

Light Measurement Report

Print date: 23-10-2024

Measurement date and time: 23-10-2024 10:49:06 – Measurement no. VFR-241023-1514-MS

Measurement tracking No. and Link: [VT241023-009259](#)

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

12 planes – 30°

5°

1,99 m

14,5 W – PF 0,97 – DPF 0,97

230 V – 0,065 A

50 Hz

Lamp stabilized in 15 min 1 sec – 2,0%

Tested Light Source

Product Name

Item No. and Manufacturer

Product Description (line 1)

DT170-5000K

DT170-5000K – Dutchfulfillment

LED DOWNLIGHT | ORTHO | CCT-SWITCH | Ø170 | 13W

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

1611 lm – 0,08% / 99,92%

111 lm/W

672 cd – 100°

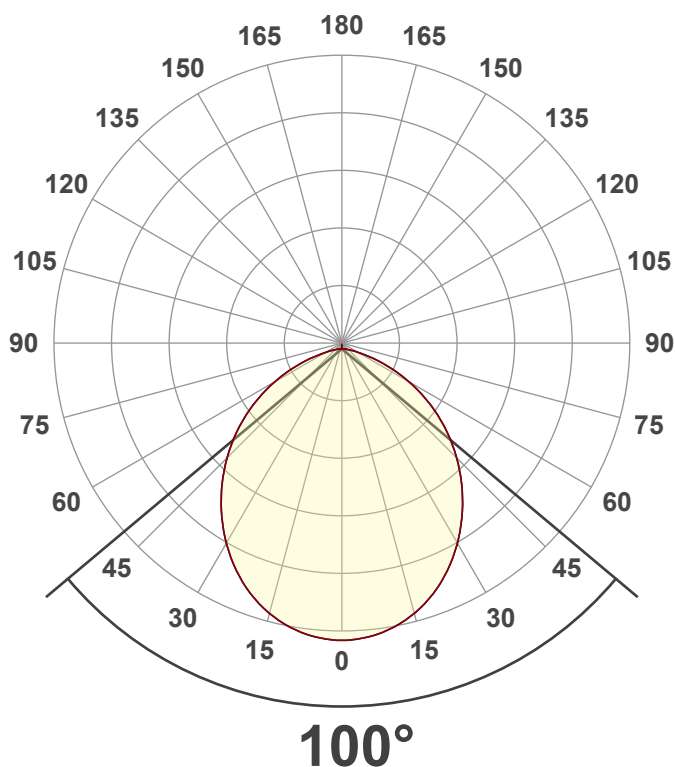
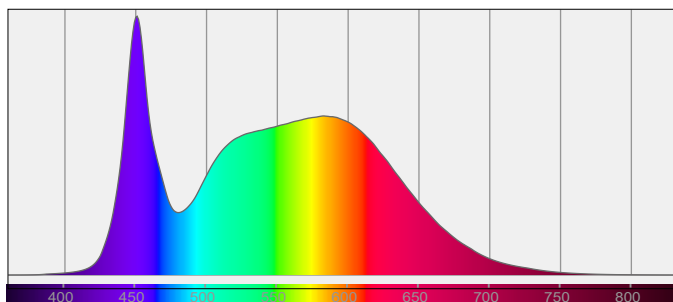
CCT = 5000 K / 5104 K

CRI 82,9

R_f 83,9 – R_g 96,2

Duv 0,0001 – SDCM 3,6

SVM 0,01 – PstLM 0,05



Light Measurement Report

Print date: 23-10-2024

Measurement date and time: 23-10-2024 10:49:06 – Measurement no. VFR-241023-1514-MS

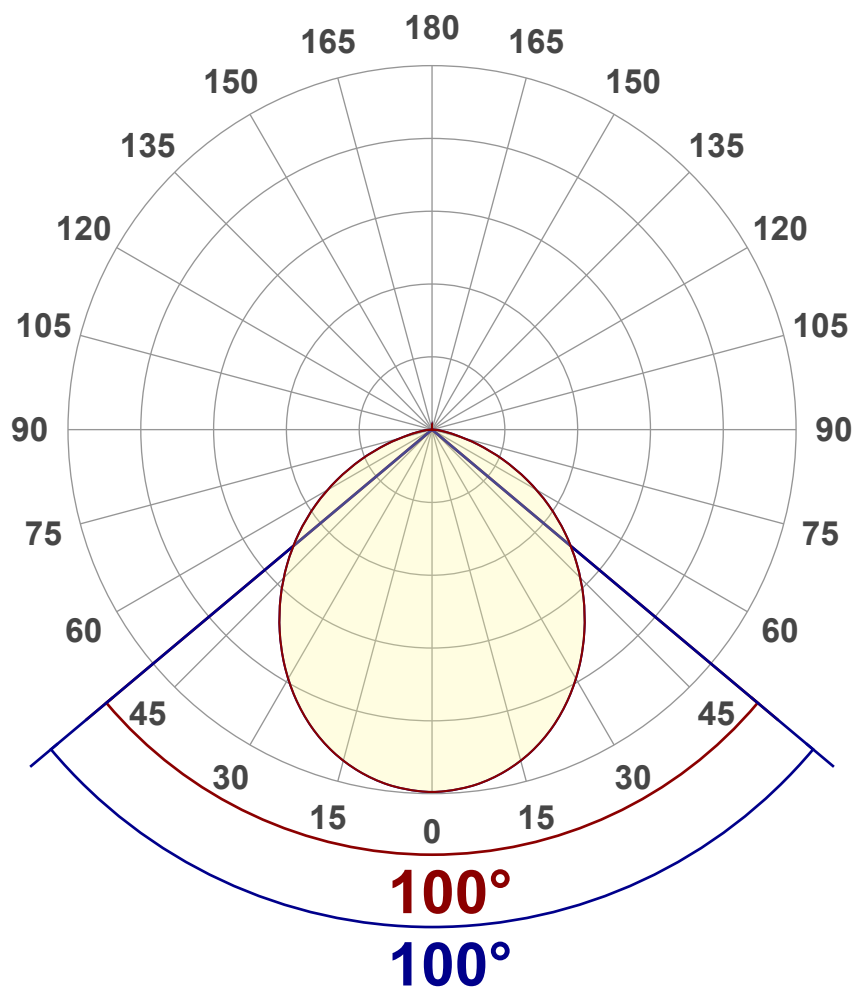
Measurement tracking No. and Link: [VT241023-009259](#)

