

Light Measurement Report

Print date: 23-10-2024

Measurement date and time: 23-10-2024 13:22:31 – Measurement no. VFR-241023-1529-MS

Measurement tracking No. and Link: [VT241023-002235](https://vt241023-002235)

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
14,4 W – PF 0,96 – DPF 0,97
230 V – 0,065 A
50 Hz
Lamp stabilized in 15 min 2 sec – 2,0%

Tested Light Source

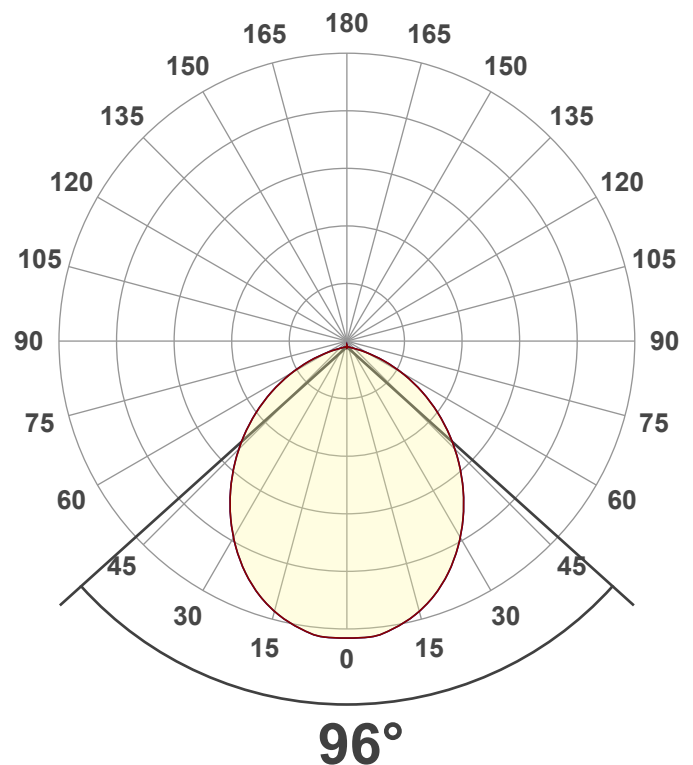
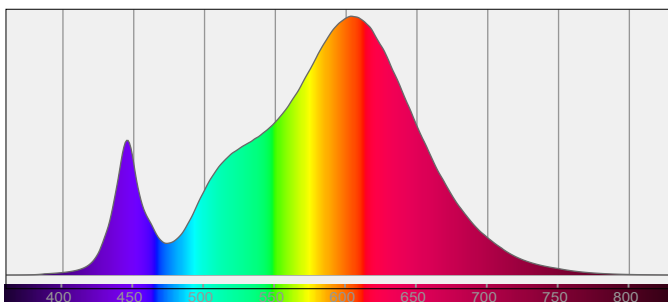
Product Name
Item No. and Manufacturer
Product Description (line 1)

271371-3000K
271371-3000K – Dutchfulfillment
LED DOWNLIGHT | ORTHO | CCT-SWITCH | Ø170 | 15W |

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

1361 lm – 0,08% / 99,92%
94 lm/W
606 cd – 96°
CCT = 3000 K / 2964 K
CRI 82,8
 R_f 83,9 – R_g 98,5
Duv -0,0002 – SDCM 1,3
SVM 0,75 – PstLM 0,03



Light Measurement Report

Print date: 23-10-2024

Measurement date and time: 23-10-2024 13:22:31 – Measurement no. VFR-241023-1529-MS

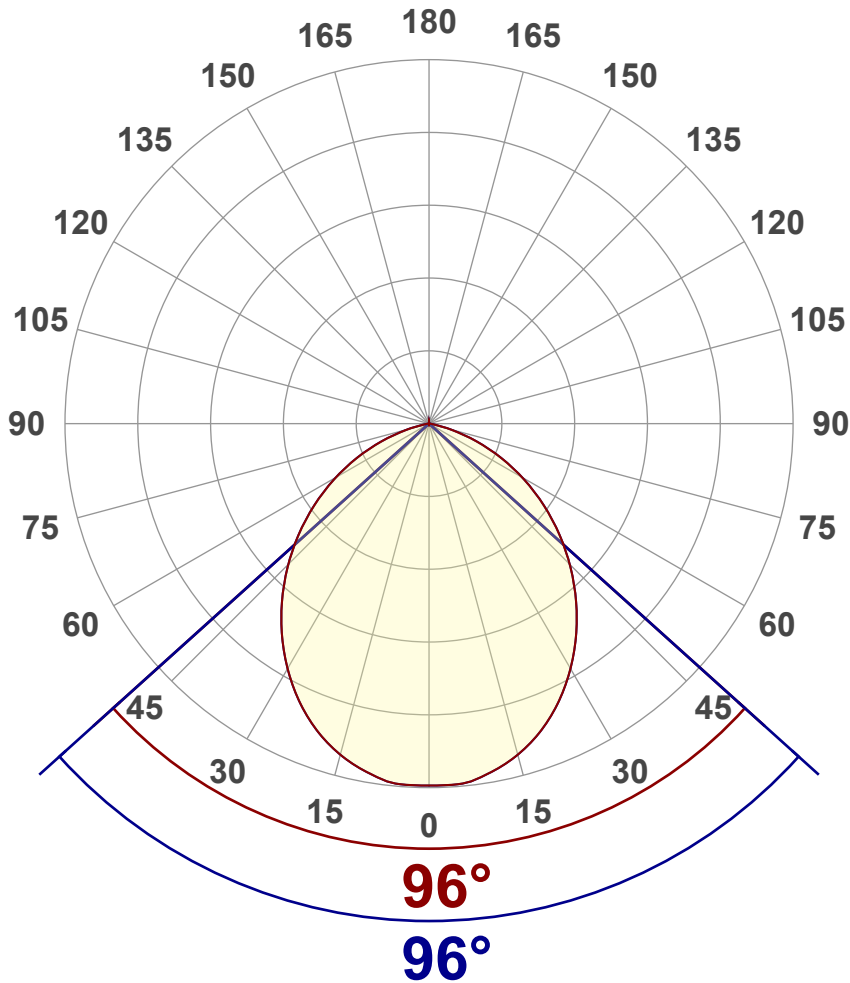
Measurement tracking No. and Link: [VT241023-002235](https://www.viso-systems.com/VT241023-002235)

