Light Measurement Report

Print date: 4-12-2024
Measurement date and time: 4-12-2024 16:16:12 – Measurement no. VFR-241204-2397-MS
Measurement tracking No. and Link: VT241204-005692
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

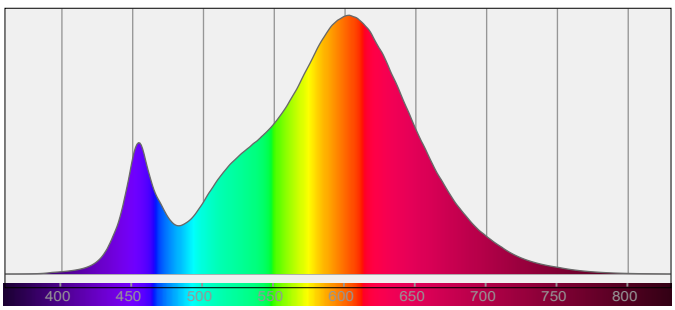
Number of C-planes and Resolution	16 planes – 22,5°
γ (gamma)-Resolution	5°
Test Distance	4,68 m
Input Power, Power and Displ. Factors	28,0 W – PF 0,97 – DPF 0,98
Input RMS Voltage and Current	230 V – 0,125 A
Frequency of Input Power	50 Hz
Warm-up Time and Variation	Lamp stabilized in 15 min 3 sec – 2,0%

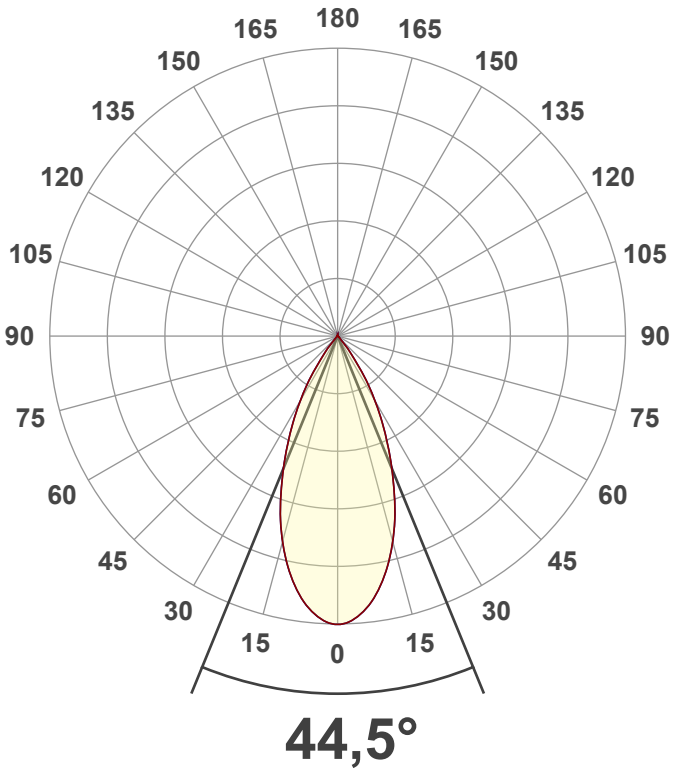
Tested Light Source

Product Name	845680-3000K
Item No. and Manufacturer	845680-3000K – Dutchfulfillment
Product Description (line 1)	3-FASE RAILSPOT ELARA 30W WIT

Main Light Measurement Results

Output – Total Lumen (Up% / Down%)	2123 lm – 0,37% / 99,63%
Efficiency	76 lm/W
Peak Intensity and Beam Angle	3680 cd – 44,5°
Correlated Color Temperature, Target/Measured	CCT = 3000 K / 2944 K
Color Rendering Index	CRI 81,2
Color Rendering TM30-18	R_f 83,5 – R_g 95,3
Color Shift, CIE duv and MacAdam Steps	Duv -0,0016 – SDCM 2,3
Flicker	SVM 0 – PstLM 0,09

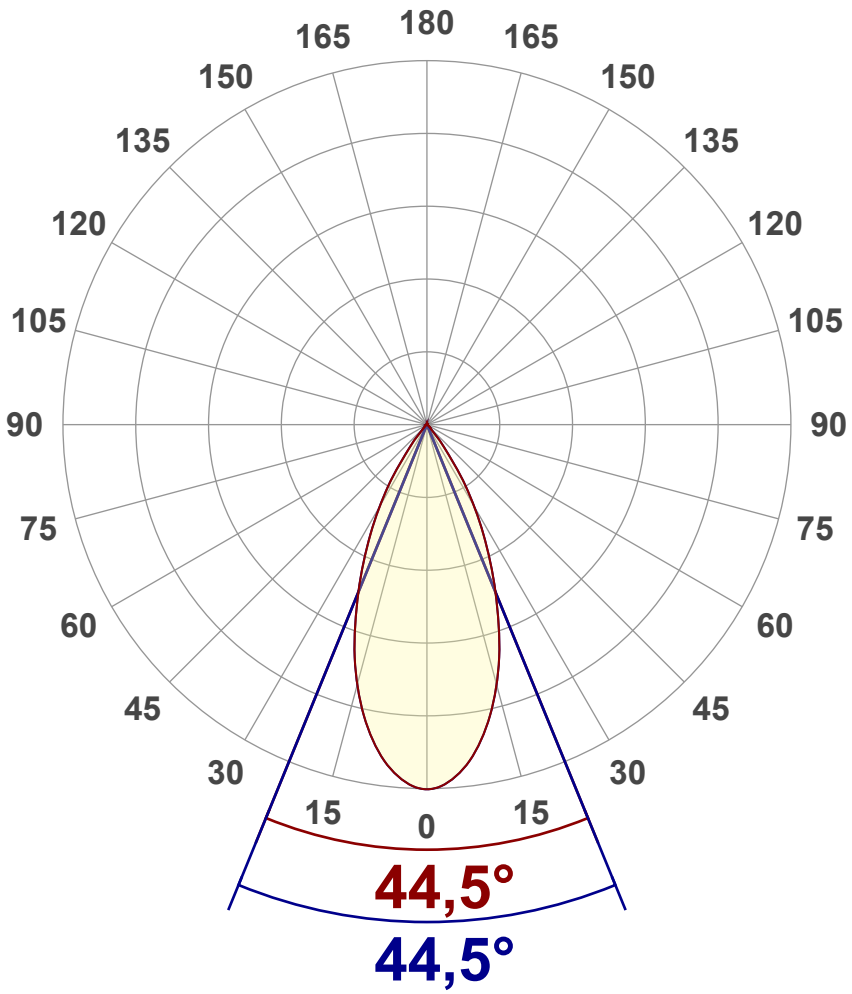




Light Measurement Report

Print date: 4-12-2024
Measurement date and time: 4-12-2024 16:16:12 – Measurement no. VFR-241204-2397-MS
Measurement tracking No. and Link: VT241204-005692
Operator:

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



Main Values

Output (total Lumen)	2123 lm
Lumen Up% / Down%	0,37% / 99,63%
Peak Intensity	3680 cd
Beam Angle (50%)	44,5°
Beam Angle (90%)	44,5°
Beam Angle (10%)	44,5°

Cut-off Angle

Average 2,5%	83°

Field Angle

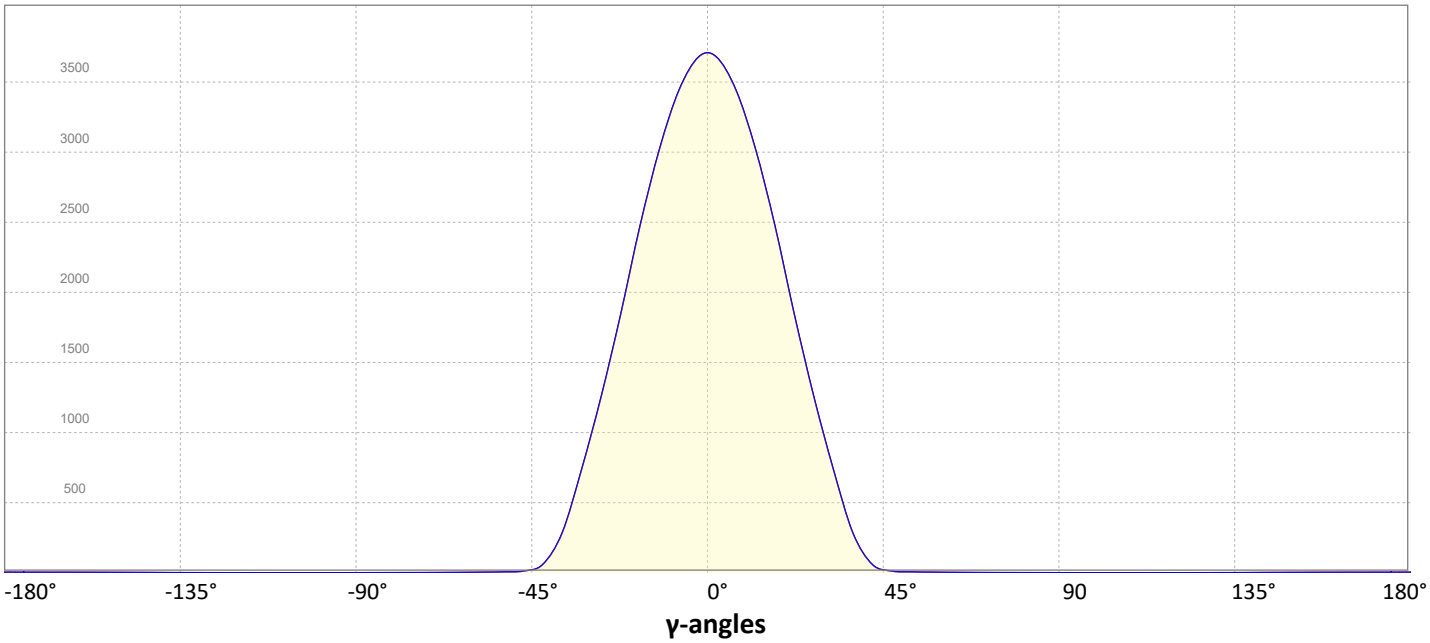
Average 10%	72,6°

Intensity Ratio

In 120° cone	99,4%
In 90° cone	98,9%

C000-C180
C090-C270

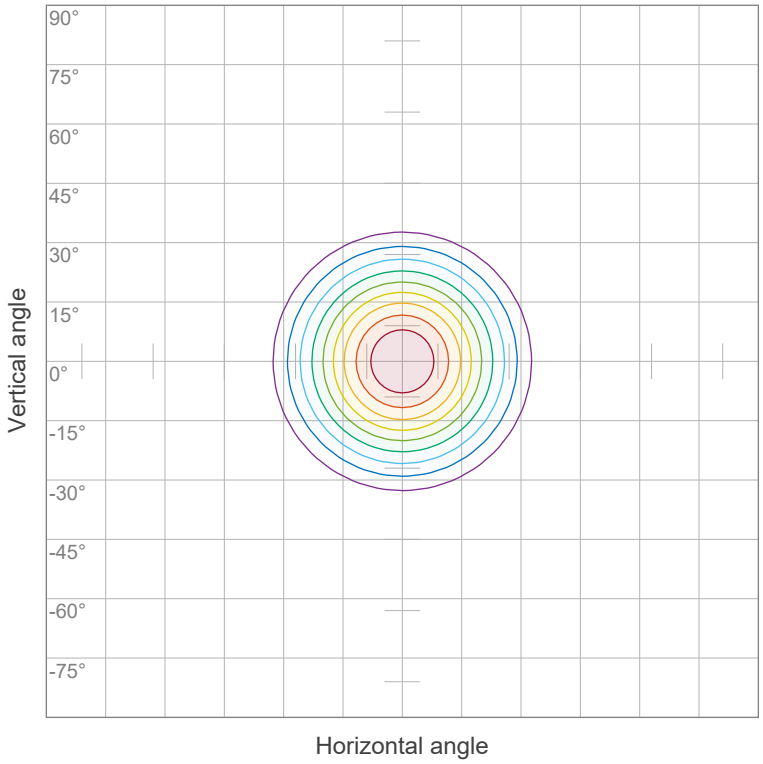
Linear distribution diagram - Intensity (candela) vs γ-angle