Operator:



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	1611 lm
Lumen Up% / Down%	0,08% / 99,92%
Peak Intensity	672 cd
Beam Angle (50%)	100°
Beam Angle (90%)	100°
Beam Angle (10%)	100°

Cut-off Angle

Average 2,5%	165,9°
--------------	--------

Field Angle

Average 10%	149,2°
-------------	--------

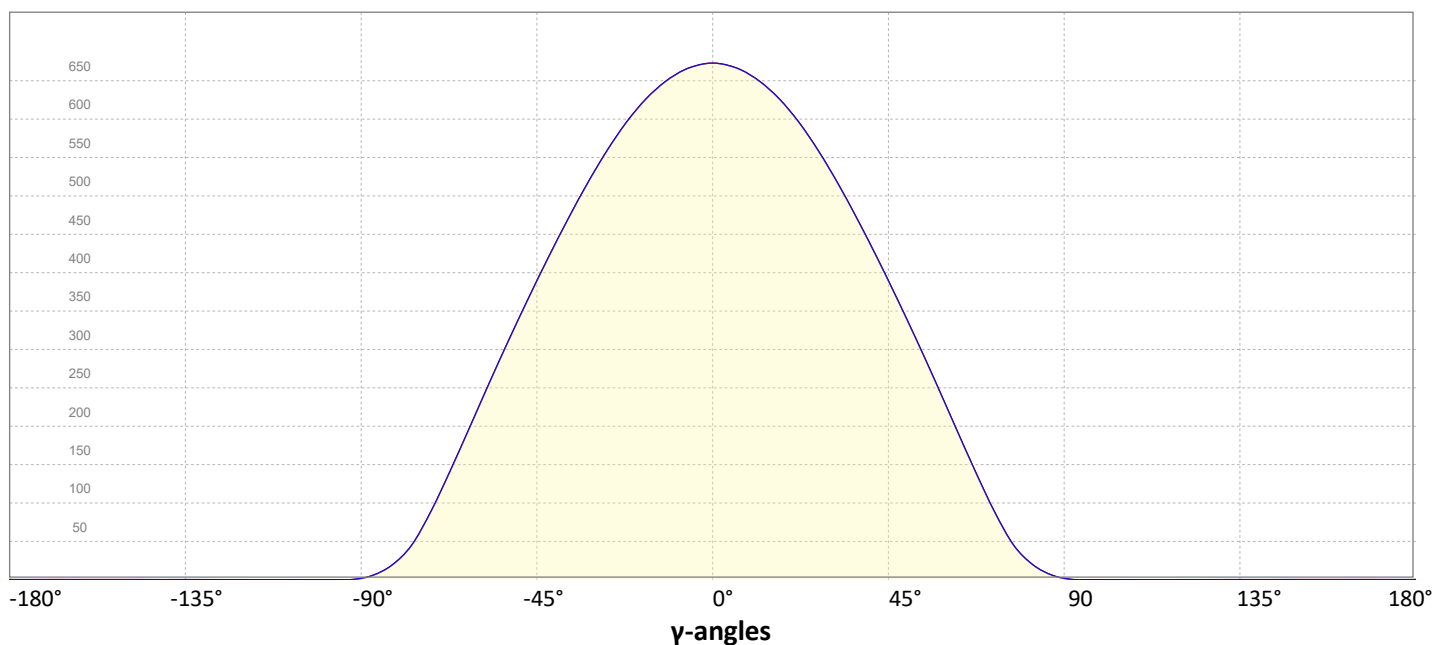
Intensity Ratio

In 120° cone	84,7%
In 90° cone	60,0%

C000-C180

C090-C270

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

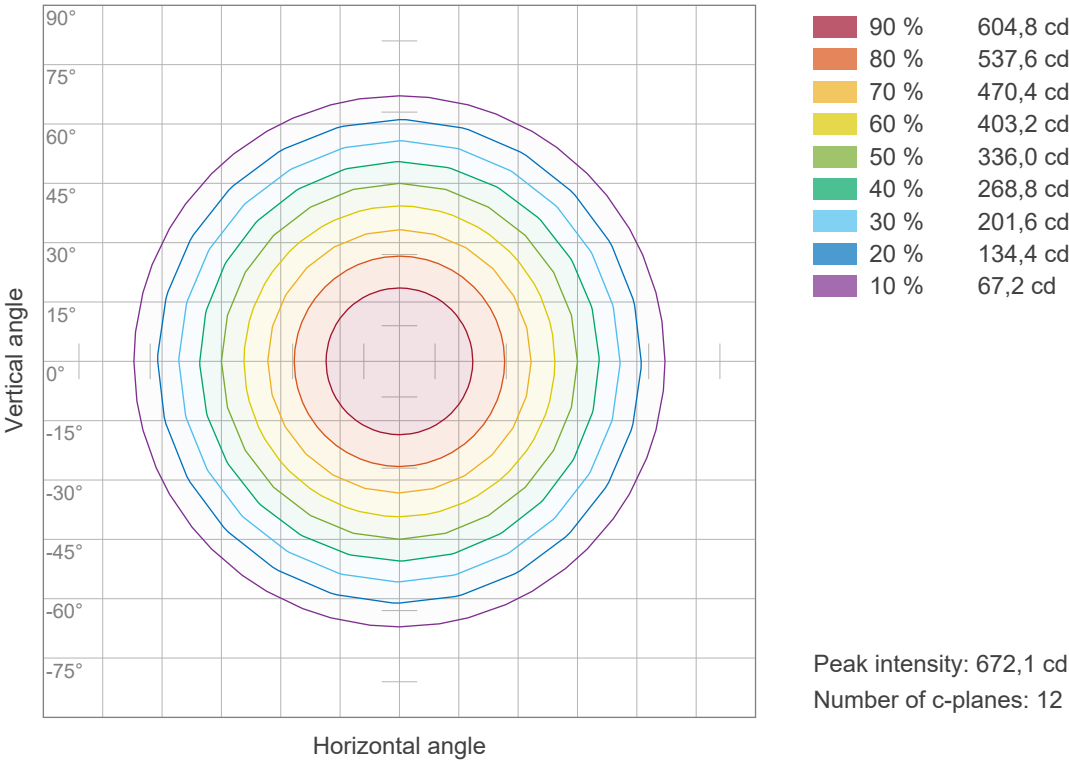


Light Measurement Report

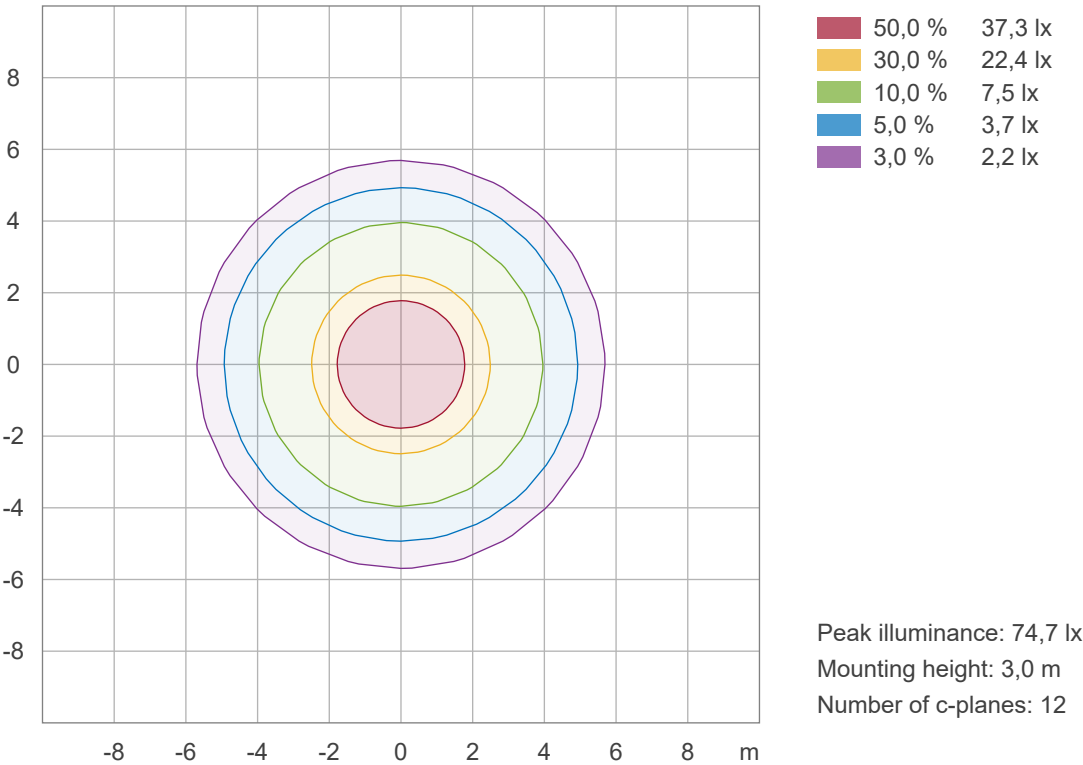
Print date: 23-10-2024
Measurement date and time: 23-10-2024 10:49:06 – Measurement no. VFR-241023-1514-MS
