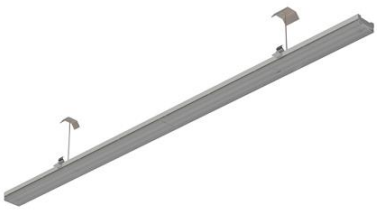
Number of C-planes and Resolution	24 planes – 15°
γ (gamma)-Resolution	5°
Test Distance	12,13 m
Input Power, Power and Displ. Factors	57,3 W – PF 0,97 – DPF 0,98
Input RMS Voltage and Current	230 V – 0,256 A
Frequency of Input Power	50 Hz
Warm-up Time and Variation	Lamp stabilized in 15 min 1 sec – 2,0%

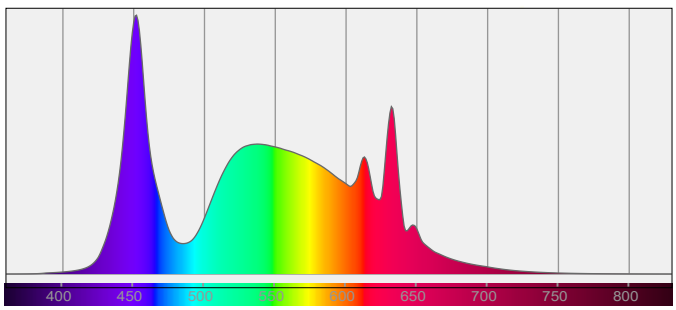
Tested Light Source

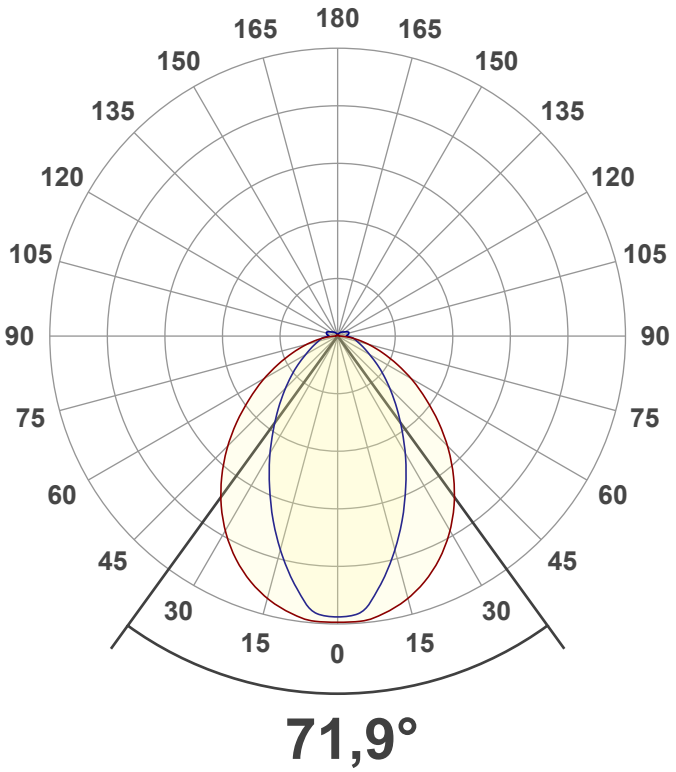
Product Name	805821-5700K
Item No. and Manufacturer	805821-5700K – Dutchfulfillment
Product Description (line 1)	RETROFIT PLUTO | LED MODULE | 32W/40W/48W/55W | 60°

Main Light Measurement Results

Output – Total Lumen (Up% / Down%)	9562 lm – 6,14% / 93,86%
Efficiency	167 lm/W
Peak Intensity and Beam Angle	5165 cd – 71,9°
Correlated Color Temperature, Target/Measured	CCT = 5700 K / 5744 K
Color Rendering Index	CRI 82,1
Color Rendering TM30-18	R_f 81,4 – R_g 98,6
Color Shift, CIE duv and MacAdam Steps	Duv 0,0012 – SDCM 6,1
Flicker	SVM 0 – PstLM 0,01