Light Measurement Report

Print date: 4-12-2024
Measurement date and time: 4-12-2024 16:16:12 – Measurement no. VFR-241204-2397-MS
Measurement tracking No. and Link: VT241204-005692
Operator:

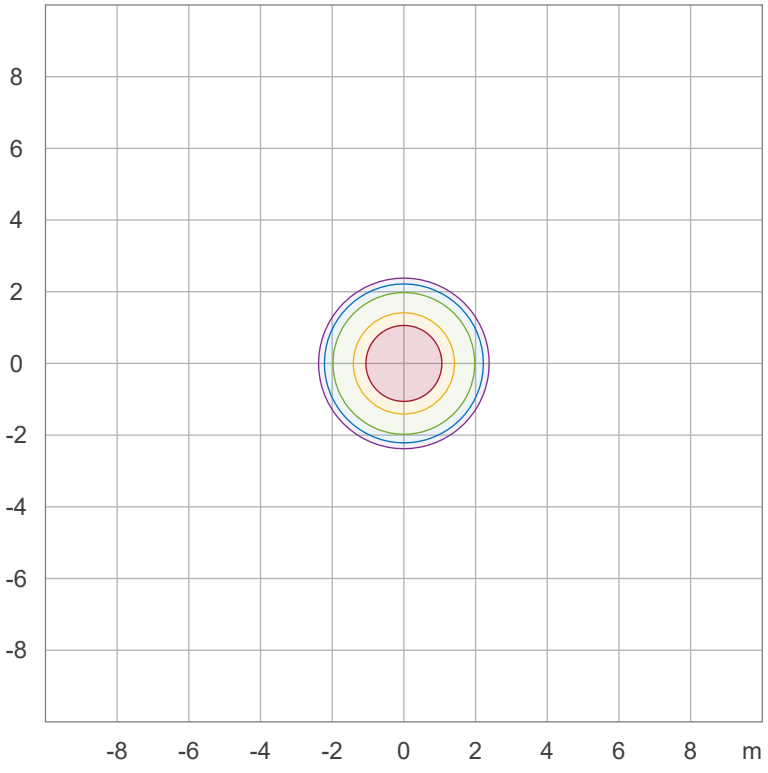
Iso-intensity Diagram (Iso-candela)



90 %	3312,1 cd
80 %	2944,1 cd
70 %	2576,1 cd
60 %	2208,1 cd
50 %	1840,1 cd
40 %	1472,1 cd
30 %	1104,0 cd
20 %	736,0 cd
10 %	368,0 cd

Peak intensity: 3680,1 cd
Number of c-planes: 16

Iso-illuminance Diagram (Iso-lux)



50,0 %	204,5 lx
30,0 %	122,7 lx
10,0 %	40,9 lx
5,0 %	20,4 lx
3,0 %	12,3 lx

Peak illuminance: 408,9 lx
Mounting height: 3,0 m
Number of c-planes: 16

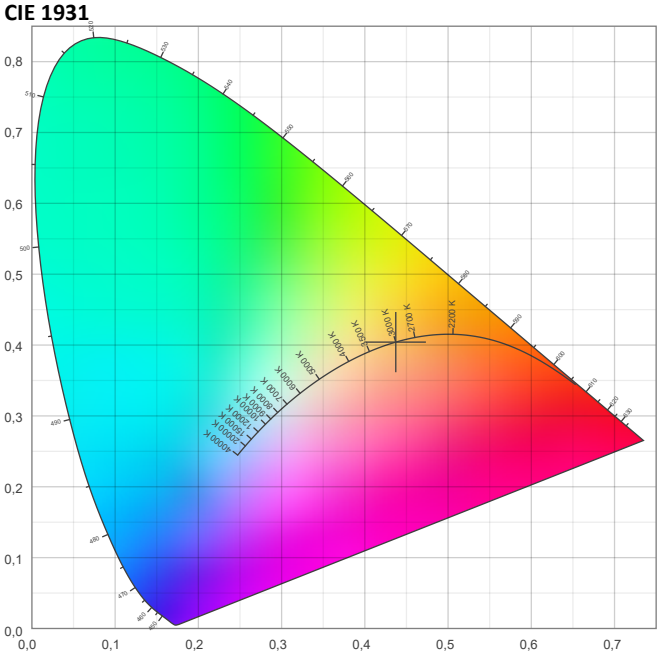
Light Measurement Report

Print date: 4-12-2024
Measurement date and time: 4-12-2024 16:16:12 – Measurement no. VFR-241204-2397-MS
Measurement tracking No. and Link: VT241204-005692
Operator:

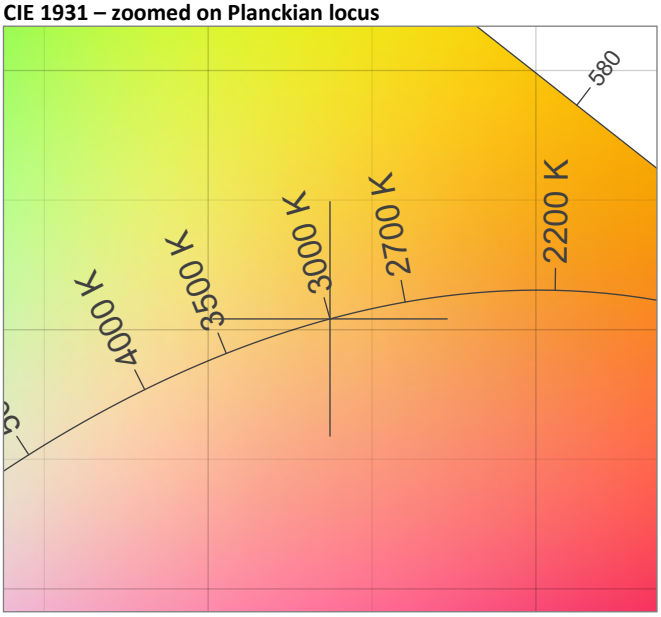
Color details

Correlated Color Temperature, Target	CCT = 3000 K
Correlated Color Temperature, Measured	CCT = 2944 K
Color Rendering Index	CRI 81,2
Color Rendering Index, R9 (red component)	R9 = 1,6
Color Rendering TM30-18	R_f 83,5 – R_g 95,3
Color Quality Scale	CQS = 80,2
MacAdam Steps	SDCM = 2,3
Color coordinates CIE 1931	(x;y) = (0,437;0,404)
Color coordinate CIEs 1960	(u;v) = (0,251;0,348)
Color deviation from BBL	Duv = -0,0016
Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0,251;0,521)