Operator:



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	1361 lm
Lumen Up% / Down%	0,08% / 99,92%
Peak Intensity	606 cd
Beam Angle (50%)	96°
Beam Angle (90%)	96°
Beam Angle (10%)	96°

Cut-off Angle

Average 2,5%	157,3°
--------------	--------

Field Angle

Average 10%	144,5°
-------------	--------

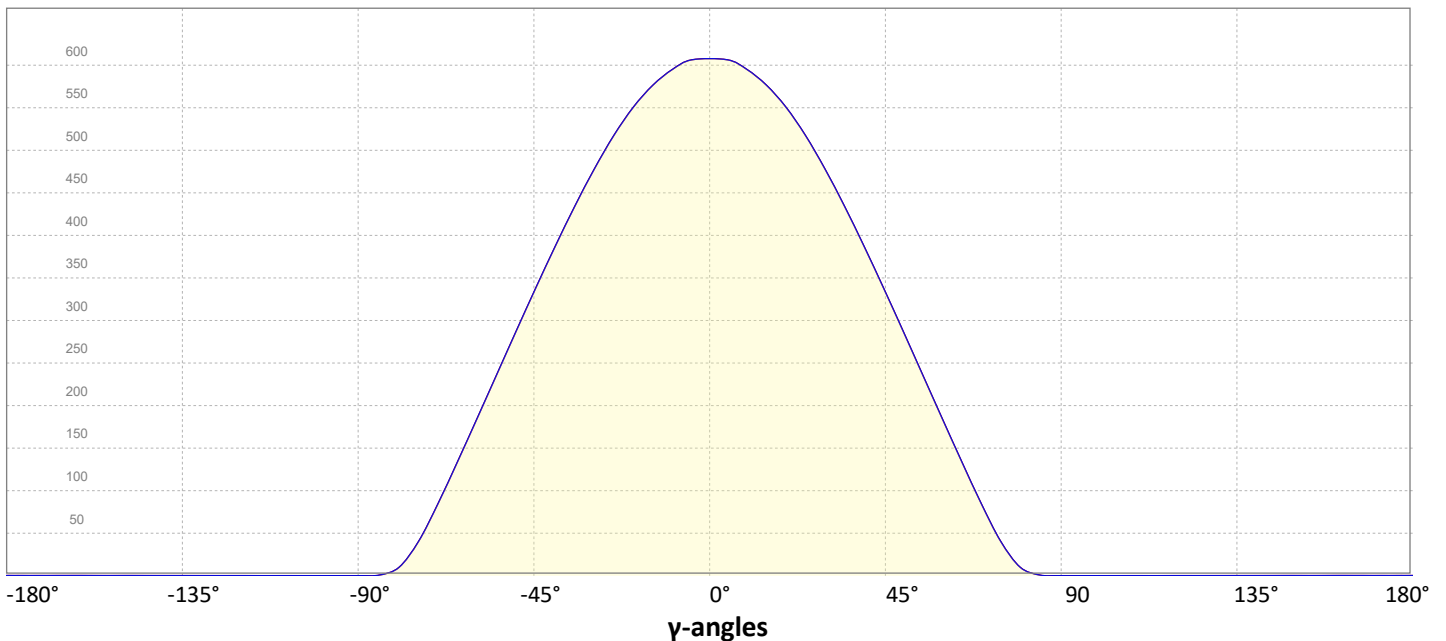
Intensity Ratio

In 120° cone	87,2%
In 90° cone	62,9%

C000-C180

C090-C270

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



Light Measurement Report

Print date: 23-10-2024

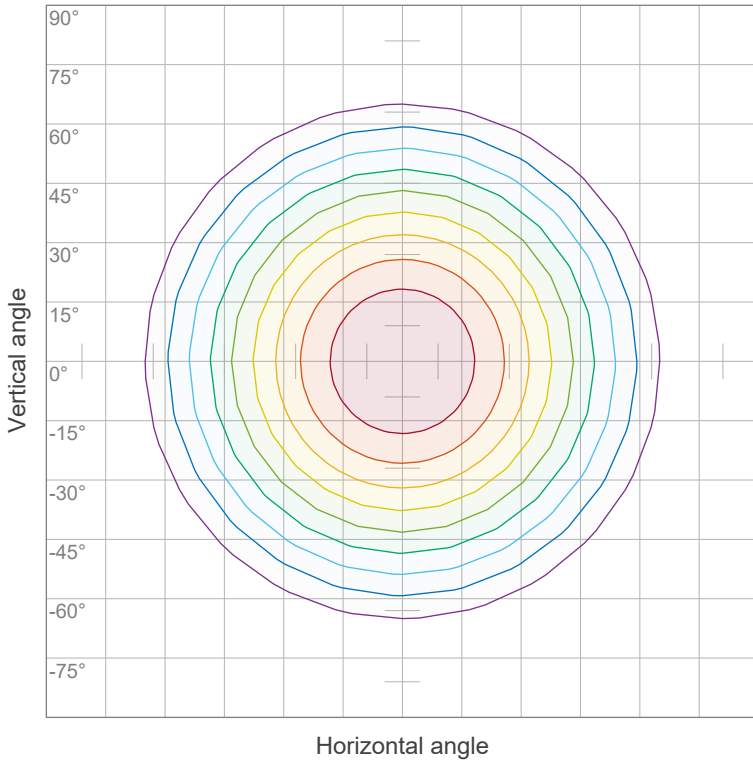
Measurement date and time: 23-10-2024 13:22:31 – Measurement no. VFR-241023-1529-MS