Measurement tracking No. and Link: [VT241023-009259](#)
Operator:



Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



Light Measurement Report

Print date: 23-10-2024

Measurement date and time: 23-10-2024 10:49:06 – Measurement no. VFR-241023-1514-MS

Measurement tracking No. and Link: [VT241023-009259](https://vfr.tracking.no/VT241023-009259)

Operator:

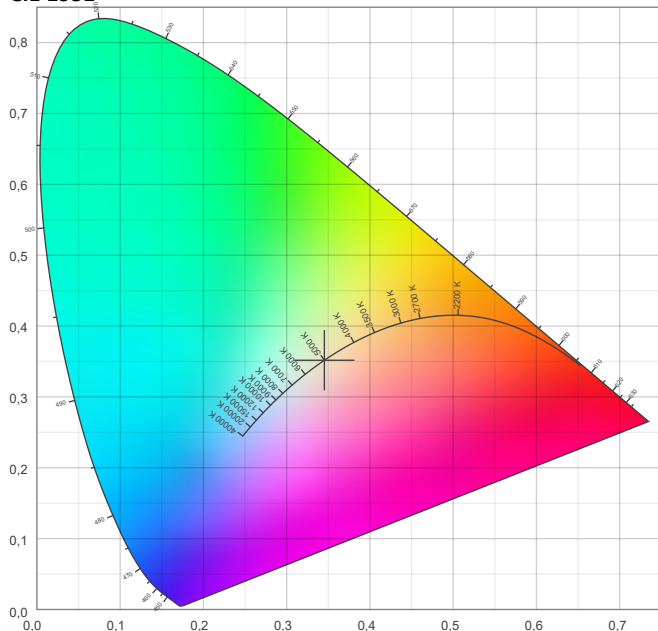


Color details

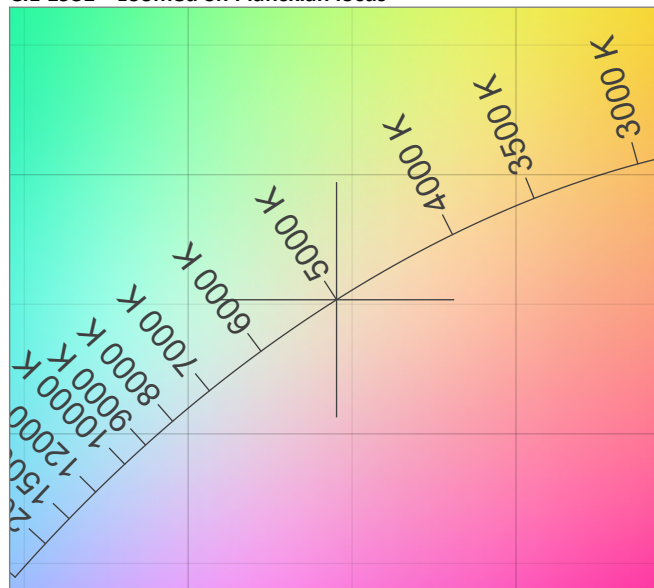
Correlated Color Temperature, Target CCT = 5000 K
Correlated Color Temperature, Measured CCT = 5104 K
Color Rendering Index CRI 82,9
Color Rendering Index, R9 (red component) R9 = 5,8
Color Rendering TM30-18 R_f 83,9 – R_g 96,2
Color Quality Scale CQS = 81,3