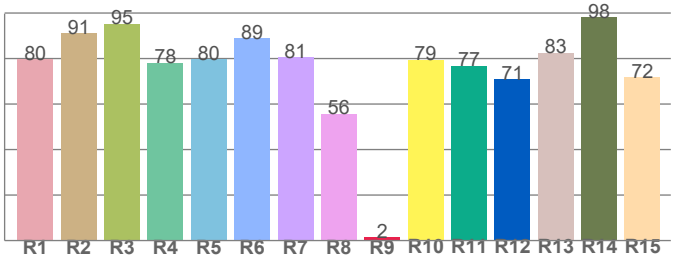
CIE 1931



CIE 1931 – zoomed on Planckian locus



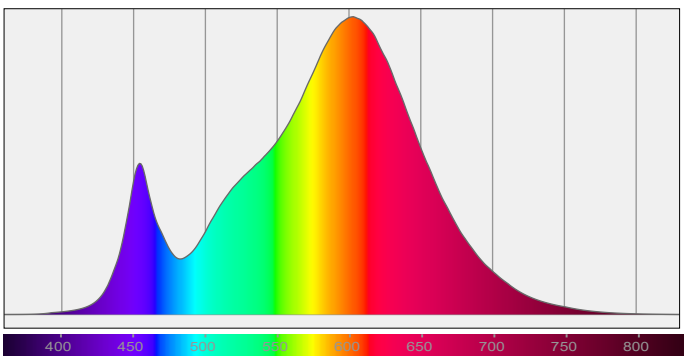
Color Rendering Index per reference color (CIE 1995)



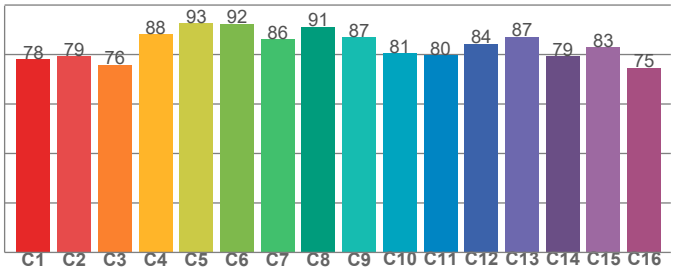
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
79,7	91,1	95,2	78,2	79,7	89,0	80,6	55,8	1,6	79,4	76,9	71,0	82,6	98,2	71,7

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



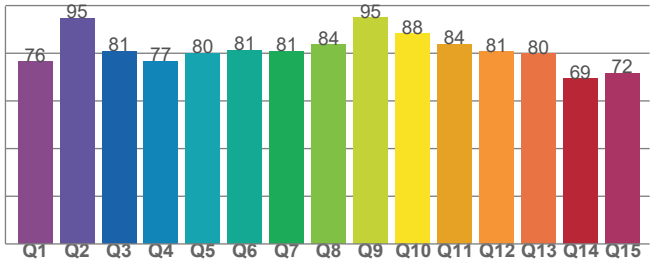
TM30-18 Rf-values per hue bin



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
78,2	79,2	75,9	88,2	92,6	92,4	86,1	91,2	86,9	80,5	79,8	84,4	87,3	79,2	82,9	74,6

Color Quality Scale by reference color



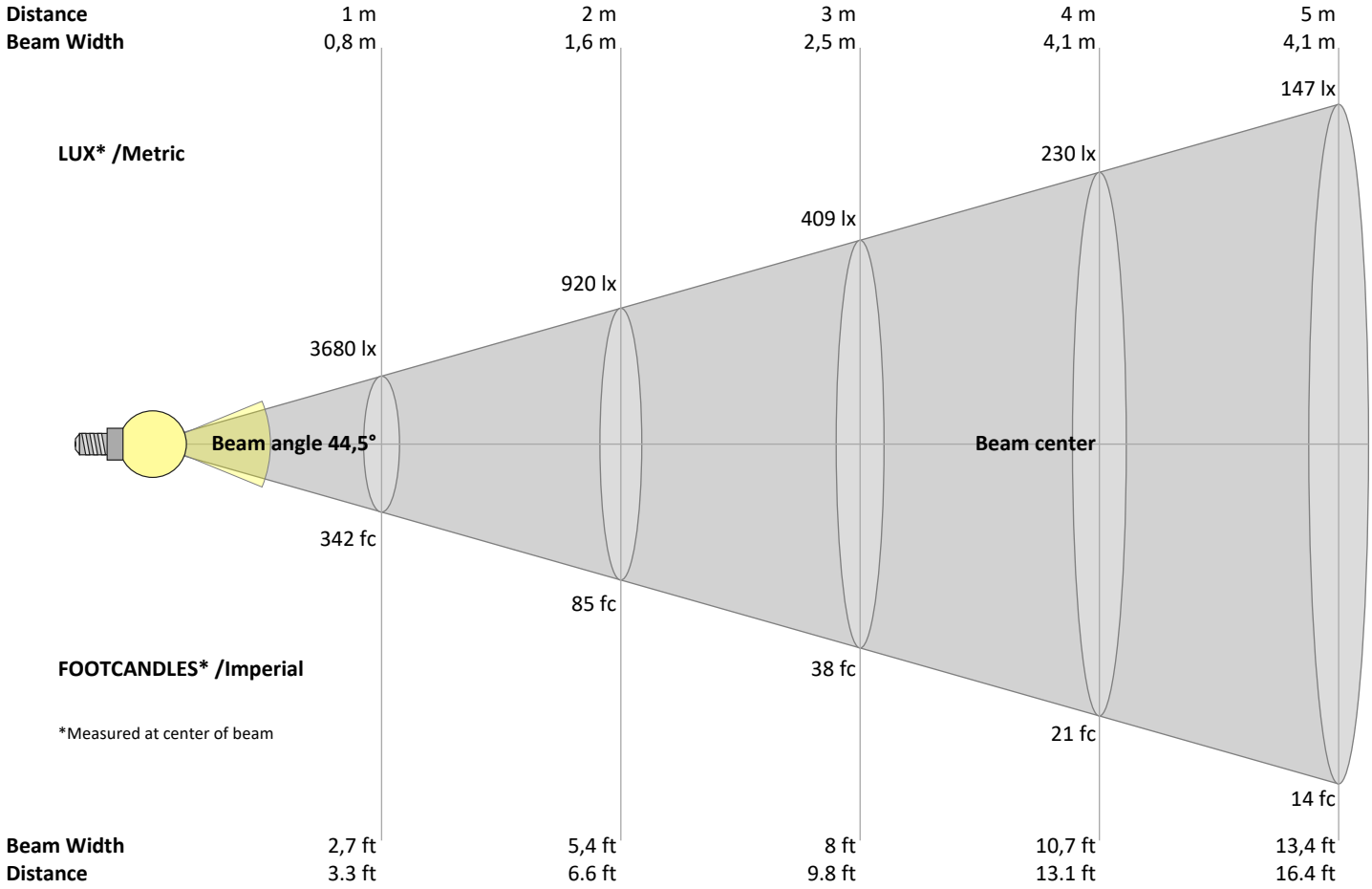
CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
76,4	94,8	80,9	76,6	80,1	81,3	81,0	83,6	95,0	88,2	83,8	80,6	79,8	69,3	71,6