Measurement tracking No. and Link: [VT241023-002235](https://www.viso-systems.com/VT241023-002235)

Operator:



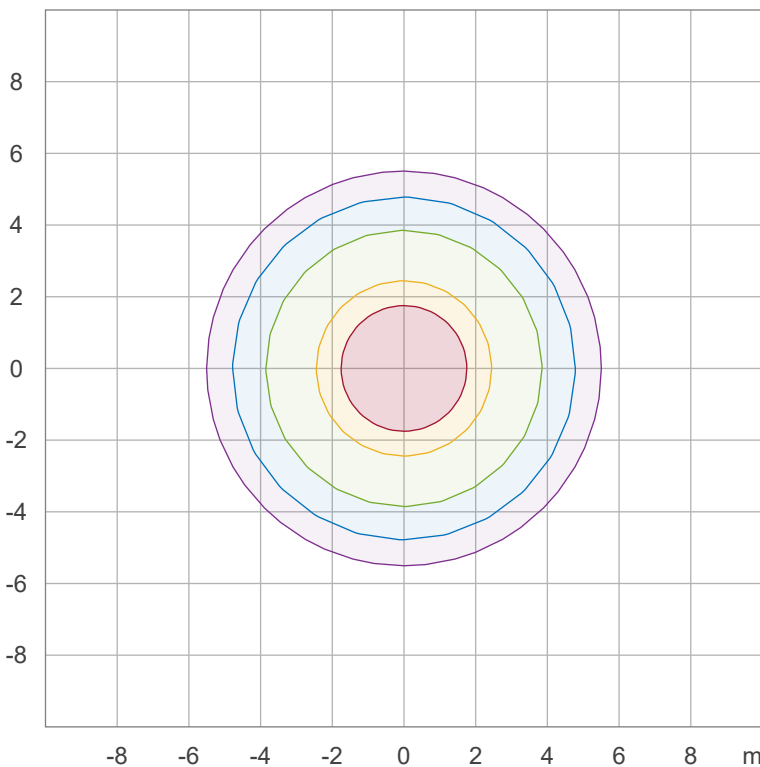
Iso-intensity Diagram (Iso-candela)



90 %	545,7 cd
80 %	485,1 cd
70 %	424,4 cd
60 %	363,8 cd
50 %	303,2 cd
40 %	242,5 cd
30 %	181,9 cd
20 %	121,3 cd
10 %	60,6 cd

Peak intensity: 606,3 cd
Number of c-planes: 12

Iso-illuminance Diagram (Iso-lux)



50,0 %	33,7 lx
30,0 %	20,2 lx
10,0 %	6,7 lx
5,0 %	3,4 lx
3,0 %	2,0 lx

Peak illuminance: 67,4 lx
Mounting height: 3,0 m
Number of c-planes: 12

Light Measurement Report

Print date: 23-10-2024

Measurement date and time: 23-10-2024 13:22:31 – Measurement no. VFR-241023-1529-MS

Measurement tracking No. and Link: [VT241023-002235](https://www.viso-systems.com/VT241023-002235)

Operator:

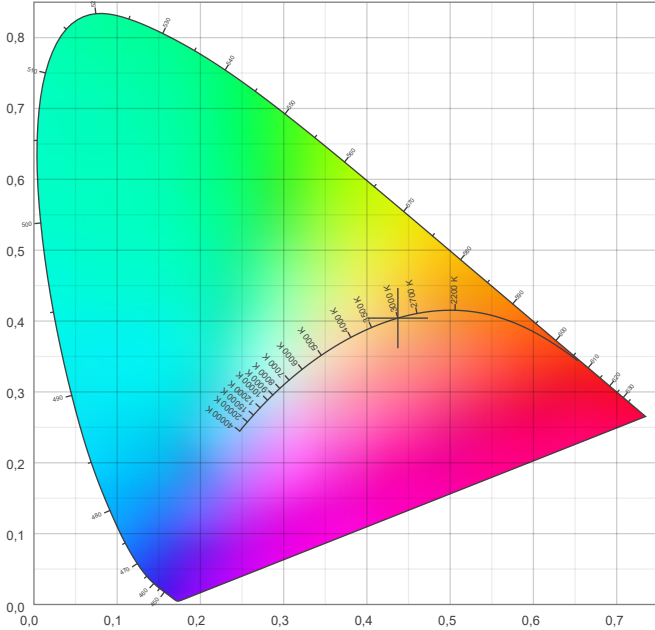


Color details

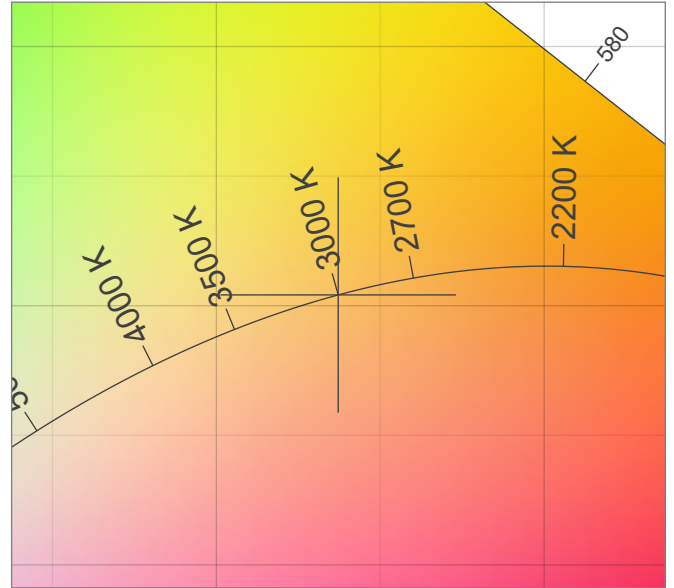
Correlated Color Temperature, Target CCT = 3000 K
 Correlated Color Temperature, Measured CCT = 2964 K
 Color Rendering Index CRI 82,8
 Color Rendering Index, R9 (red component) R9 = 6,3
 Color Rendering TM30-18 R_f 83,9 – R_g 98,5
 Color Quality Scale CQS = 81,7