MacAdam Steps
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 = 0,0001
Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,211;0,485)

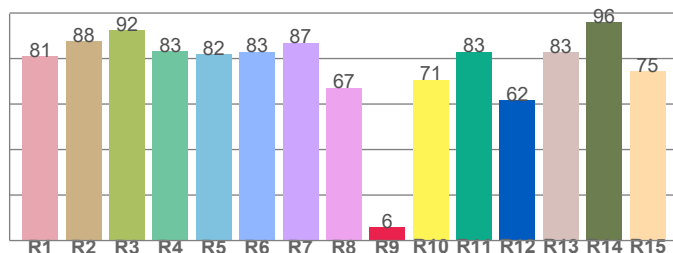
CIE 1931



CIE 1931 – zoomed on Planckian locus



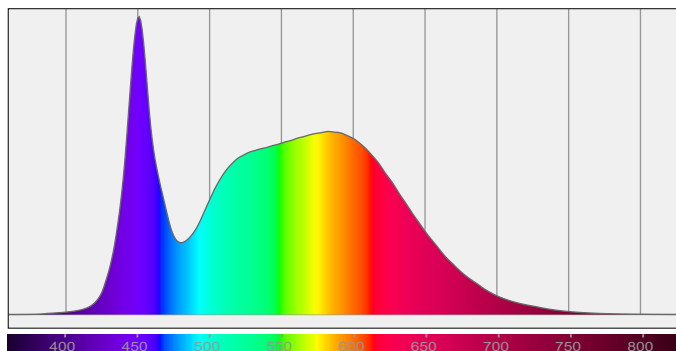
Color Rendering Index per reference color (CIE 1995)



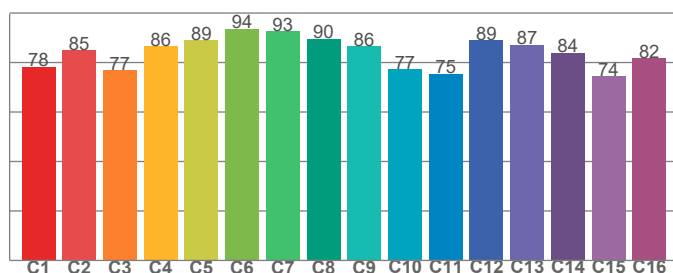
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
81,1	87,6	92,3	83,3	81,8	83,0	86,9	67,1	5,8	70,8	83,0	61,7	82,8	96,0	74,5

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



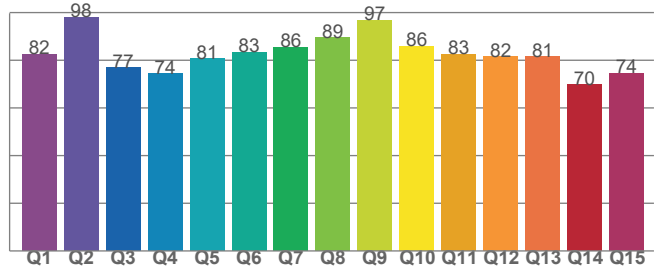
TM30-18 Rf-values per hue bin



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
78,3	85,0	76,9	86,5	89,1	93,6	92,7	89,7	86,5	77,3	75,5	89,0	87,2	83,9	74,4	81,7

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
82,5	98,1	76,9	74,4	80,7	83,3	85,6	89,4	96,7	86,0	82,6	81,5	81,5	69,8	74,5

Light Measurement Report

Print date: 23-10-2024

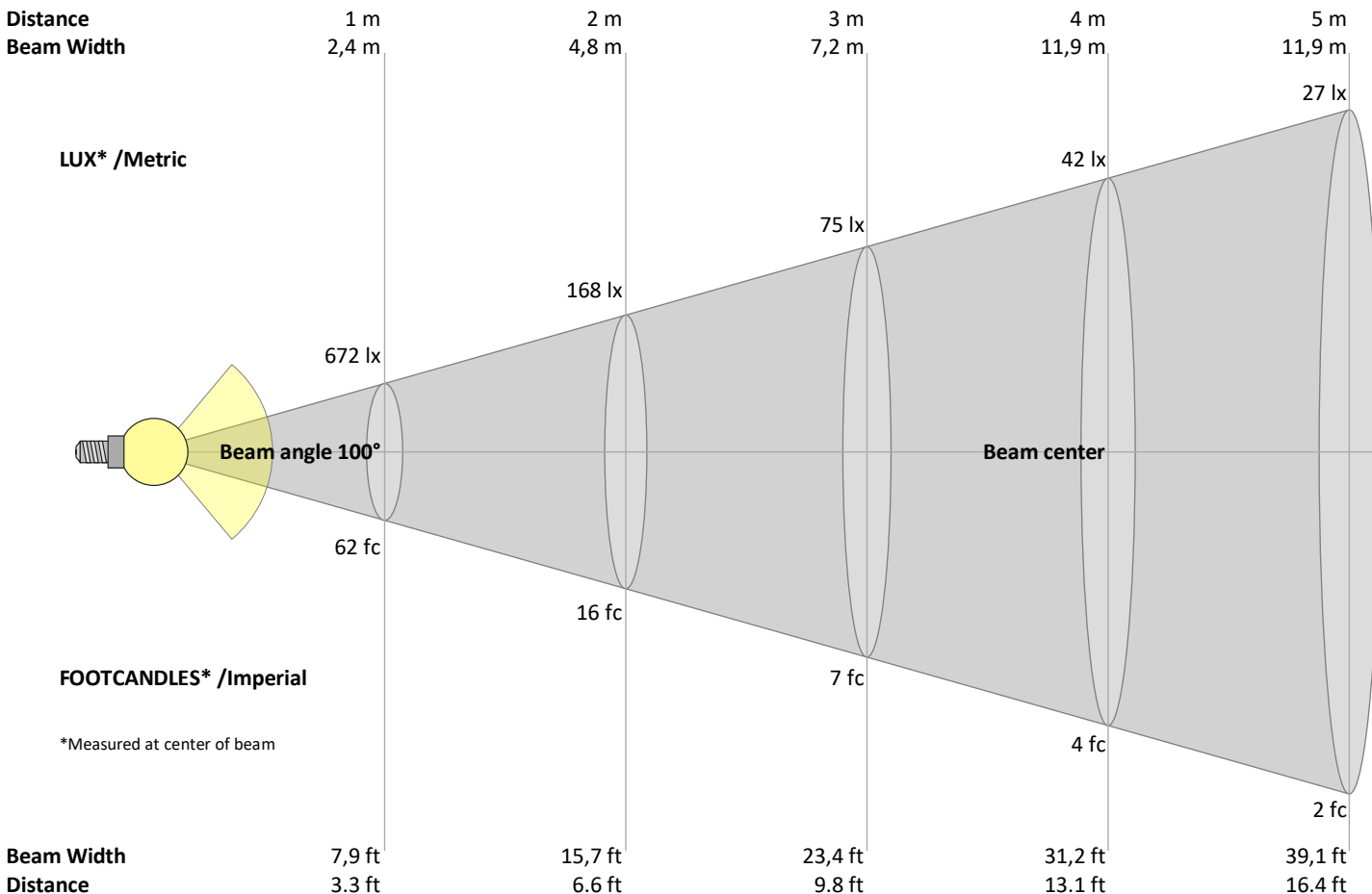
Measurement date and time: 23-10-2024 10:49:06 – Measurement no. VFR-241023-1514-MS

Measurement tracking No. and Link: [VT241023-009259](#)

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
672	168	75	42	27	19	14	11	8	7	6	5	4	3	3	3	2	2	2	2	lux
62,4	15,6	6,9	3,9	2,5	1,7	1,3	1	0,8	0,6	0,5	0,4	0,4	0,3	0,3	0,2	0,2	0,2	0,2	0,2	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
672	668	655	636	609	574	534	489	440	389	336	281	224	167	112	63	30	11	3	0	cd
100%	99%	98%	95%	91%	85%	79%	73%	66%	58%	50%	42%	33%	25%	17%	9%	4%	2%	0%	0%	of 0°va

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
672	668	655	636	609	574	534	489	440	389	336	281	224	167	112	63	30	11	3	0	cd
100%	99%	98%	95%	91%	85%	79%	73%	66%	58%	50%	42%	33%	25%	17%	9%	4%	2%	0%	0%	of 0°va

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
672	668	655	636	609	574	534	489	440	389	336	281	224	167	112	63	30	11	3	0	cd
100%	99%	98%	95%	91%	85%	79%	73%	66%	58%	50%	42%	33%	25%	17%	9%	4%	2%	0%	0%	of 0°va

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
672	668	655	636	609	574	534	489	440	389	336	281	224	167	112	63	30	11	3	0	cd
100%	99%	98%	95%	91%	85%	79%	73%	66%	58%	50%	42%	33%	25%	17%	9%	4%	2%	0%	0%	of 0°va

Light Measurement Report

Print date: 23-10-2024

Measurement date and time: 23-10-2024 10:49:06 – Measurement no. VFR-241023-1514-MS

Measurement tracking No. and Link: [VT241023-009259](#)

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		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	23,4	24,5	23,6	24,8	25,0	23,4	24,5	23,6	24,8	25,0
	3H	24,3	25,5	24,7	25,7	25,9	24,3	25,5	24,7	25,7	25,9
	4H	24,5	25,7	24,9	25,9	26,2	24,5	25,7	24,9	25,9	26,2
	6H	24,7	25,7	25,0	26,0	26,3	24,7	25,7	25,0	26,0	26,3
	8H	24,7	25,7	25,0	26,0	26,4	24,7	25,7	25,0	26,0	26,4
	12H	24,7	25,6	25,0	25,9	26,4	24,7	25,6	25,0	25,9	26,4
4H	2H	23,8	24,9	24,2	25,2	25,5	23,8	24,9	24,2	25,2	25,5
	3H	25,0	25,9	25,3	26,2	26,7	25,0	25,9	25,3	26,2	26,7
	4H	25,2	26,1	25,7	26,5	27,0	25,2	26,1	25,7	26,5	27,0
	6H	25,4	26,2	25,9	26,6	26,9	25,4	26,2	25,9	26,6	26,9
	8H	25,4	26,1	25,9	26,5	26,9	25,4	26,1	25,9	26,5	26,9
	12H	25,4	26,0	25,9	26,4	26,9	25,4	26,0	25,9	26,4	26,9
8H	4H	25,3	26,1	25,8	26,4	26,8	25,3	26,1	25,8	26,4	26,8
	6H	25,6	26,1	26,1	26,6	27,1	25,6	26,1	26,1	26,6	27,1
	8H	25,6	26,1	26,1	26,6	27,3	25,6	26,1	26,1	26,6	27,3
	12H	25,6	26,0	26,2	26,6	27,2	25,6	26,0	26,2	26,6	27,2
12H	4H	25,3	25,9	25,8	26,3	26,8	25,3	25,9	25,8	26,3	26,8
	6H	25,6	26,1	26,1	26,6	27,2	25,6	26,1	26,1	26,6	27,2
	8H	25,6	26,0	26,2	26,5	27,2	25,6	26,0	26,2	26,5	27,2
Variations with the observer position for the luminaire spacings, S:											
S = 1.0H		0,2 / -0,2					0,2 / -0,2				
S = 1.5H		0,4 / -0,6					0,4 / -0,6				
S = 2.0H		0,9 / -1,3					0,9 / -1,3				