Light Measurement Report

Print date: 4-12-2024
Measurement date and time: 4-12-2024 16:16:12 – Measurement no. VFR-241204-2397-MS
Measurement tracking No. and Link: VT241204-005692
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
3680	920	409	230	147	102	75	58	45	37	30	26	22	19	16	14	13	11	10	9	lux
341,9	85,5	38	21,4	13,7	9,5	7	5,3	4,2	3,4	2,8	2,4	2	1,7	1,5	1,3	1,2	1,1	0,9	0,9	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
3680	3680	3598	3505	3383	3215	3048	2835	2615	2383	2128	1873	1636	1401	1177	969	762	577	396	249	cd
100%	100%	98%	95%	92%	87%	83%	77%	71%	65%	58%	51%	44%	38%	32%	26%	21%	16%	11%	7%	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
3680	3680	3598	3505	3383	3215	3048	2835	2615	2383	2128	1873	1636	1401	1177	969	762	577	396	249	cd
100%	100%	98%	95%	92%	87%	83%	77%	71%	65%	58%	51%	44%	38%	32%	26%	21%	16%	11%	7%	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
3680	3680	3598	3505	3383	3215	3048	2835	2615	2383	2128	1873	1636	1401	1177	969	762	577	396	249	cd
100%	100%	98%	95%	92%	87%	83%	77%	71%	65%	58%	51%	44%	38%	32%	26%	21%	16%	11%	7%	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
3680	3680	3598	3505	3383	3215	3048	2835	2615	2383	2128	1873	1636	1401	1177	969	762	577	396	249	cd
100%	100%	98%	95%	92%	87%	83%	77%	71%	65%	58%	51%	44%	38%	32%	26%	21%	16%	11%	7%	of 0°val

Light Measurement Report

Print date: 4-12-2024
Measurement date and time: 4-12-2024 16:16:12 – Measurement no. VFR-241204-2397-MS
Measurement tracking No. and Link: VT241204-005692
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	19,2	19,8	19,3	20,0	20,2	19,2	19,8	19,3	20,0	20,2
	3H	18,9	19,6	19,3	19,8	20,0	18,9	19,6	19,3	19,8	20,0
	4H	18,8	19,5	19,2	19,7	20,0	18,8	19,5	19,2	19,7	20,0
	6H	18,8	19,4	19,1	19,7	20,1	18,8	19,4	19,1	19,7	20,1
	8H	18,8	19,3	19,1	19,7	20,0	18,8	19,3	19,1	19,7	20,0
	12H	18,7	19,3	19,1	19,6	20,0	18,7	19,3	19,1	19,6	20,0
4H	2H	18,8	19,5	19,2	19,7	20,0	18,8	19,5	19,2	19,7	20,0
	3H	18,7	19,3	19,1	19,6	20,0	18,7	19,3	19,1	19,6	20,0
	4H	18,6	19,1	19,0	19,5	20,0	18,6	19,1	19,0	19,5	20,0
	6H	18,5	19,0	19,0	19,4	19,7	18,5	19,0	19,0	19,4	19,7
	8H	18,5	18,9	19,0	19,3	19,7	18,5	18,9	19,0	19,3	19,7
	12H	18,4	18,8	18,9	19,2	19,6	18,4	18,8	18,9	19,2	19,6
8H	4H	18,5	18,9	19,0	19,3	19,6	18,5	18,9	19,0	19,3	19,6
	6H	18,4	18,7	18,9	19,2	19,7	18,4	18,7	18,9	19,2	19,7
	8H	18,4	18,6	18,9	19,2	19,8	18,4	18,6	18,9	19,2	19,8
	12H	18,3	18,5	18,9	19,0	19,7	18,3	18,5	18,9	19,0	19,7
12H	4H	18,4	18,8	18,9	19,2	19,6	18,4	18,8	18,9	19,2	19,6
	6H	18,4	18,6	18,9	19,2	19,8	18,4	18,6	18,9	19,2	19,8
	8H	18,3	18,5	18,9	19,0	19,6	18,3	18,5	18,9	19,0	19,6

Variations with the observer position for the luminaire spacings, S:		
S = 1.0H	5,9 / -14,4	5,9 / -14,4
S = 1.5H	8,6 / -14,8	8,6 / -14,8
S = 2.0H	10,6 / -15,1	10,6 / -15,1