MacAdam Steps SDCM = 1,3
 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 = -0,0002
 Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,251;0,521)

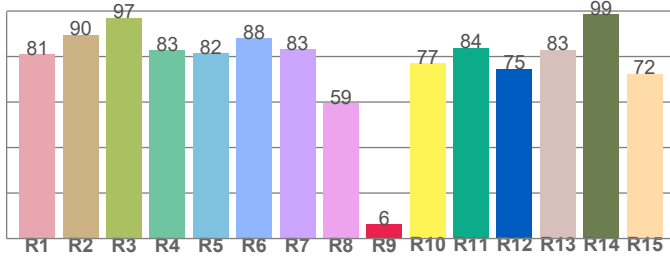
CIE 1931



CIE 1931 – zoomed on Planckian locus



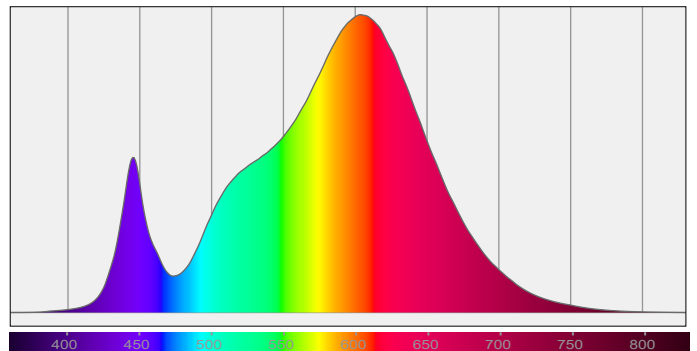
Color Rendering Index per reference color (CIE 1995)



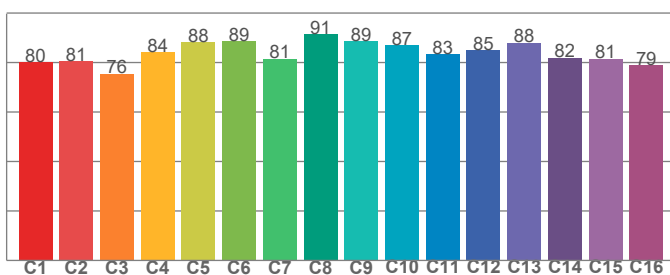
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
81,1	89,6	97,0	82,9	81,5	88,1	83,2	59,4	6,3	77,1	83,8	74,6	82,9	98,5	72,4

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



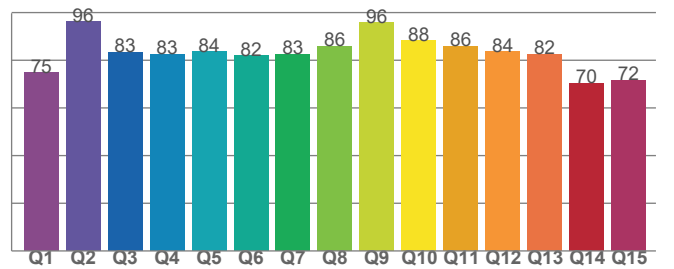
TM30-18 Rf-values per hue bin



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
80,1	80,6	75,5	84,1	88,2	88,5	81,5	91,3	88,5	87,0	83,4	84,9	87,9	81,9	81,5	78,9

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
74,8	96,2	83,4	82,6	83,6	81,9	82,6	85,9	95,7	88,2	86,0	83,5	82,5	70,3	71,7

Light Measurement Report

Print date: 23-10-2024

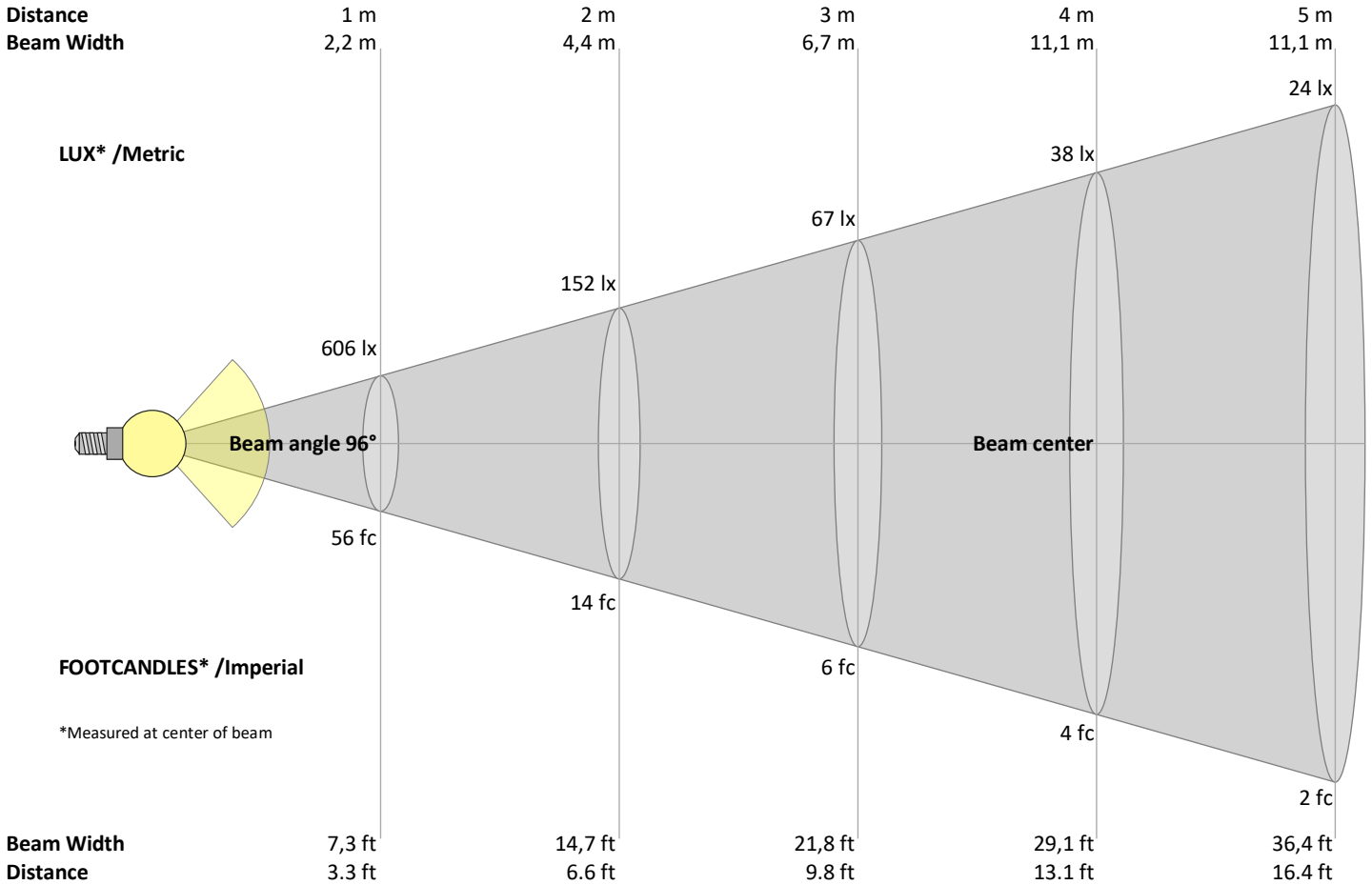
Measurement date and time: 23-10-2024 13:22:31 – Measurement no. VFR-241023-1529-MS