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	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	110	106	102	98	107	103	100	97	99	96	94	95	93	91	92	90	88	86
2	101	93	87	82	98	91	85	81	88	83	79	84	80	77	81	78	75	73
3	92	82	75	69	90	81	74	68	78	72	67	75	70	66	73	68	65	63
4	85	73	65	59	83	72	64	58	70	63	58	67	62	57	65	60	56	54
5	78	66	57	51	76	65	57	51	63	56	50	61	55	50	59	54	49	47
6	72	60	51	45	71	59	51	45	57	50	44	55	49	44	54	48	44	42
7	67	54	46	40	66	53	45	40	52	45	39	50	44	39	49	43	39	37
8	63	50	41	36	61	49	41	36	48	40	35	46	40	35	45	39	35	33
9	59	46	38	32	57	45	37	32	44	37	32	43	36	32	42	36	32	30
10	55	42	34	29	54	42	34	29	41	34	29	40	33	29	39	33	29	27

Light Measurement Report

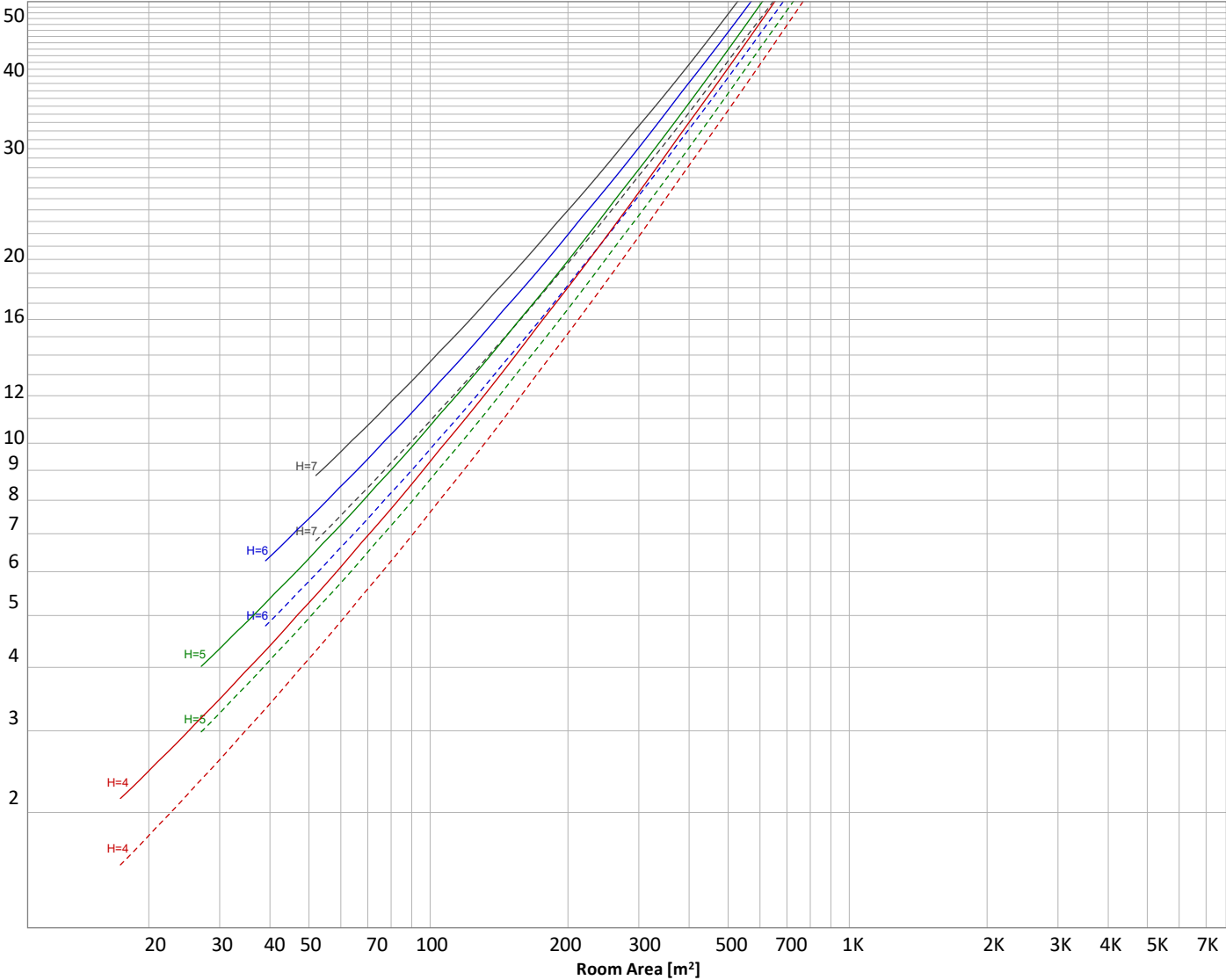
Print date: 23-10-2024
Measurement date and time: 23-10-2024 10:49:06 – Measurement no. VFR-241023-1514-MS
Measurement tracking No. and Link: [VT241023-009259](#)
Operator:



Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 1611 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°
63,5 lm	179 lm	265 lm	306 lm	300 lm	251 lm	165 lm	67,7 lm	12,7 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
0,275 lm	0,143 lm	0,159 lm	0,151 lm	0,166 lm	0,141 lm	0,119 lm	0,072 lm	0,023 lm

Light Measurement Report

Print date: 23-10-2024

Measurement date and time: 23-10-2024 10:49:06 – Measurement no. VFR-241023-1514-MS

Measurement tracking No. and Link: [VT241023-009259](#)

Operator:



Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	63 lm	3,9%
10-20°	179 lm	11,1%
20-30°	265 lm	16,4%
30-40°	306 lm	19,0%
40-50°	300 lm	18,6%
50-60°	251 lm	15,6%
60-70°	165 lm	10,2%
70-80°	68 lm	4,2%
80-90°	13 lm	0,8%
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	1611 lm	100,0%

Intensity peaks

Max intensity	672 cd
Intensity, 90°	3 cd
Intensity, 0°	672 cd

Zonal Lumen summary

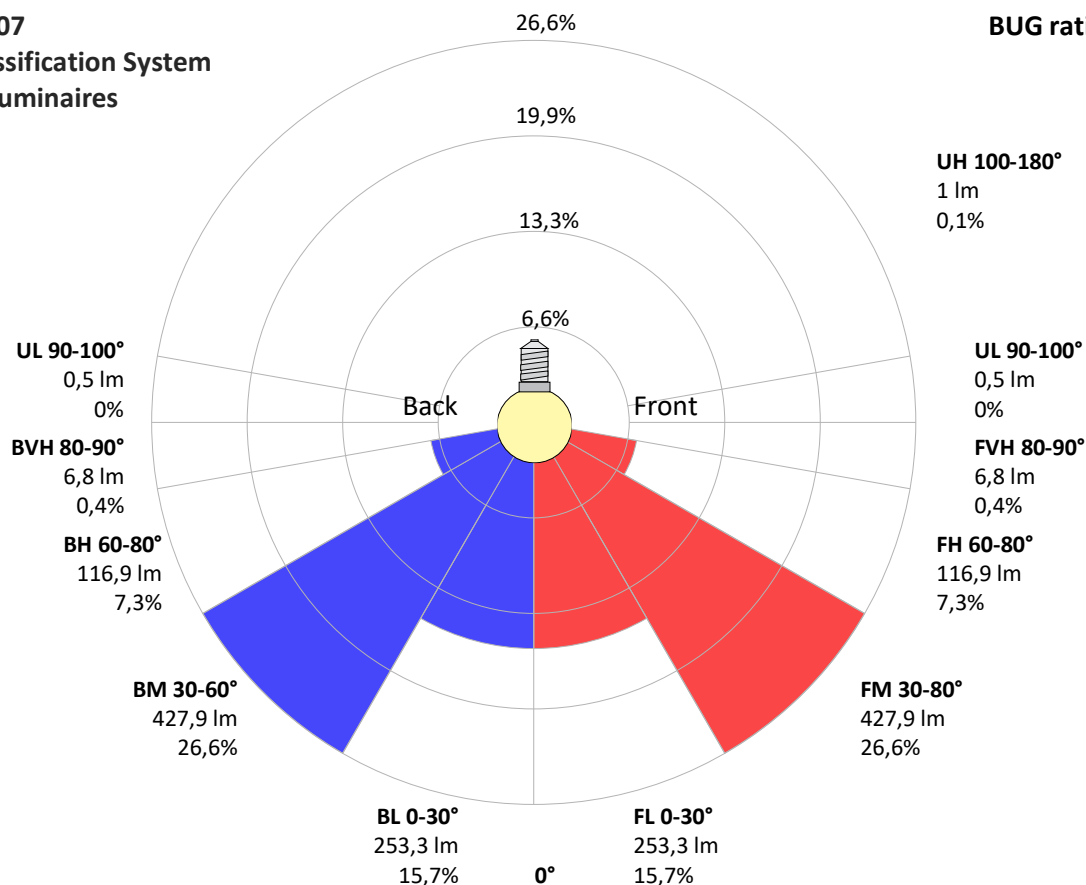
Zone (γ)	Lumen	% Total
0-30°	508 lm	31,5%
0-40°	814 lm	50,5%
0-60°	1365 lm	84,7%
60-90°	245 lm	15,2%
70-100°	81 lm	5,0%
90-120°	1 lm	0,0%
0-90°	1610 lm	99,9%
90-180°	1 lm	0,1%
0-180°	1611 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	253 lm	15,7%
Medium(30-60°)	428 lm	26,6%
High(60-80°)	117 lm	7,3%
Very high(80-90°)	7 lm	0,4%
Back light		
Low(0-30°)	253 lm	15,7%
Medium(30-60°)	428 lm	26,6%
High(60-80°)	117 lm	7,3%
Very high(80-90°)	7 lm	0,4%
Uplight		
Low(90-100°)	1 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: 23-10-2024
Measurement date and time: 23-10-2024 10:49:06 – Measurement no. VFR-241023-1514-MS
Measurement tracking No. and Link: [VT241023-009259](#)
Operator:

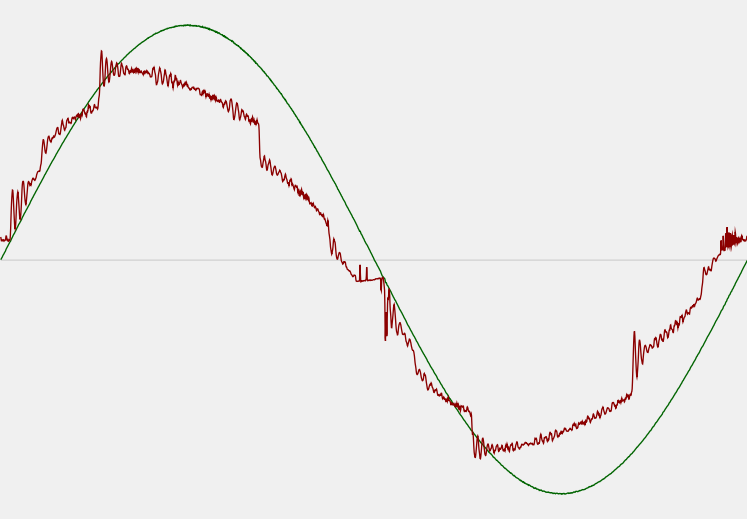


Power Details

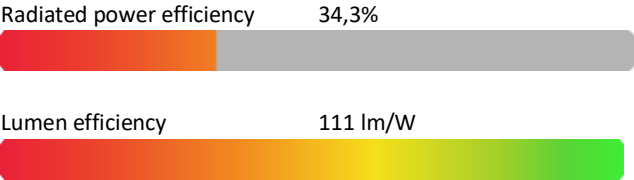
Input Power

Power feed to light source	14,5 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,065 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	14,96 VA
Displacement factor of AC power feed	0,97
Power factor of AC current feed	0,97
Total harmonic distortion of the current	7,79%
Total harmonic distortion of the voltage	0,06%