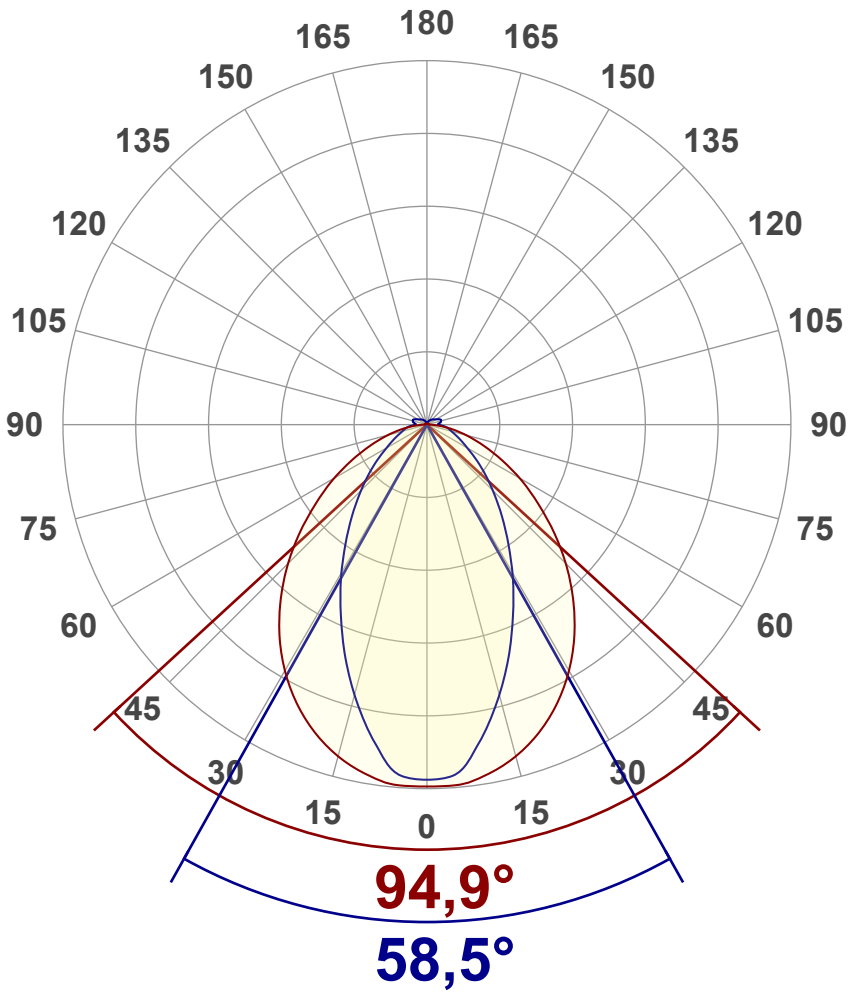


Light Measurement Report

Print date: 18-11-2024
Measurement date and time: 18-11-2024 14:12:10 – Measurement no. VFR-241118-2059-MS
Measurement tracking No. and Link: VT241118-001432
Operator:

Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	9562 lm
Lumen Up% / Down%	6,14% / 93,86%
Peak Intensity	5165 cd
Beam Angle (50%)	71,9°
Beam Angle (90%)	58,5°
Beam Angle (10%)	89,1°

Cut-off Angle

Average 2,5%	214°

Field Angle

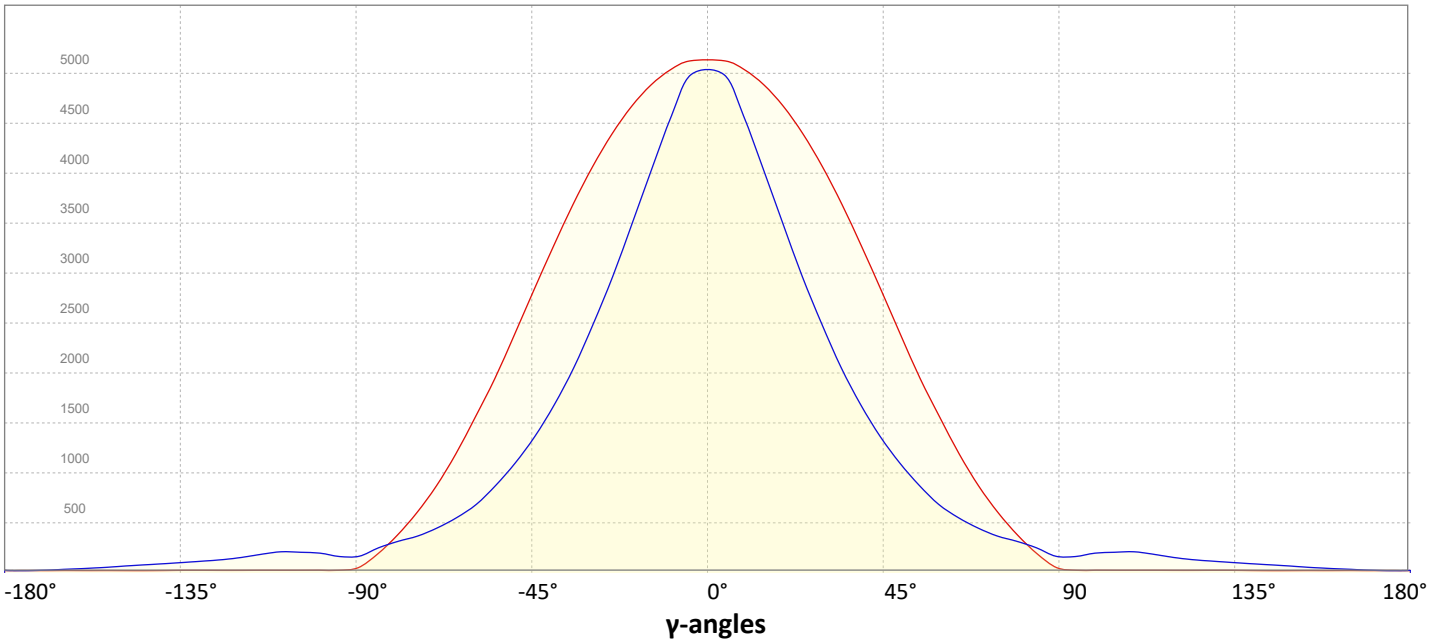
Average 10%	142,4°

Intensity Ratio

In 120° cone	78,5%
In 90° cone	59,7%

C000-C180
C090-C270

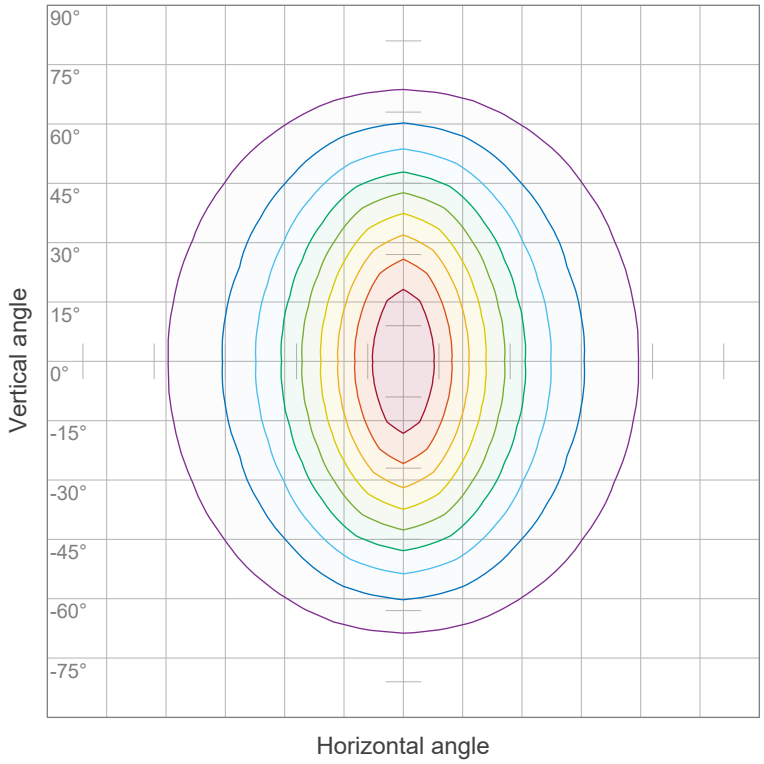
Linear distribution diagram - Intensity (candela) vs γ-angle



Light Measurement Report

Print date: 18-11-2024
Measurement date and time: 18-11-2024 14:12:10 – Measurement no. VFR-241118-2059-MS
Measurement tracking No. and Link: VT241118-001432
Operator:

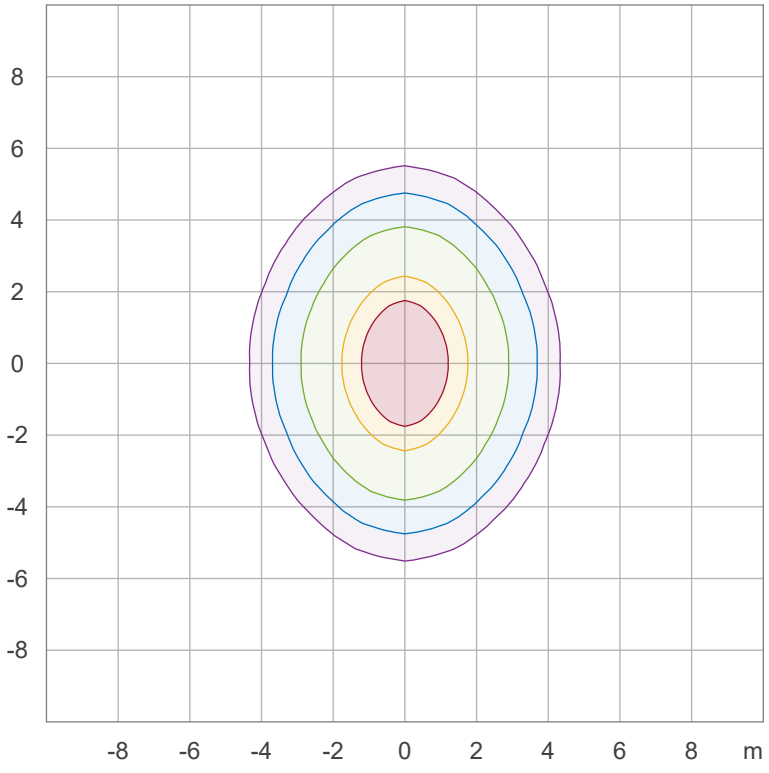
Iso-intensity Diagram (Iso-candela)



90 %	4627,2 cd
80 %	4113,1 cd
70 %	3599,0 cd
60 %	3084,8 cd
50 %	2570,7 cd
40 %	2056,5 cd
30 %	1542,4 cd
20 %	1028,3 cd
10 %	514,1 cd

Peak intensity: 5141,4 cd
Number of c-planes: 24

Iso-illuminance Diagram (Iso-lux)



50,0 %	285,5 lx
30,0 %	171,3 lx
10,0 %	57,1 lx
5,0 %	28,6 lx
3,0 %	17,1 lx

Peak illuminance: 571,0 lx
Mounting height: 3,0 m
Number of c-planes: 24

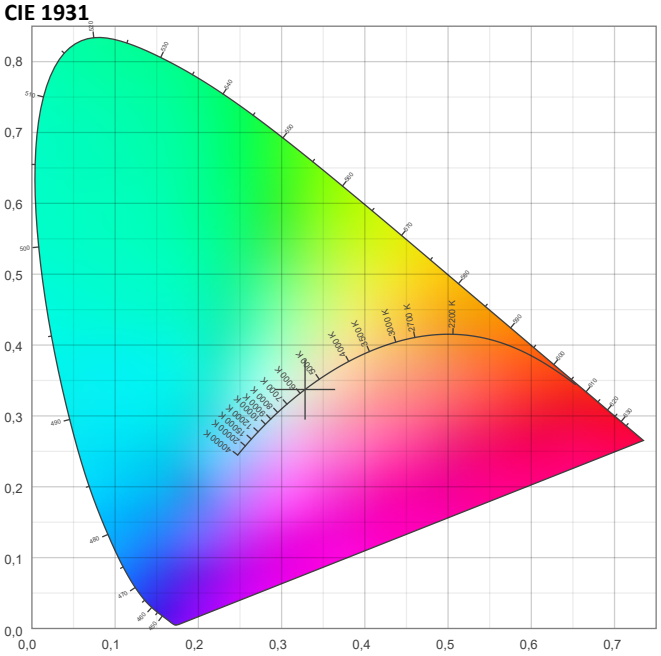
Light Measurement Report

Print date: 18-11-2024
Measurement date and time: 18-11-2024 14:12:10 – Measurement no. VFR-241118-2059-MS
Measurement tracking No. and Link: VT241118-001432
Operator:

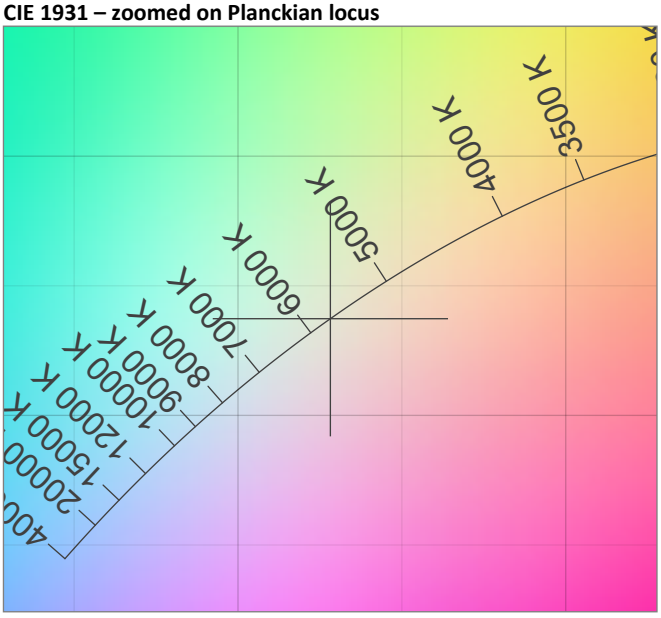
Color details

Correlated Color Temperature, Target	CCT = 5700 K
Correlated Color Temperature, Measured	CCT = 5744 K
Color Rendering Index	CRI 82,1
Color Rendering Index, R9 (red component)	R9 = 37,2
Color Rendering TM30-18	R_f 81,4 – R_g 98,6
Color Quality Scale	CQS = 80,7
MacAdam Steps	SDCM = 6,1
Color coordinates CIE 1931	(x;y) = (0,328;0,337)
Color coordinate CIEs 1960	(u;v) = (0,205;0,317)
Color deviation from BBL	Duv = 0,0012
Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0,205;0,475)