Measurement tracking No. and Link: [VT241023-002235](https://www.viso-systems.com/VT241023-002235)

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
606	152	67	38	24	17	12	9	7	6	5	4	4	3	3	2	2	2	2	2	lux
56,3	14,1	6,3	3,5	2,3	1,6	1,1	0,9	0,7	0,6	0,5	0,4	0,3	0,3	0,3	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
606	605	593	574	548	514	474	430	383	333	283	231	180	130	81	38	9	1	0	0	cd
100%	100%	98%	95%	90%	85%	78%	71%	63%	55%	47%	38%	30%	21%	13%	6%	1%	0%	0%	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
606	605	593	574	548	514	474	430	383	333	283	231	180	130	81	38	9	1	0	0	cd
100%	100%	98%	95%	90%	85%	78%	71%	63%	55%	47%	38%	30%	21%	13%	6%	1%	0%	0%	0%	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
606	605	593	574	548	514	474	430	383	333	283	231	180	130	81	38	9	1	0	0	cd
100%	100%	98%	95%	90%	85%	78%	71%	63%	55%	47%	38%	30%	21%	13%	6%	1%	0%	0%	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
606	605	593	574	548	514	474	430	383	333	283	231	180	130	81	38	9	1	0	0	cd
100%	100%	98%	95%	90%	85%	78%	71%	63%	55%	47%	38%	30%	21%	13%	6%	1%	0%	0%	0%	of 0°val

Light Measurement Report

Print date: 23-10-2024

Measurement date and time: 23-10-2024 13:22:31 – Measurement no. VFR-241023-1529-MS

Measurement tracking No. and Link: [VT241023-002235](https://vt241023-002235)

Operator:



Light Planning – UGR table

Uncorrected, comprehensive UGR table according to 117-1995

Reflectances		70	70	50	50	30	70	70	50	50	30
	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	22,7	23,8	22,9	24,1	24,3	22,7	23,8	22,9	24,1	24,3
	3H	23,4	24,5	23,8	24,8	25,0	23,4	24,5	23,8	24,8	25,0
	4H	23,5	24,6	23,9	24,9	25,1	23,5	24,6	23,9	24,9	25,1
	6H	23,6	24,5	23,9	24,8	25,2	23,6	24,5	23,9	24,8	25,2
	8H	23,5	24,4	23,9	24,7	25,1	23,5	24,4	23,9	24,7	25,1
	12H	23,5	24,3	23,8	24,7	25,1	23,5	24,3	23,8	24,7	25,1
4H	2H	23,0	24,1	23,4	24,4	24,6	23,0	24,1	23,4	24,4	24,6
	3H	24,0	24,9	24,3	25,2	25,6	24,0	24,9	24,3	25,2	25,6
	4H	24,1	24,9	24,5	25,3	25,9	24,1	24,9	24,5	25,3	25,9
	6H	24,1	24,9	24,6	25,2	25,6	24,1	24,9	24,6	25,2	25,6
	8H	24,1	24,8	24,6	25,1	25,5	24,1	24,8	24,6	25,1	25,5
	12H	24,0	24,6	24,5	25,0	25,5	24,0	24,6	24,5	25,0	25,5
8H	4H	24,1	24,8	24,6	25,2	25,6	24,1	24,8	24,6	25,2	25,6
	6H	24,1	24,7	24,6	25,1	25,7	24,1	24,7	24,6	25,1	25,7
	8H	24,1	24,6	24,7	25,1	25,7	24,1	24,6	24,7	25,1	25,7
	12H	24,1	24,5	24,7	25,0	25,6	24,1	24,5	24,7	25,0	25,6
12H	4H	24,1	24,6	24,6	25,1	25,5	24,1	24,6	24,6	25,1	25,5
	6H	24,1	24,6	24,7	25,1	25,7	24,1	24,6	24,7	25,1	25,7
	8H	24,1	24,5	24,7	25,0	25,6	24,1	24,5	24,7	25,0	25,6

Variations with the observer position for the luminaire spacings, S:

S = 1.0H	0,2 / -0,3	0,2 / -0,3
S = 1.5H	0,5 / -0,9	0,5 / -0,9
S = 2.0H	1,3 / -2,0	1,3 / -2,0

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	0			
Floor reflectance	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	106	106	106	102	102	102	100	
1	110	106	103	99	108	104	101	98	100	97	95	96	94	92	93	91	89	87
2	102	94	88	83	99	92	87	82	89	84	80	86	82	78	83	80	77	75
3	93	84	76	71	91	82	75	70	79	74	69	77	72	68	74	70	66	64
4	86	75	67	61	84	74	66	60	71	65	59	69	63	59	67	62	58	56
5	79	67	59	53	77	66	58	53	64	57	52	62	56	52	61	55	51	49
6	74	61	53	47	72	60	52	46	58	51	46	57	50	46	55	50	45	43
7	68	56	47	42	67	55	47	41	53	46	41	52	46	41	51	45	41	39
8	64	51	43	37	62	50	43	37	49	42	37	48	41	37	47	41	37	35
9	60	47	39	34	58	46	39	34	45	38	33	44	38	33	43	37	33	31
10	56	43	36	31	55	43	36	31	42	35	31	41	35	30	40	34	30	29

Light Measurement Report

Print date: 23-10-2024

Measurement date and time: 23-10-2024 13:22:31 – Measurement no. VFR-241023-1529-MS

Measurement tracking No. and Link: [VT241023-002235](https://www.viso-systems.com/VT241023-002235)

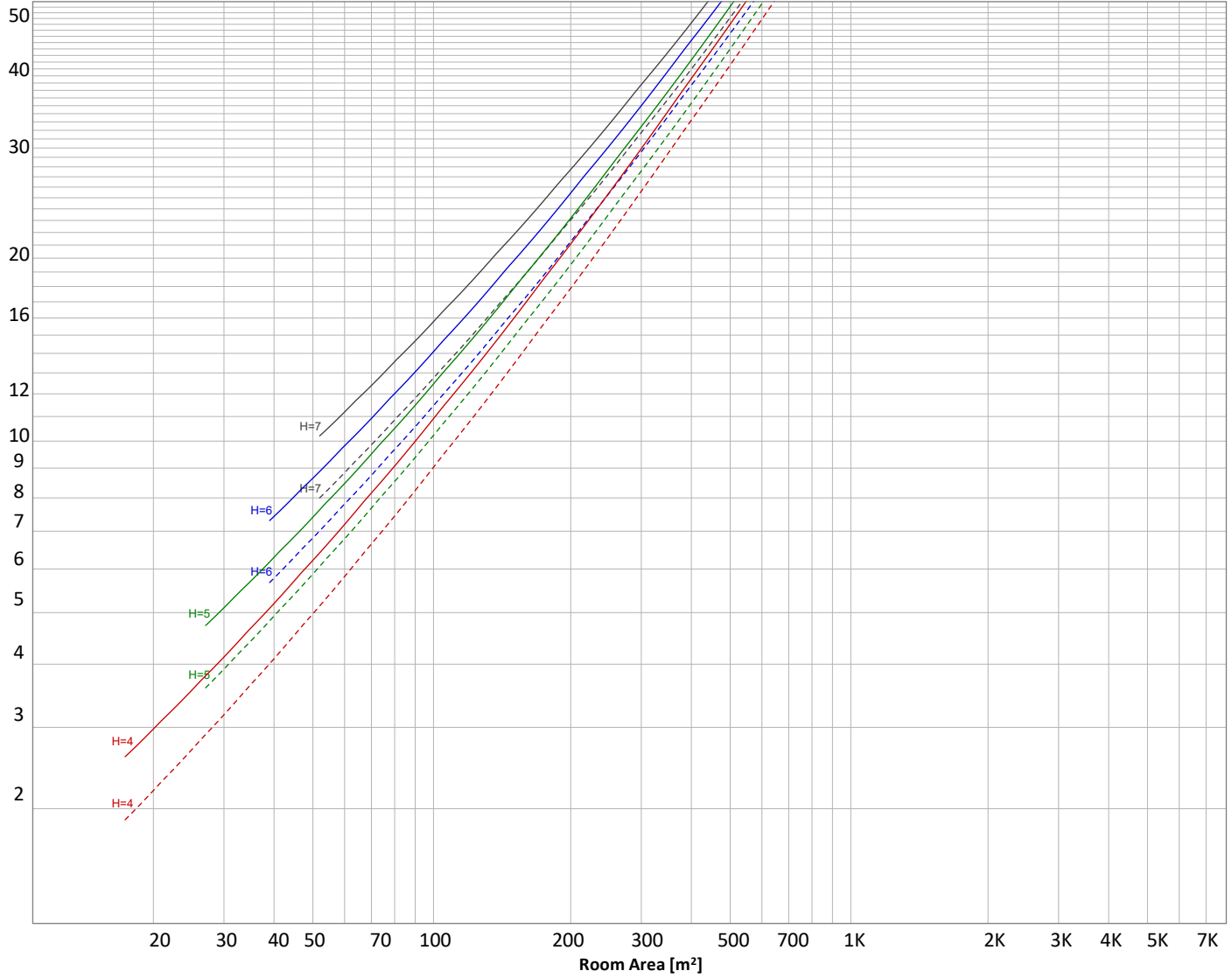
Operator:



Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 1361 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°
57,3 lm	162 lm	236 lm	268 lm	257 lm	207 lm	128 lm	42,3 lm	2,68 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
0,124 lm	0,149 lm	0,155 lm	0,162 lm	0,161 lm	0,156 lm	0,122 lm	0,087 lm	0,026 lm

Light Measurement Report

Print date: 23-10-2024

Measurement date and time: 23-10-2024 13:22:31 – Measurement no. VFR-241023-1529-MS

Measurement tracking No. and Link: [VT241023-002235](#)

Operator:



Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	57 lm	4,2%
10-20°	162 lm	11,9%
20-30°	236 lm	17,3%
30-40°	268 lm	19,7%
40-50°	257 lm	18,9%
50-60°	207 lm	15,2%
60-70°	128 lm	9,4%
70-80°	42 lm	3,1%
80-90°	3 lm	0,2%
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	1361 lm	100,0%