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	4975 K
CCT shift	+25 K
CCT end	5000 K

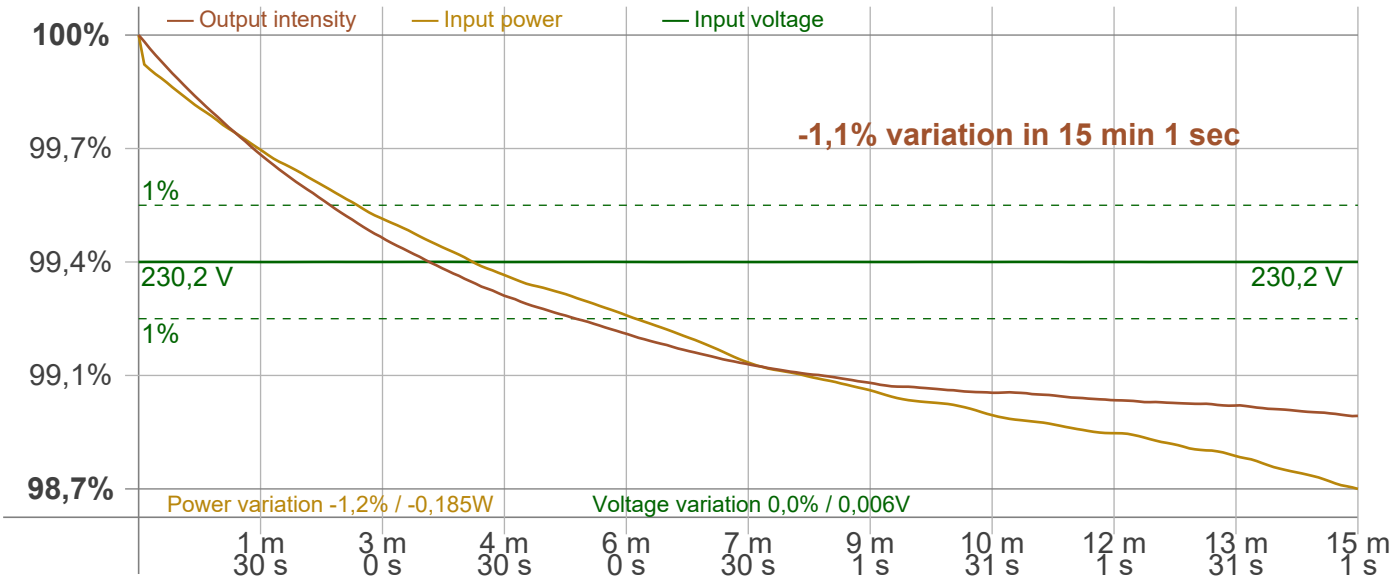
Warmup Result

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

Output Change

Output start	1629 lm
Output change	-18 lm
Output end	1611 lm

Stabilization Curve



Light Measurement Report

Print date: 23-10-2024
Measurement date and time: 23-10-2024 10:49:06 – Measurement no. VFR-241023-1514-MS
Measurement tracking No. and Link: [VT241023-009259](#)
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

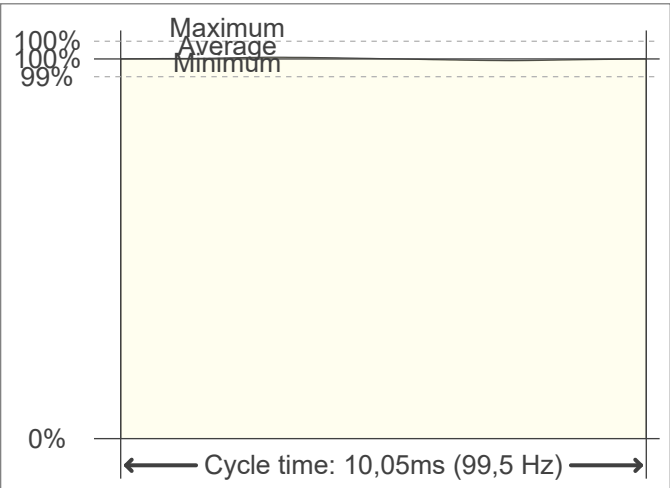
Flicker indices according to Illuminating Engineering Society (IES)
Flicker frequency 99,5 Hz
Percent Flicker 0,48 %
Flicker index 0

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 0,41 %
JA8/10 400 Hz 0,47 %
JA8/10 1000 Hz 0,47 %

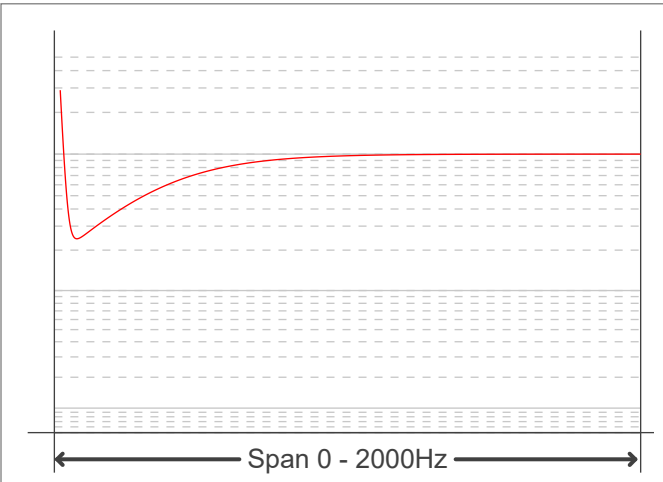
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)
PstLM value (F < 80 Hz) 0,05
SVM value (80 < F < 2000 Hz) 0,01

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