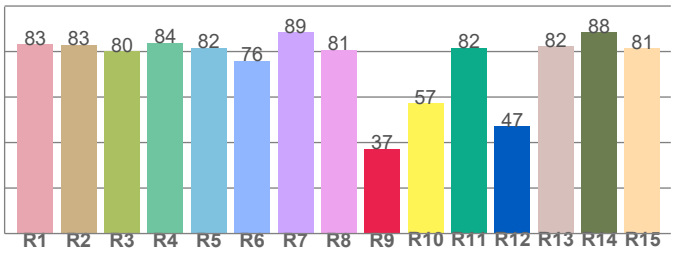
CIE 1931



CIE 1931 – zoomed on Planckian locus



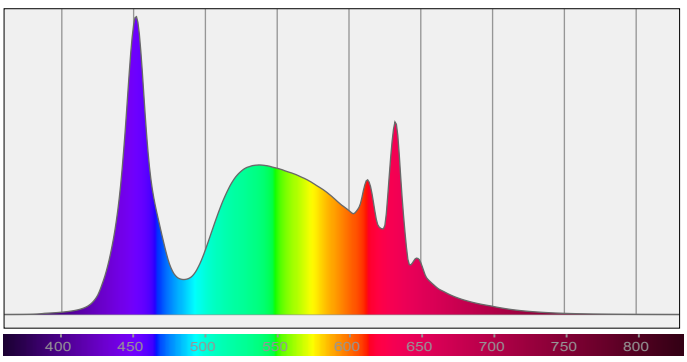
Color Rendering Index per reference color (CIE 1995)



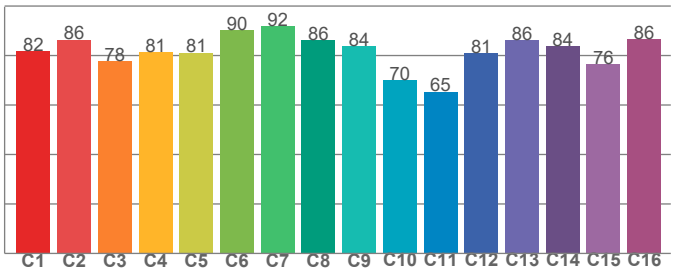
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
83,1	83,0	80,1	83,8	81,6	76,0	88,6	80,7	37,2	57,2	81,7	47,3	82,3	88,4	81,5

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



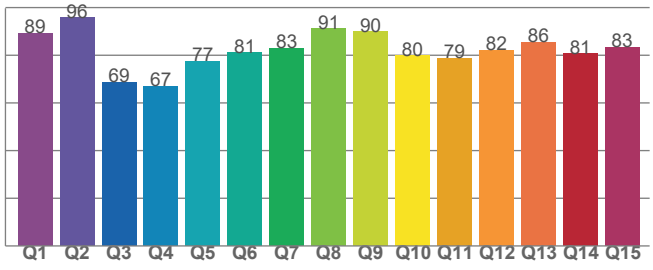
TM30-18 Rf-values per hue bin



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
81,6	86,4	77,7	81,2	81,2	90,1	91,9	86,1	83,8	70,0	65,4	80,9	86,1	83,8	76,5	86,5

Color Quality Scale by reference color



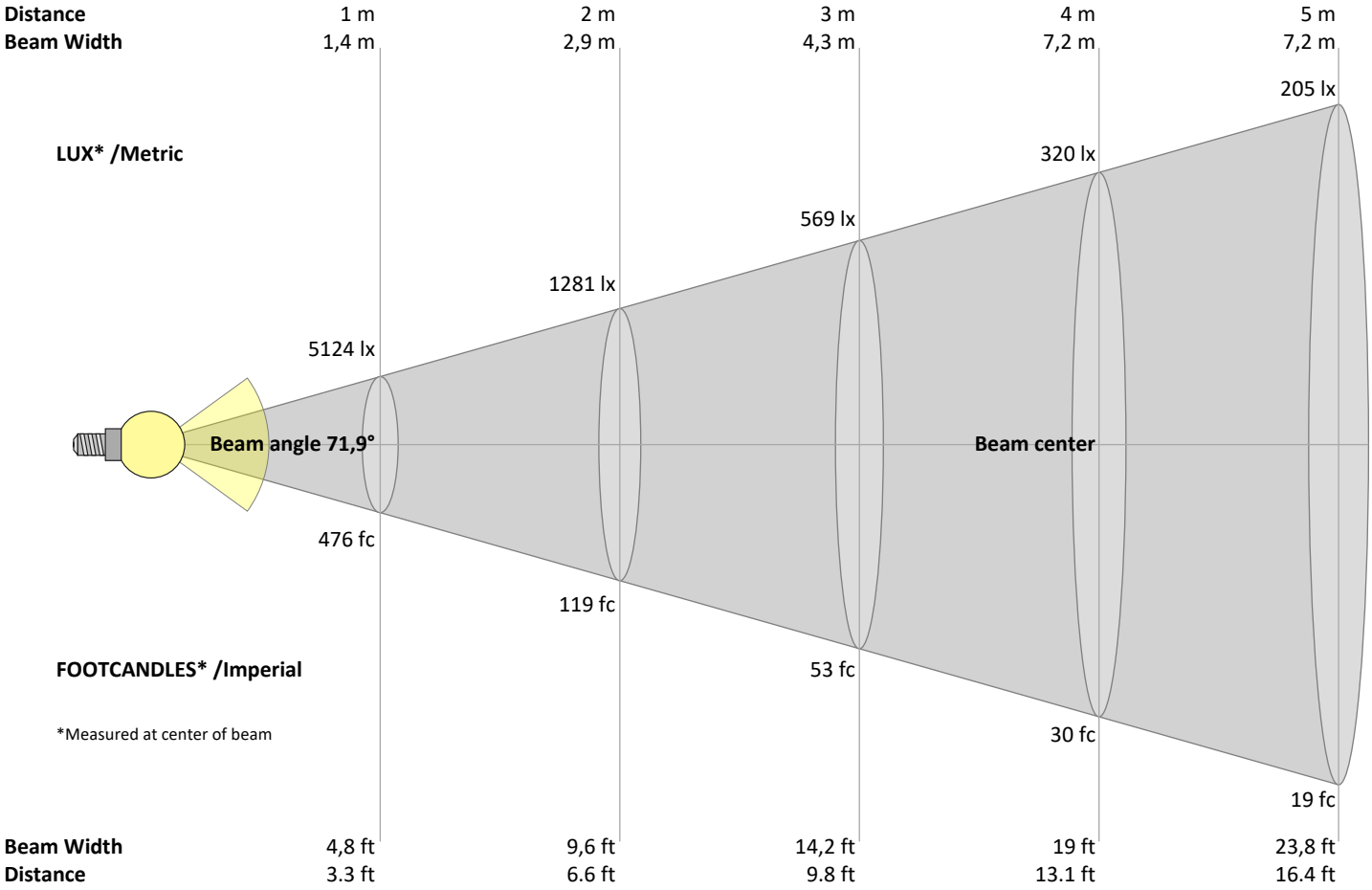
CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
89,2	95,8	68,7	67,1	77,5	81,0	83,0	91,1	89,8	79,8	78,7	82,2	85,5	80,6	83,4

Light Measurement Report

Print date: 18-11-2024
Measurement date and time: 18-11-2024 14:12:10 – Measurement no. VFR-241118-2059-MS
Measurement tracking No. and Link: VT241118-001432
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
5124	1281	569	320	205	142	105	80	63	51	42	36	30	26	23	20	18	16	14	13	lux
476	119	52,9	29,8	19	13,2	9,7	7,4	5,9	4,8	3,9	3,3	2,8	2,4	2,1	1,9	1,6	1,5	1,3	1,2	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
5124	5115	5019	4860	4638	4356	4022	3640	3219	2781	2334	1902	1518	1154	838	575	355	173	48	25	cd
100%	100%	98%	95%	91%	85%	78%	71%	63%	54%	46%	37%	30%	23%	16%	11%	7%	3%	1%	0%	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
5124	4922	4492	3962	3421	2896	2425	1996	1633	1323	1064	845	663	536	436	359	305	237	165	168	cd
100%	96%	88%	77%	67%	57%	47%	39%	32%	26%	21%	16%	13%	10%	9%	7%	6%	5%	3%	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
5124	5115	5019	4860	4638	4356	4022	3640	3219	2781	2334	1902	1518	1154	838	575	355	173	48	25	cd
100%	100%	98%	95%	91%	85%	78%	71%	63%	54%	46%	37%	30%	23%	16%	11%	7%	3%	1%	0%	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
5124	4922	4492	3962	3421	2896	2425	1996	1633	1323	1064	845	663	536	436	359	305	237	165	168	cd
100%	96%	88%	77%	67%	57%	47%	39%	32%	26%	21%	16%	13%	10%	9%	7%	6%	5%	3%	3%	of 0°val

Light Measurement Report

Print date: 18-11-2024
Measurement date and time: 18-11-2024 14:12:10 – Measurement no. VFR-241118-2059-MS
Measurement tracking No. and Link: VT241118-001432
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	24,0	25,0	24,3	25,4	25,7	19,9	20,9	20,2	21,3	21,6
	3H	25,2	26,3	25,7	26,6	27,0	20,8	21,9	21,3	22,2	22,6
	4H	25,7	26,8	26,2	27,1	27,5	21,3	22,4	21,8	22,7	23,1
	6H	26,2	27,1	26,6	27,5	28,0	22,0	22,9	22,4	23,3	23,8
	8H	26,4	27,3	26,8	27,7	28,2	22,3	23,2	22,7	23,6	24,1
	12H	26,5	27,4	26,9	27,8	28,3	22,5	23,4	23,0	23,8	24,4
4H	2H	24,0	25,0	24,5	25,4	25,7	20,6	21,6	21,1	22,0	22,4
	3H	25,5	26,4	26,0	26,8	27,4	21,8	22,7	22,3	23,1	23,7
	4H	26,2	27,0	26,7	27,5	28,1	22,4	23,3	23,0	23,7	24,4
	6H	26,7	27,5	27,3	28,0	28,4	23,2	23,9	23,7	24,4	24,8
	8H	27,0	27,7	27,6	28,1	28,6	23,5	24,2	24,1	24,7	25,2
	12H	27,2	27,7	27,7	28,2	28,8	23,9	24,4	24,4	25,0	25,5
8H	4H	26,2	26,9	26,8	27,4	27,9	22,9	23,6	23,5	24,0	24,5
	6H	27,0	27,5	27,5	28,0	28,7	23,8	24,3	24,4	24,9	25,5
	8H	27,3	27,7	27,9	28,4	29,1	24,3	24,8	24,9	25,4	26,1
	12H	27,6	28,0	28,3	28,6	29,3	24,8	25,2	25,5	25,8	26,5
12H	4H	26,2	26,8	26,8	27,3	27,9	22,9	23,5	23,5	24,0	24,6
	6H	27,0	27,4	27,6	28,1	28,8	24,0	24,4	24,6	25,0	25,8
	8H	27,4	27,7	28,0	28,3	29,0	24,5	24,9	25,2	25,5	26,2

Variations with the observer position for the luminaire spacings, S:		
S = 1.0H	0,1 / -0,1	0,1 / -0,2
S = 1.5H	0,4 / -0,4	0,2 / -0,4
S = 2.0H	1,1 / -0,9	0,4 / -0,6

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	114	114	114	114	108	108	108	102	102	102	96	96	96	94
1	108	104	100	96	105	101	97	94	95	92	90	91	88	86	86	84	82	80
2	99	92	85	80	96	89	84	79	85	80	76	81	77	73	77	74	71	69
3	91	82	74	68	89	80	73	67	76	70	65	72	68	64	69	65	62	59
4	84	73	65	59	82	72	64	59	69	62	57	66	60	56	63	58	54	52
5	78	66	58	52	76	65	57	52	62	56	50	60	54	49	57	52	48	46
6	73	60	52	46	71	59	51	46	57	50	45	55	49	44	53	47	43	41
7	68	55	47	42	66	54	47	41	52	45	41	50	44	40	49	43	39	37
8	64	51	43	38	62	50	43	37	48	42	37	47	41	36	45	40	36	34
9	60	47	39	34	58	46	39	34	45	38	34	43	37	33	42	37	33	31
10	56	44	36	31	55	43	36	31	42	35	31	40	35	30	39	34	30	28

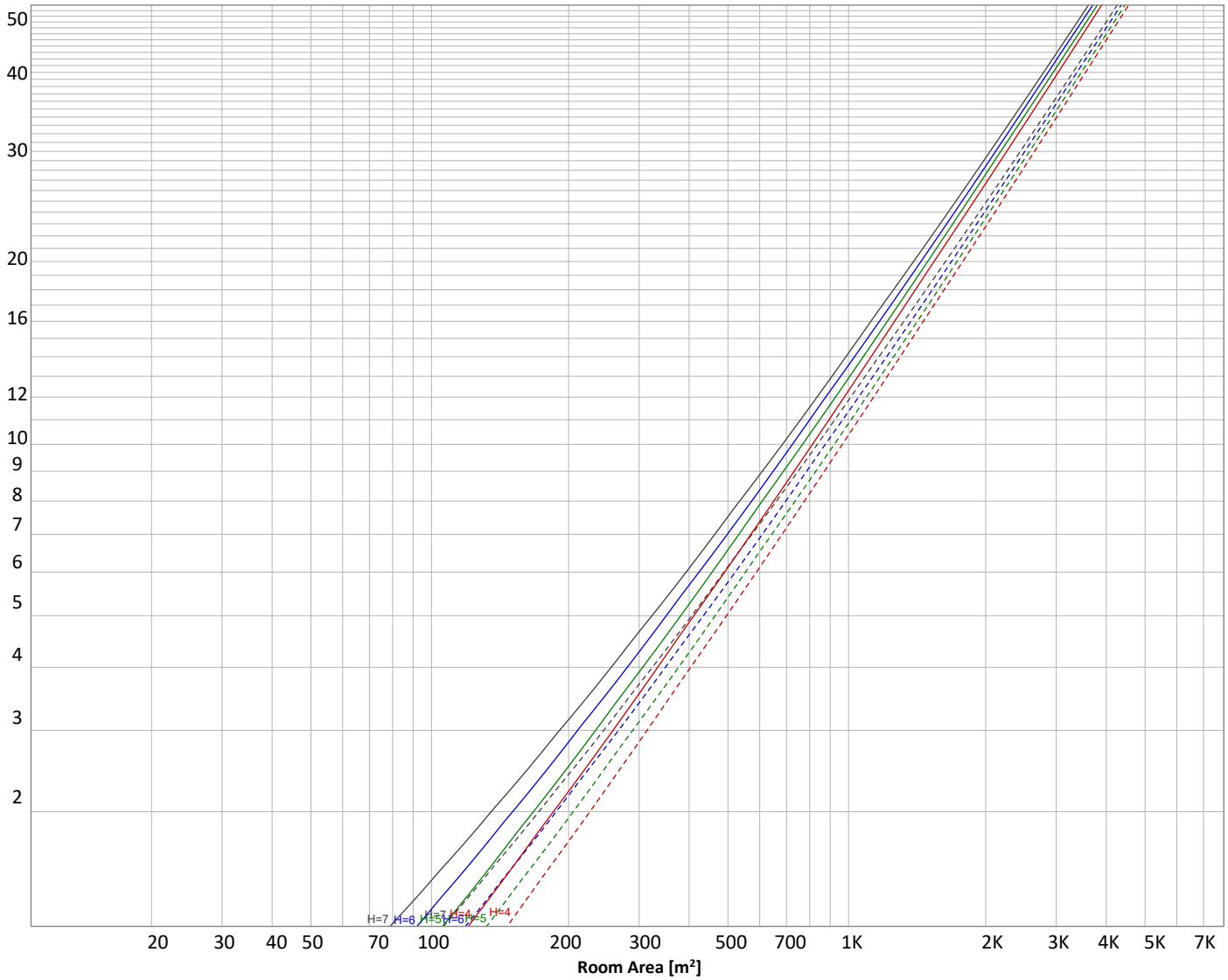
Light Measurement Report

Print date: 18-11-2024
Measurement date and time: 18-11-2024 14:12:10 – Measurement no. VFR-241118-2059-MS
Measurement tracking No. and Link: VT241118-001432
Operator:

Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 9562 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°
471 lm	1223 lm	1610 lm	1649 lm	1441 lm	1110 lm	761 lm	470 lm	242 lm

90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
140 lm	146 lm	113 lm	76,9 lm	52,1 lm	31,9 lm	17,2 lm	7,77 lm	2,13 lm

Light Measurement Report

Print date: 18-11-2024
Measurement date and time: 18-11-2024 14:12:10 – Measurement no. VFR-241118-2059-MS
Measurement tracking No. and Link: VT241118-001432
Operator:

Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	471 lm	4,9%
10-20°	1223 lm	12,8%
20-30°	1610 lm	16,8%
30-40°	1649 lm	17,2%
40-50°	1441 lm	15,1%
50-60°	1110 lm	11,6%
60-70°	761 lm	8,0%
70-80°	470 lm	4,9%
80-90°	242 lm	2,5%
90-100°	140 lm	1,5%
100-110°	146 lm	1,5%
110-120°	113 lm	1,2%
120-130°	77 lm	0,8%
130-140°	52 lm	0,5%
140-150°	32 lm	0,3%
150-160°	17 lm	0,2%
160-170°	8 lm	0,1%
170-180°	2 lm	0,0%
Total	9562 lm	100,0%

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	3303 lm	34,5%
0-40°	4952 lm	51,8%
0-60°	7503 lm	78,5%
60-90°	1472 lm	15,4%
70-100°	852 lm	8,9%
90-120°	399 lm	4,2%
0-90°	8975 lm	93,9%
90-180°	587 lm	6,1%
0-180°	9562 lm	100,0%

Intensity peaks

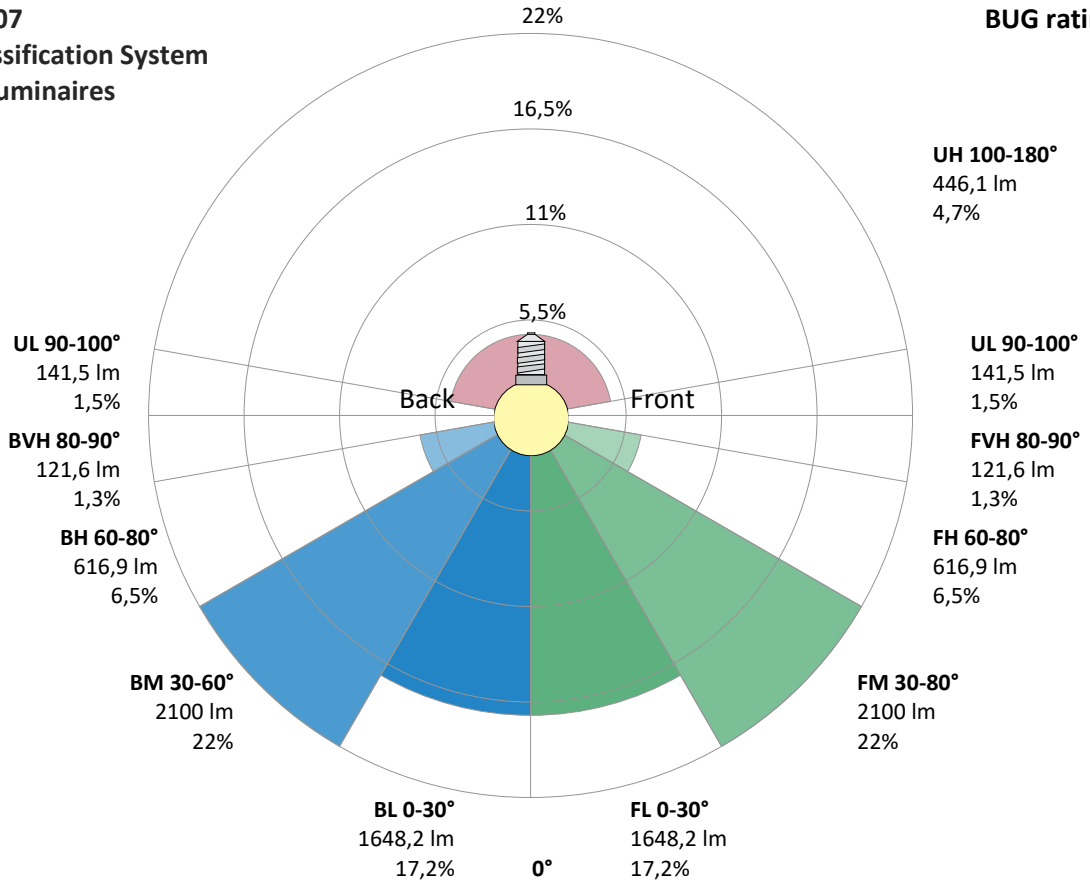
Max intensity	5165 cd
Intensity, 90°	48 cd
Intensity, 0°	5124 cd

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	1648 lm	17,2%
Medium(30-60°)	2100 lm	22,0%
High(60-80°)	617 lm	6,5%
Very high(80-90°)	122 lm	1,3%
Back light		
Low(0-30°)	1648 lm	17,2%
Medium(30-60°)	2100 lm	22,0%
High(60-80°)	617 lm	6,5%
Very high(80-90°)	122 lm	1,3%
Uplight		
Low(90-100°)	141 lm	1,5%
High(100-180°)	446 lm	4,7%

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

BUG rating B3 U3 G2



Light Measurement Report

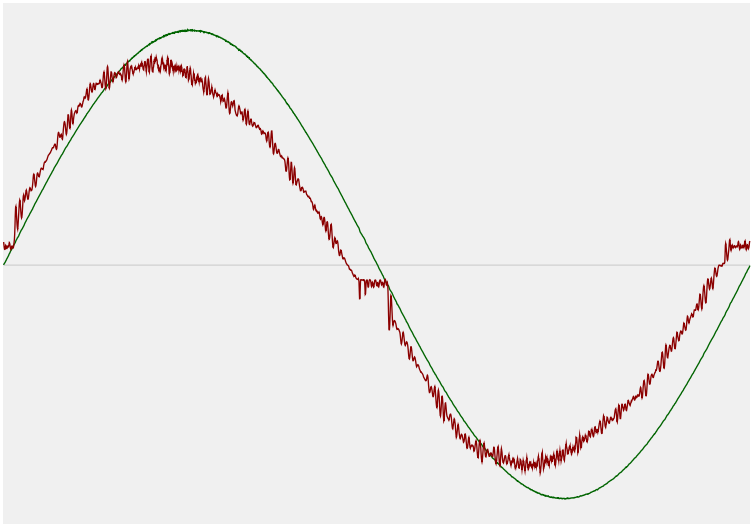
Print date: 18-11-2024
Measurement date and time: 18-11-2024 14:12:10 – Measurement no. VFR-241118-2059-MS
Measurement tracking No. and Link: VT241118-001432
Operator:

Power Details

Input Power

Power feed to light source	57,3 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,256 A
Volt-Ampere or apparent power = V_{RMS}*I_{RMS}	58,91 VA
Displacement factor of AC power feed	0,98
Power factor of AC current feed	0,97
Total harmonic distortion of the current	6,29%
Total harmonic distortion of the voltage	0,07%

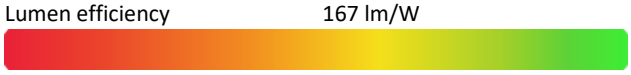
Input Power Curve



Efficiency

Radiated power efficiency 50,8%

Lumen efficiency 167 lm/W



Stabilization Details

Warmup Conditions

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

Color Temperature Change

CCT start	5700 K
CCT shift	+0 K
CCT end	5700 K

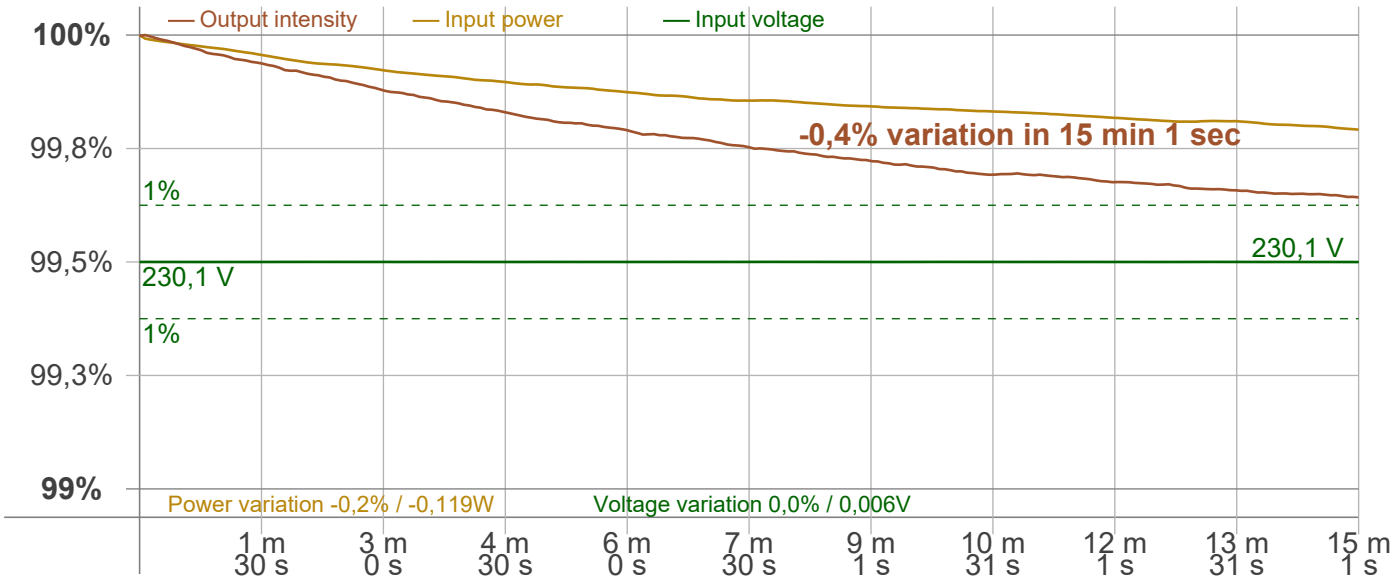
Warmup Result

Total warmup time	Lamp stabilized in 15 min 1 sec
Warmup variation	-0,4%

Output Change

Output start	9596 lm
Output change	-34 lm
Output end	9562 lm

Stabilization Curve



Light Measurement Report

Print date: 18-11-2024
Measurement date and time: 18-11-2024 14:12:10 – Measurement no. VFR-241118-2059-MS
Measurement tracking No. and Link: VT241118-001432
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	0,15 %
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	0,13 %
JA8/10 400 Hz	0,14 %
JA8/10 1000 Hz	0,14 %

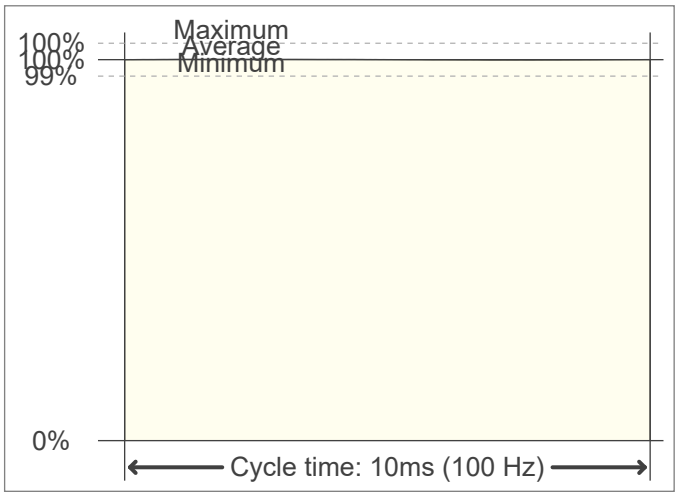
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

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

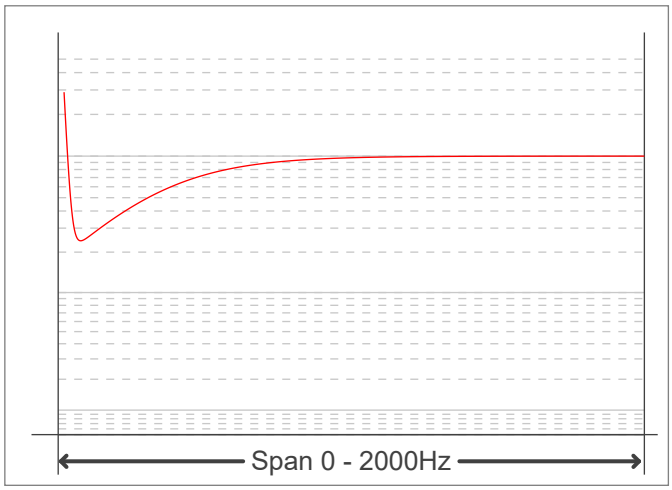
Flicker indices according to Lighting Research Center (2015)

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