Intensity peaks

Max intensity	606 cd
Intensity, 90°	0 cd
Intensity, 0°	606 cd

Zonal Lumen summary

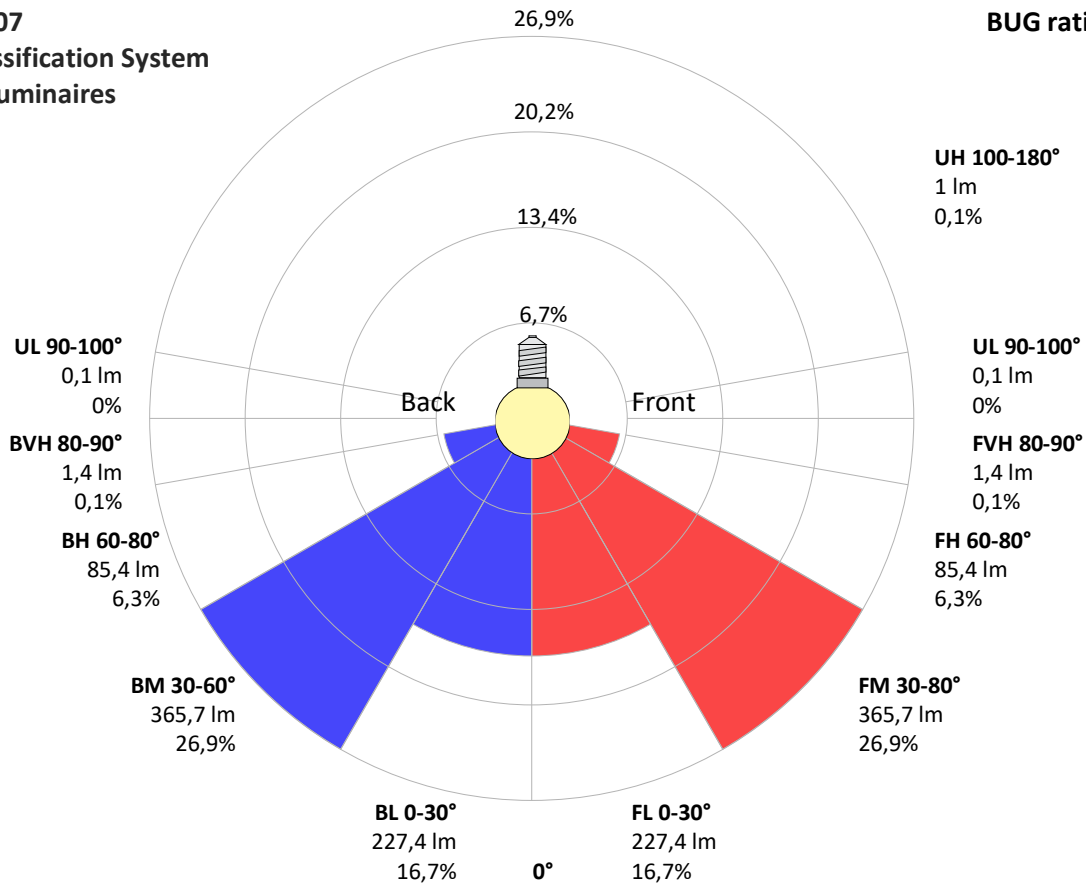
Zone (γ)	Lumen	% Total
0-30°	455 lm	33,4%
0-40°	723 lm	53,1%
0-60°	1186 lm	87,2%
60-90°	173 lm	12,7%
70-100°	45 lm	3,3%
90-120°	0 lm	0,0%
0-90°	1360 lm	99,9%
90-180°	1 lm	0,1%
0-180°	1361 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	227 lm	16,7%
Medium(30-60°)	366 lm	26,9%
High(60-80°)	85 lm	6,3%
Very high(80-90°)	1 lm	0,1%
Back light		
Low(0-30°)	227 lm	16,7%
Medium(30-60°)	366 lm	26,9%
High(60-80°)	85 lm	6,3%
Very high(80-90°)	1 lm	0,1%
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: 23-10-2024

Measurement date and time: 23-10-2024 13:22:31 – Measurement no. VFR-241023-1529-MS

Measurement tracking No. and Link: [VT241023-002235](https://www.viso-systems.com/VT241023-002235)

Operator:

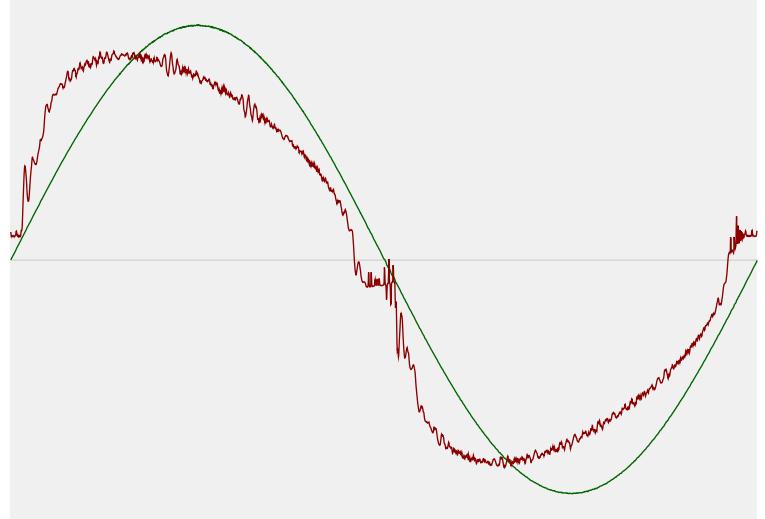


Power Details

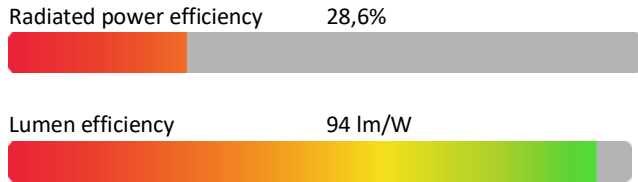
Input Power

Power feed to light source	14,4 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 = $V_{RMS} * I_{RMS}$	15,07 VA
Displacement factor of AC power feed	0,97
Power factor of AC current feed	0,96
Total harmonic distortion of the current	14,2%
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	2999 K
CCT shift	+1 K
CCT end	3000 K

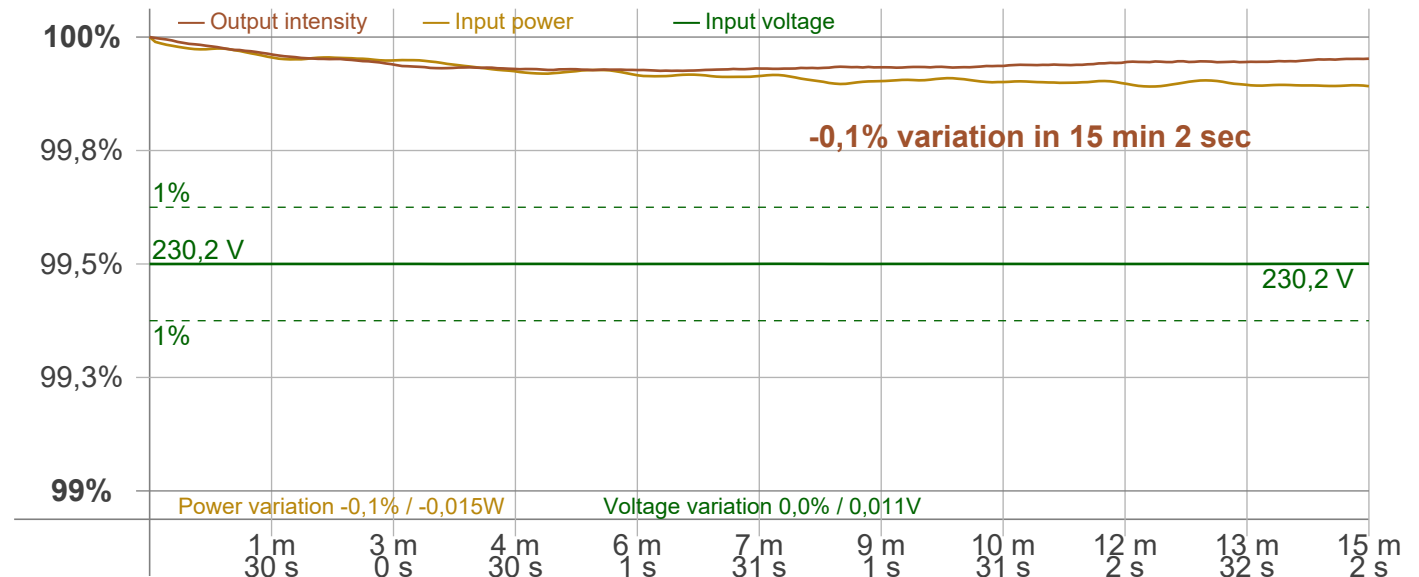
Warmup Result

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

Output Change

Output start	1362 lm
Output change	-1 lm
Output end	1361 lm

Stabilization Curve



Light Measurement Report

Print date: 23-10-2024

Measurement date and time: 23-10-2024 13:22:31 – Measurement no. VFR-241023-1529-MS

Measurement tracking No. and Link: [VT241023-002235](https://www.viso-systems.com/VT241023-002235)

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: 19,33 %
 Flicker index: 0,06

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

JA8/10 40 Hz: 0,05 %
 JA8/10 90 Hz: 0,18 %
 JA8/10 200 Hz: 19,37 %
 JA8/10 400 Hz: 19,35 %
 JA8/10 1000 Hz: 19,32 %

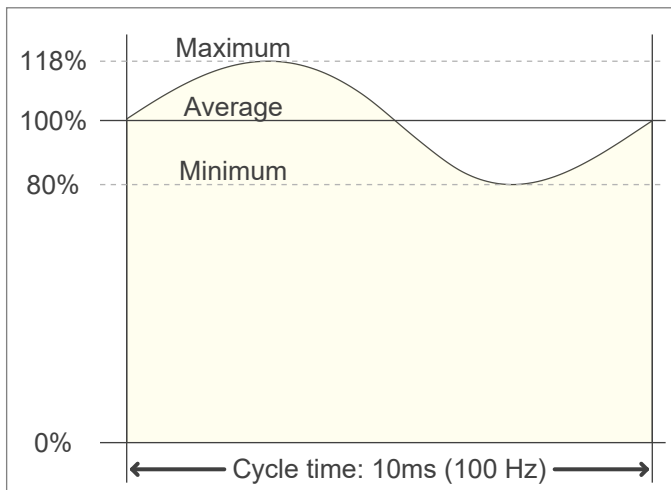
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

PstLM value (F < 80 Hz): 0,03
 SVM value (80 < F < 2000 Hz): 0,75

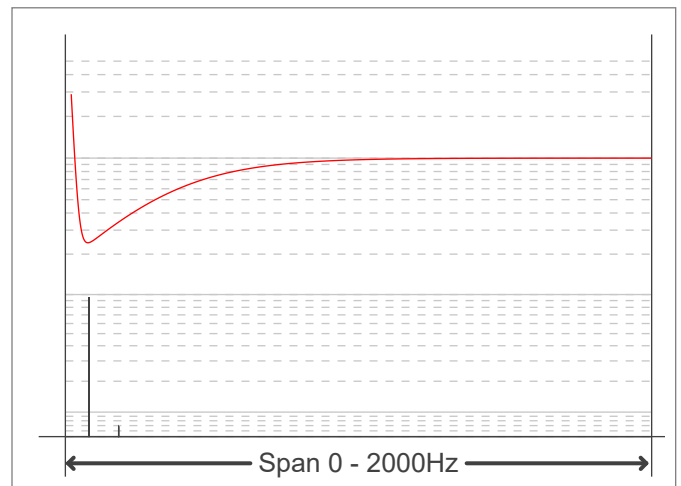
Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp: 0,02

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot