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	114	111	109	107	112	109	107	105	105	104	102	101	100	99	98	97	96	94
2	109	105	101	98	107	103	100	97	100	97	95	97	95	93	94	92	91	89
3	104	99	94	91	102	97	93	90	95	91	88	92	89	87	90	88	86	84
4	100	93	88	85	98	92	88	84	90	86	83	88	85	82	86	83	81	80
5	96	88	83	79	94	87	82	79	86	81	78	84	80	77	82	79	77	75
6	92	84	78	75	90	83	78	74	81	77	74	80	76	73	79	75	73	71
7	88	80	74	70	86	79	74	70	78	73	70	76	72	69	75	72	69	68
8	84	76	70	67	83	75	70	67	74	70	66	73	69	66	72	68	66	64
9	81	72	67	63	80	72	67	63	71	66	63	70	66	63	69	65	63	61
10	78	69	64	60	77	68	64	60	68	63	60	67	63	60	66	62	60	59

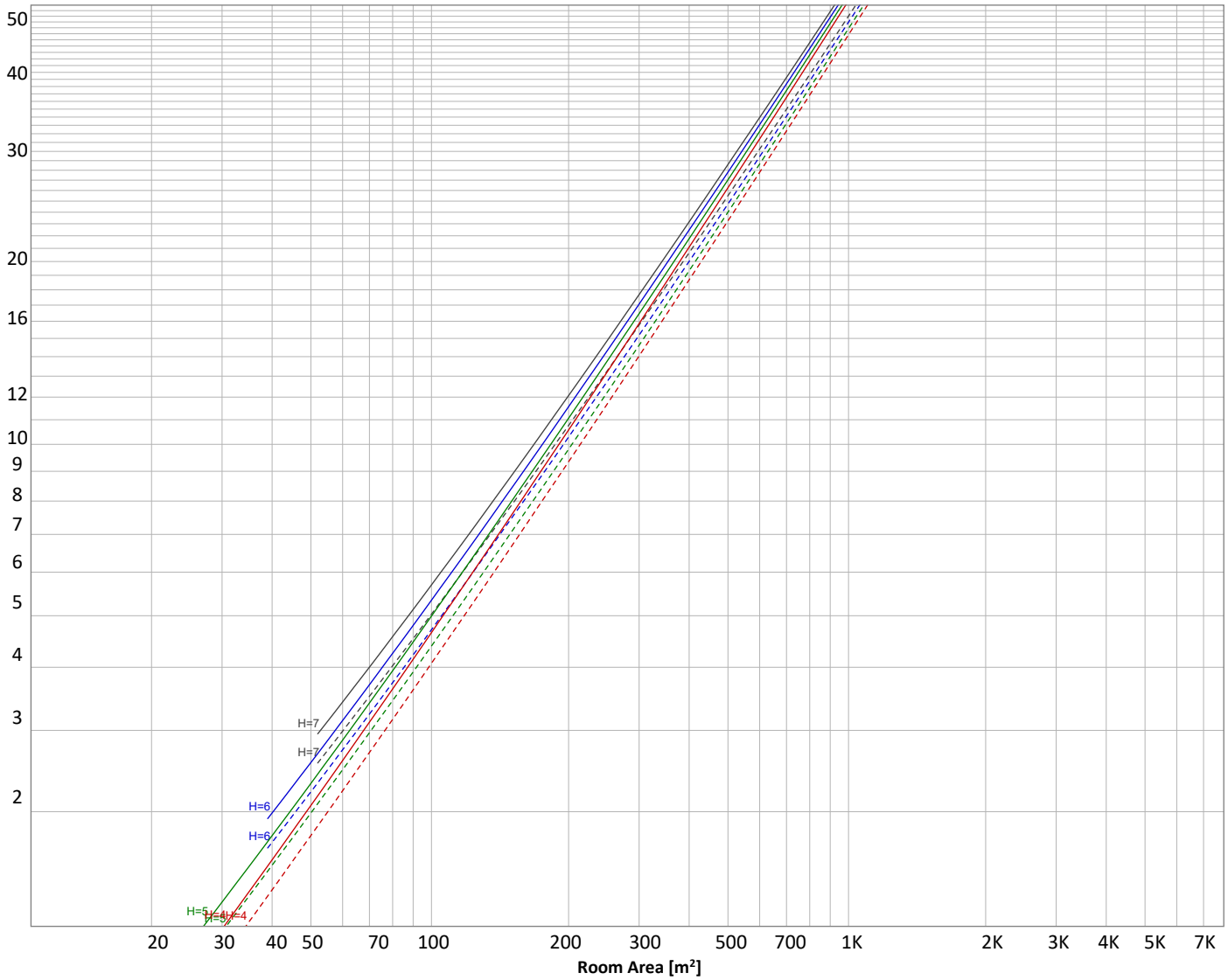
Light Measurement Report

Print date: 4-12-2024
Measurement date and time: 4-12-2024 16:16:12 – Measurement no. VFR-241204-2397-MS
Measurement tracking No. and Link: VT241204-005692
Operator:

Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 2123 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°
332 lm	758 lm	690 lm	300 lm	25,4 lm	4,56 lm	2,72 lm	1,64 lm	1,18 lm

90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
0,484 lm	0,476 lm	0,537 lm	0,729 lm	1,03 lm	1,53 lm	1,54 lm	1,08 lm	0,385 lm

Light Measurement Report

Print date: 4-12-2024
Measurement date and time: 4-12-2024 16:16:12 – Measurement no. VFR-241204-2397-MS
Measurement tracking No. and Link: VT241204-005692
Operator:

Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	332 lm	15,6%
10-20°	758 lm	35,7%
20-30°	690 lm	32,5%
30-40°	300 lm	14,1%
40-50°	25 lm	1,2%
50-60°	5 lm	0,2%
60-70°	3 lm	0,1%
70-80°	2 lm	0,1%
80-90°	1 lm	0,1%
90-100°	0 lm	0,0%
100-110°	0 lm	0,0%
110-120°	1 lm	0,0%
120-130°	1 lm	0,0%
130-140°	1 lm	0,0%
140-150°	2 lm	0,1%
150-160°	2 lm	0,1%
160-170°	1 lm	0,1%
170-180°	0 lm	0,0%
Total	2123 lm	100,0%

Intensity peaks

Max intensity	3680 cd
Intensity, 90°	1 cd
Intensity, 0°	3680 cd

Zonal Lumen summary

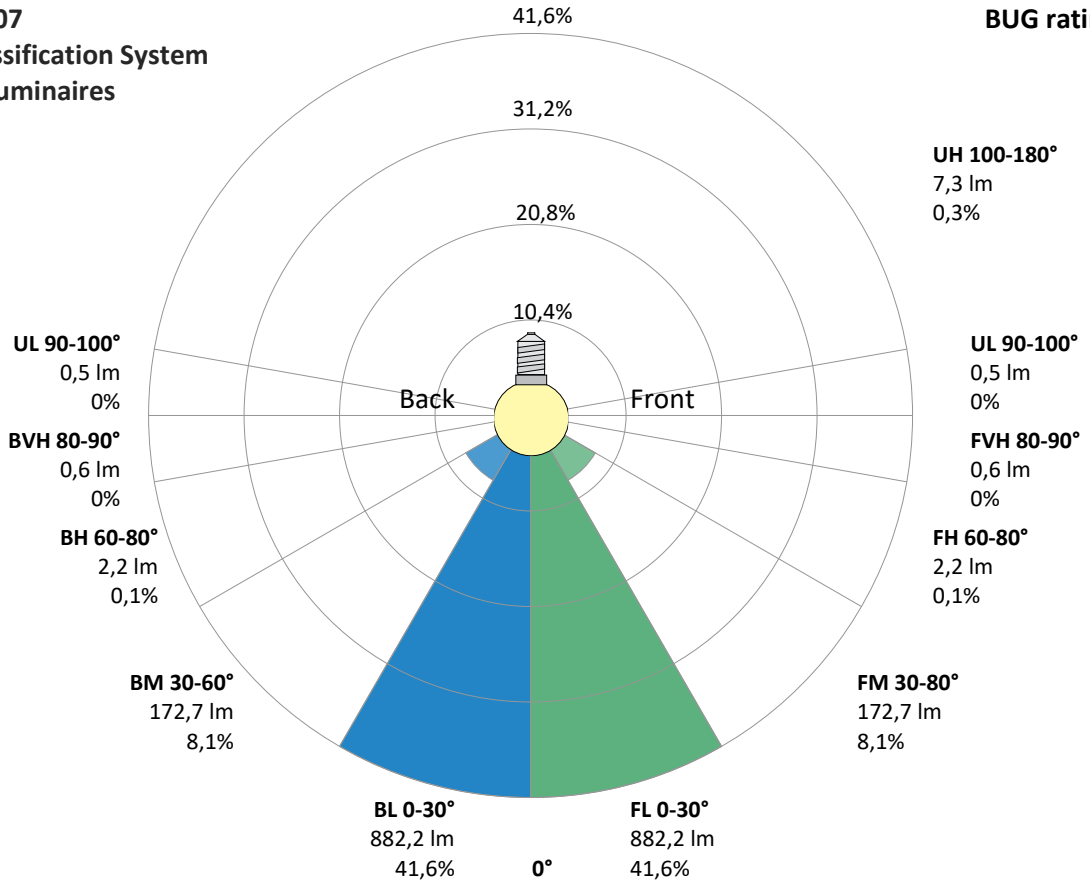
Zone (γ)	Lumen	% Total
0-30°	1779 lm	83,8%
0-40°	2080 lm	98,0%
0-60°	2110 lm	99,4%
60-90°	6 lm	0,3%
70-100°	3 lm	0,2%
90-120°	1 lm	0,1%
0-90°	2115 lm	99,6%
90-180°	8 lm	0,4%
0-180°	2123 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	882 lm	41,6%
Medium(30-60°)	173 lm	8,1%
High(60-80°)	2 lm	0,1%
Very high(80-90°)	1 lm	0,0%
Back light		
Low(0-30°)	882 lm	41,6%
Medium(30-60°)	173 lm	8,1%
High(60-80°)	2 lm	0,1%
Very high(80-90°)	1 lm	0,0%
Uplight		
Low(90-100°)	1 lm	0,0%
High(100-180°)	7 lm	0,3%

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

BUG rating B2 U1 G0



Light Measurement Report

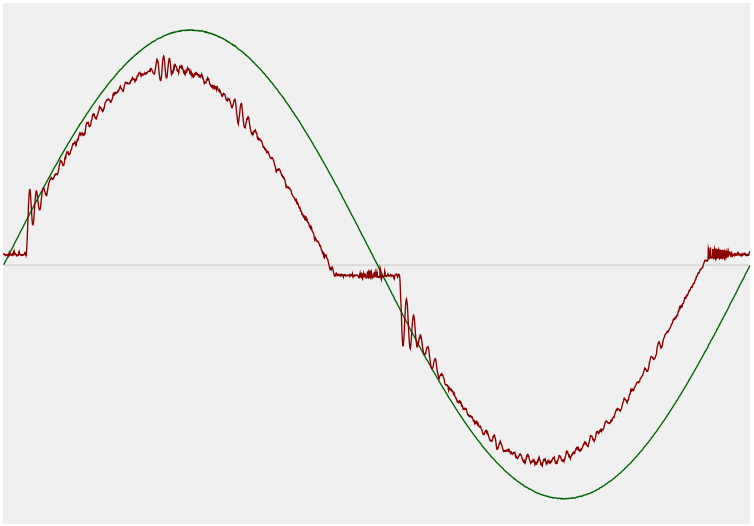
Print date: 4-12-2024
Measurement date and time: 4-12-2024 16:16:12 – Measurement no. VFR-241204-2397-MS
Measurement tracking No. and Link: VT241204-005692
Operator:

Power Details

Input Power

Power feed to light source	28,0 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,125 A
Volt-Ampere or apparent power = V_{RMS}*I_{RMS}	28,88 VA
Displacement factor of AC power feed	0,98
Power factor of AC current feed	0,97
Total harmonic distortion of the current	14,67%
Total harmonic distortion of the voltage	0,07%

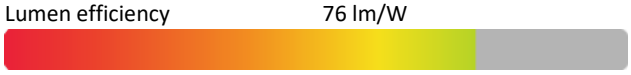
Input Power Curve



Efficiency

Radiated power efficiency 23,0%

Lumen efficiency 76 lm/W



Stabilization Details

Warmup Conditions

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

Color Temperature Change

CCT start	2998 K
CCT shift	+2 K
CCT end	3000 K

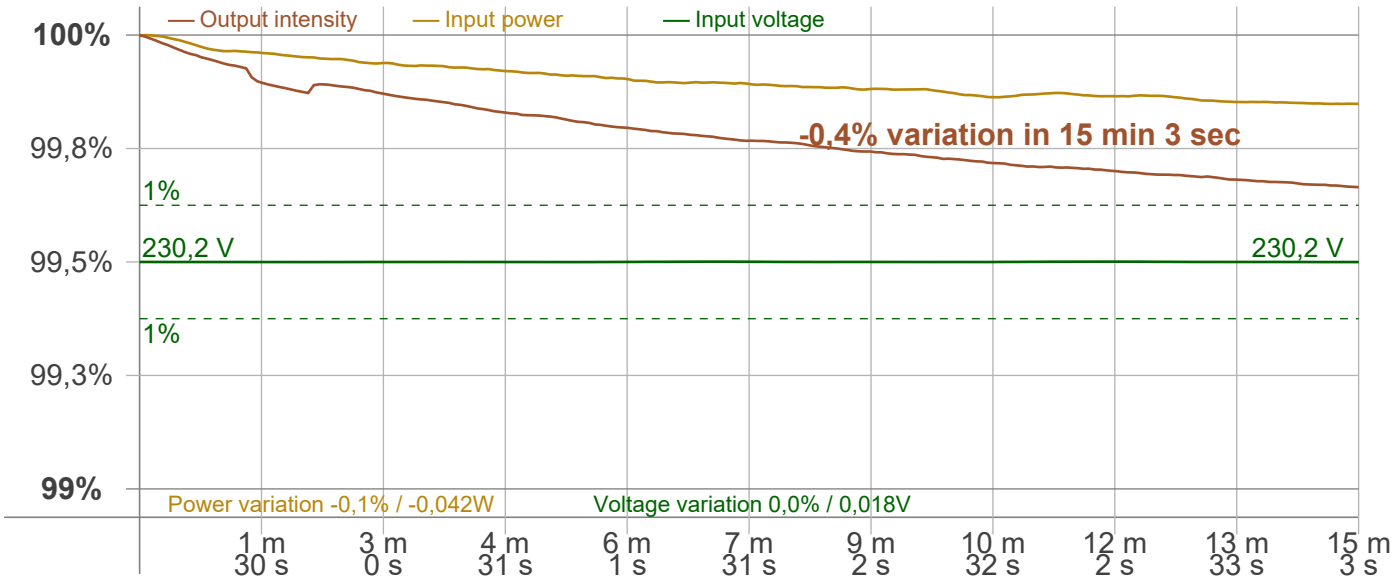
Warmup Result

Total warmup time	Lamp stabilized in 15 min 3 sec
Warmup variation	-0,4%

Output Change

Output start	2130 lm
Output change	-7 lm
Output end	2123 lm

Stabilization Curve



Light Measurement Report

Print date: 4-12-2024
Measurement date and time: 4-12-2024 16:16:12 – Measurement no. VFR-241204-2397-MS
Measurement tracking No. and Link: VT241204-005692
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	102,04 Hz
Percent Flicker	0,12 %
Flicker index	0

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	0,11 %
JA8/10 400 Hz	0,11 %
JA8/10 1000 Hz	0,12 %

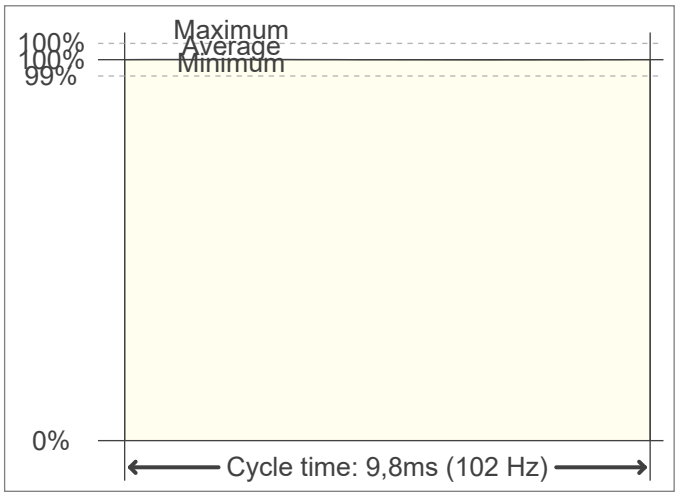
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

PstLM value (F < 80 Hz)	0,09
SVM value (80 < F < 2000 Hz)	0

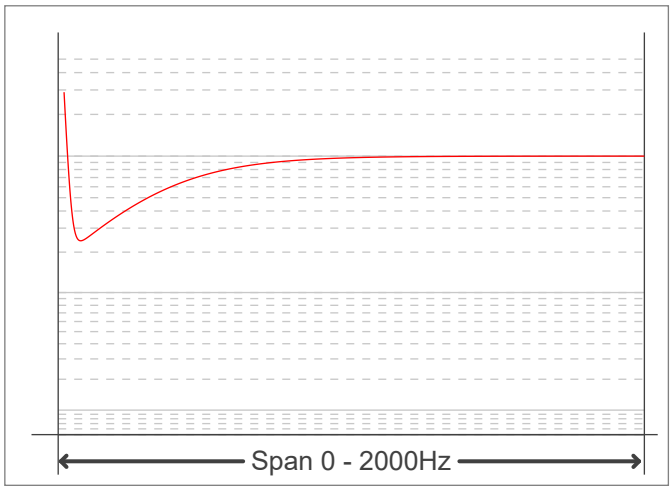
Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp	0,03

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot