

# Light Measurement Report

Print date: 23-9-2025

Measurement date and time: 22-9-2025 11:38:05 – Measurement no. VFR-250922-3296-MS

Measurement tracking No. and Link: [VT250922-002972](#)

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  
 $\gamma$  (gamma)-Resolution  
Test Distance  
Input Power, Power and Displ. Factors  
Input RMS Voltage and Current  
Frequency of Input Power  
Warm-up Time and Variation

32 planes – 11,25°  
5°  
4,56 m  
9,0 W – PF 0,53 – DPF 0,78  
230 V – 0,074 A  
50 Hz  
Lamp stabilized in 15 min 0 sec – 2,0%

## Tested Light Source

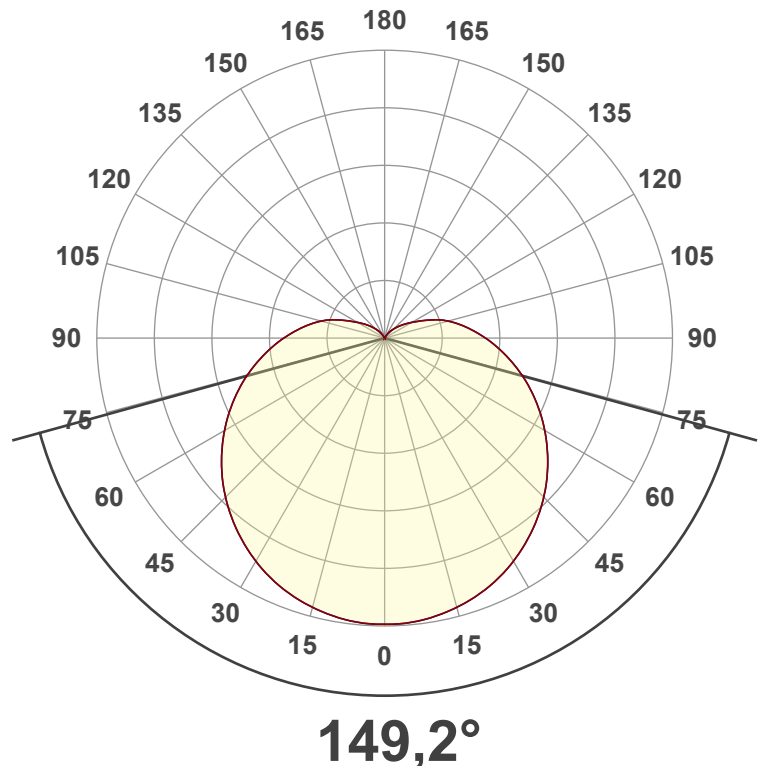
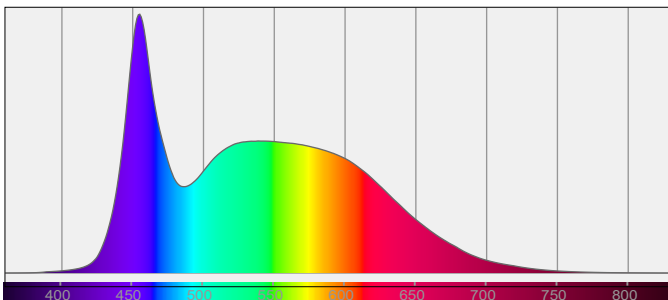
Product Name  
Item No. and Manufacturer  
Product Description (line 1)

812508-6500K  
812508-6500K – Dutchfulfillment  
T5 BALK | KOPPELBAAR | 60CM | 9W | CCT-SWITCH

## 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

1010 lm – 17,08% / 82,92%  
112 lm/W  
203 cd – 149,2°  
CCT = 6500 K / 6660 K  
CRI 85,0  
 $R_f$  84,3 –  $R_g$  92,0  
Duv 0,0078 – SDCM 11,0  
SVM 0 – PstLM 0,01



# Light Measurement Report

Print date: 23-9-2025

Measurement date and time: 22-9-2025 11:38:05 – Measurement no. VFR-250922-3296-MS

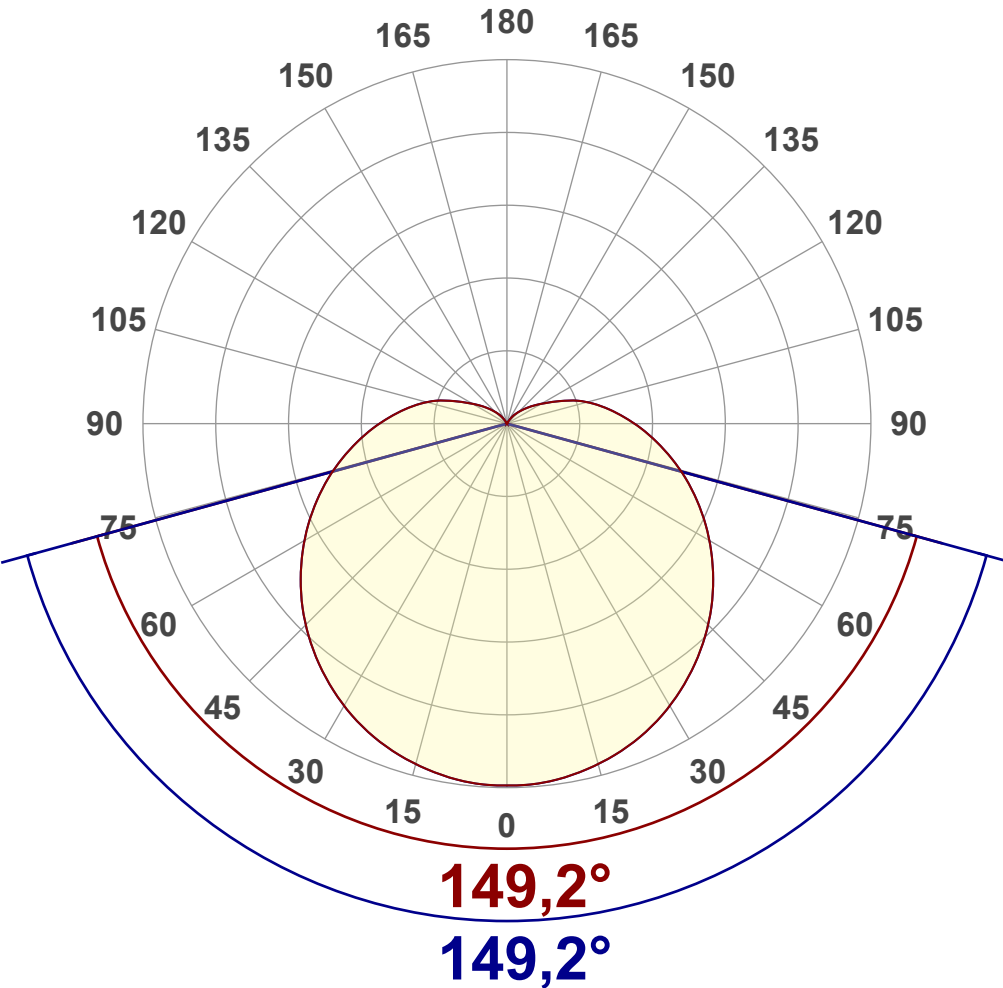
Measurement tracking No. and Link: [VT250922-002972](#)

Operator:



## Luminous Intensity diagram

Unit: 0-100% of peak intensity



## Main Values

Output (total Lumen)	1010 lm
Lumen Up% / Down%	17,08% / 82,92%
Peak Intensity	203 cd
Beam Angle (50%)	149,2°
Beam Angle (90%)	149,2°
Beam Angle (10%)	149,2°

## Cut-off Angle

Average 2,5%	284,3°
--------------	--------

## Field Angle

Average 10%	243,7°
-------------	--------

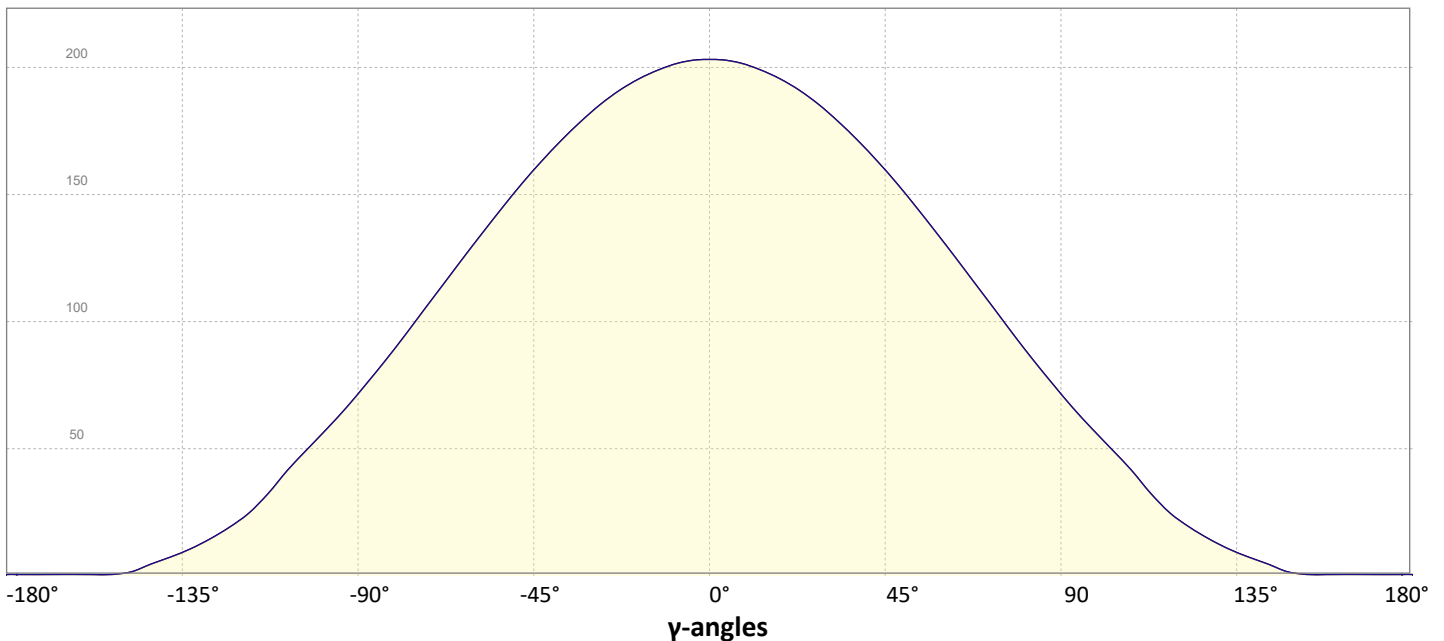
## Intensity Ratio

In 120° cone	51,7%
In 90° cone	33,0%

**C000-C180**

**C090-C270**

## Linear distribution diagram - Intensity (candela) vs $\gamma$ -angle



# Light Measurement Report

Print date: 23-9-2025

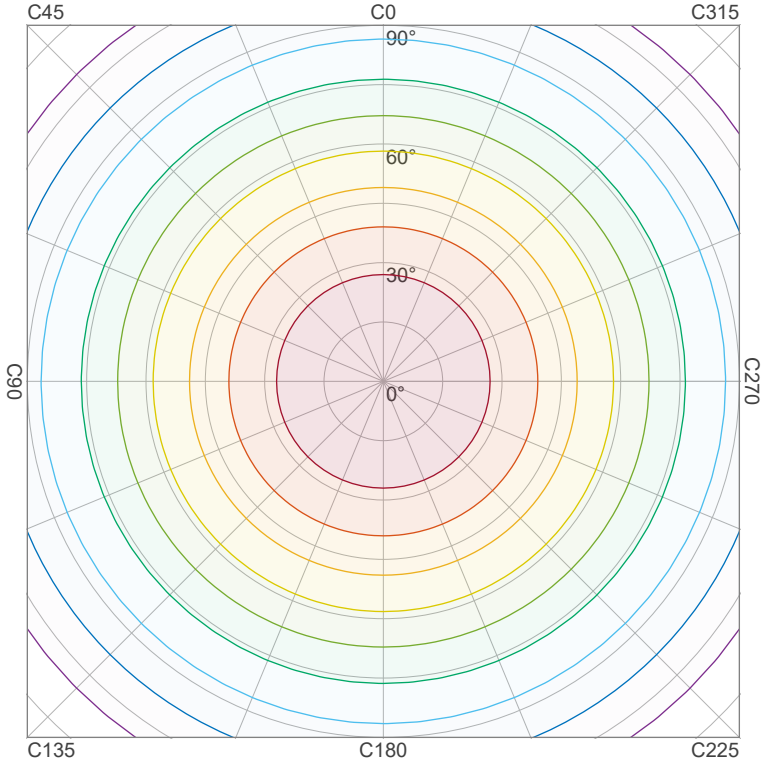
Measurement date and time: 22-9-2025 11:38:05 – Measurement no. VFR-250922-3296-MS

Measurement tracking No. and Link: [VT250922-002972](https://vt250922-002972)

Operator:



## Iso-intensity Diagram (Iso-candela)

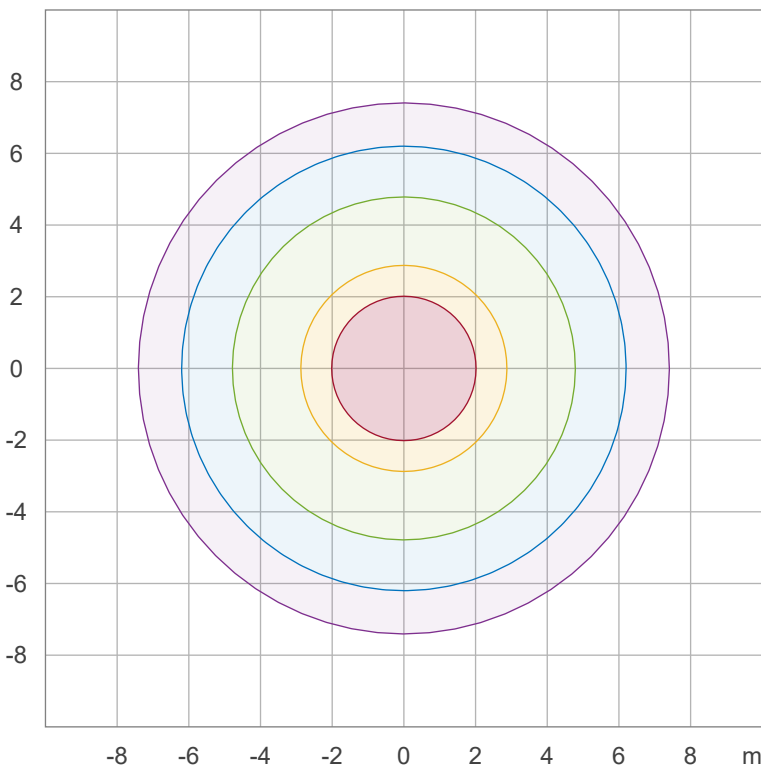


90 %	182,7 cd
80 %	162,4 cd
70 %	142,1 cd
60 %	121,8 cd
50 %	101,5 cd
40 %	81,2 cd
30 %	60,9 cd
20 %	40,6 cd
10 %	20,3 cd

Peak intensity: 203,0 cd

Number of c-planes: 32

## Iso-illuminance Diagram (Iso-lux)



50,0 %	11,3 lx
30,0 %	6,8 lx
10,0 %	2,3 lx
5,0 %	1,1 lx
3,0 %	0,7 lx

Peak illuminance: 22,6 lx

Mounting height: 3,0 m

Number of c-planes: 32

# Light Measurement Report

Print date: 23-9-2025

Measurement date and time: 22-9-2025 11:38:05 – Measurement no. VFR-250922-3296-MS

Measurement tracking No. and Link: [VT250922-002972](https://www.viso-systems.com/VT250922-002972)

Operator:

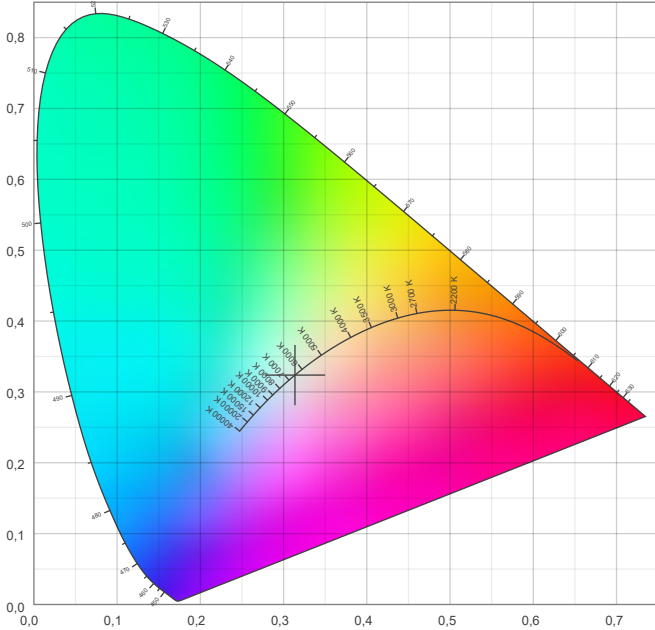


## Color details

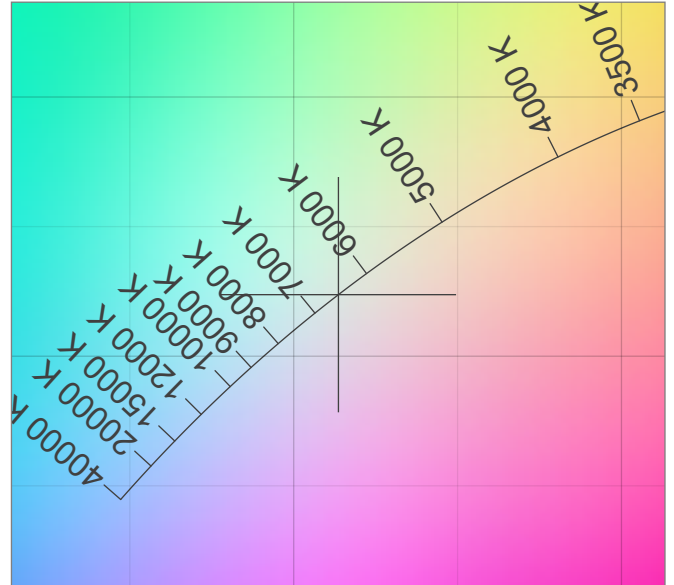
Correlated Color Temperature, Target CCT = 6500 K  
 Correlated Color Temperature, Measured CCT = 6660 K  
 Color Rendering Index CRI 85,0  
 Color Rendering Index, R9 (red component) R9 = 14,3  
 Color Rendering TM30-18 R<sub>f</sub> 84,3 – R<sub>g</sub> 92,0  
 Color Quality Scale CQS = 83,4

MacAdam Steps  
 Color coordinates CIE 1931 (x;y) = (0,314;0,324)  
 Color coordinate CIEs 1960 (u;v) = (0,200;0,310)  
 Color deviation from BBL Duv = 0,0078  
 Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,200;0,466)

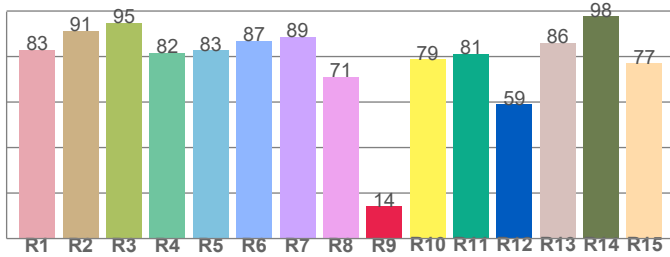
### CIE 1931



### CIE 1931 – zoomed on Planckian locus



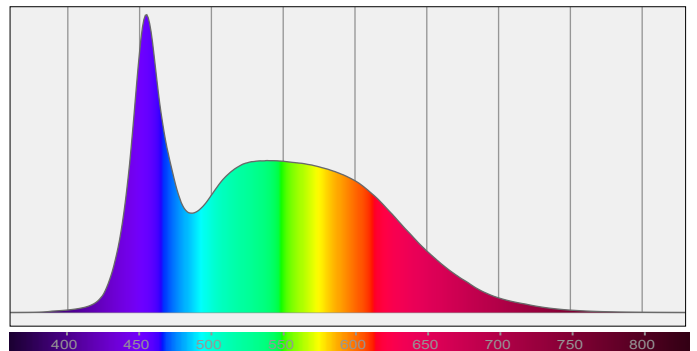
### Color Rendering Index per reference color (CIE 1995)



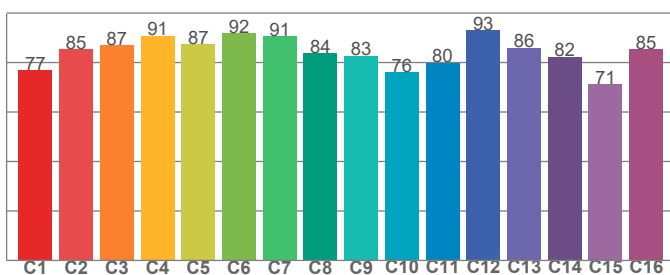
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
83,0	91,4	94,9	81,6	82,7	86,9	88,7	71,1	14,3	78,8	81,3	59,1	86,0	97,6	77,0

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



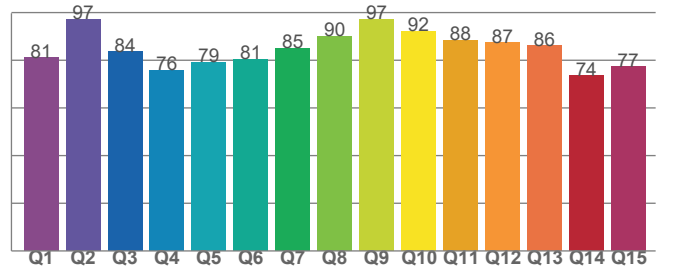
### TM30-18 R<sub>f</sub>-values per hue bin



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
76,9	85,4	86,9	90,9	87,4	91,8	90,7	83,6	82,7	76,1	79,9	93,1	86,0	82,4	71,2	85,5

### Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
81,0	97,1	83,7	75,9	79,2	80,5	85,0	90,0	97,2	92,3	88,5	87,3	86,1	73,5	77,2

# Light Measurement Report

Print date: 23-9-2025

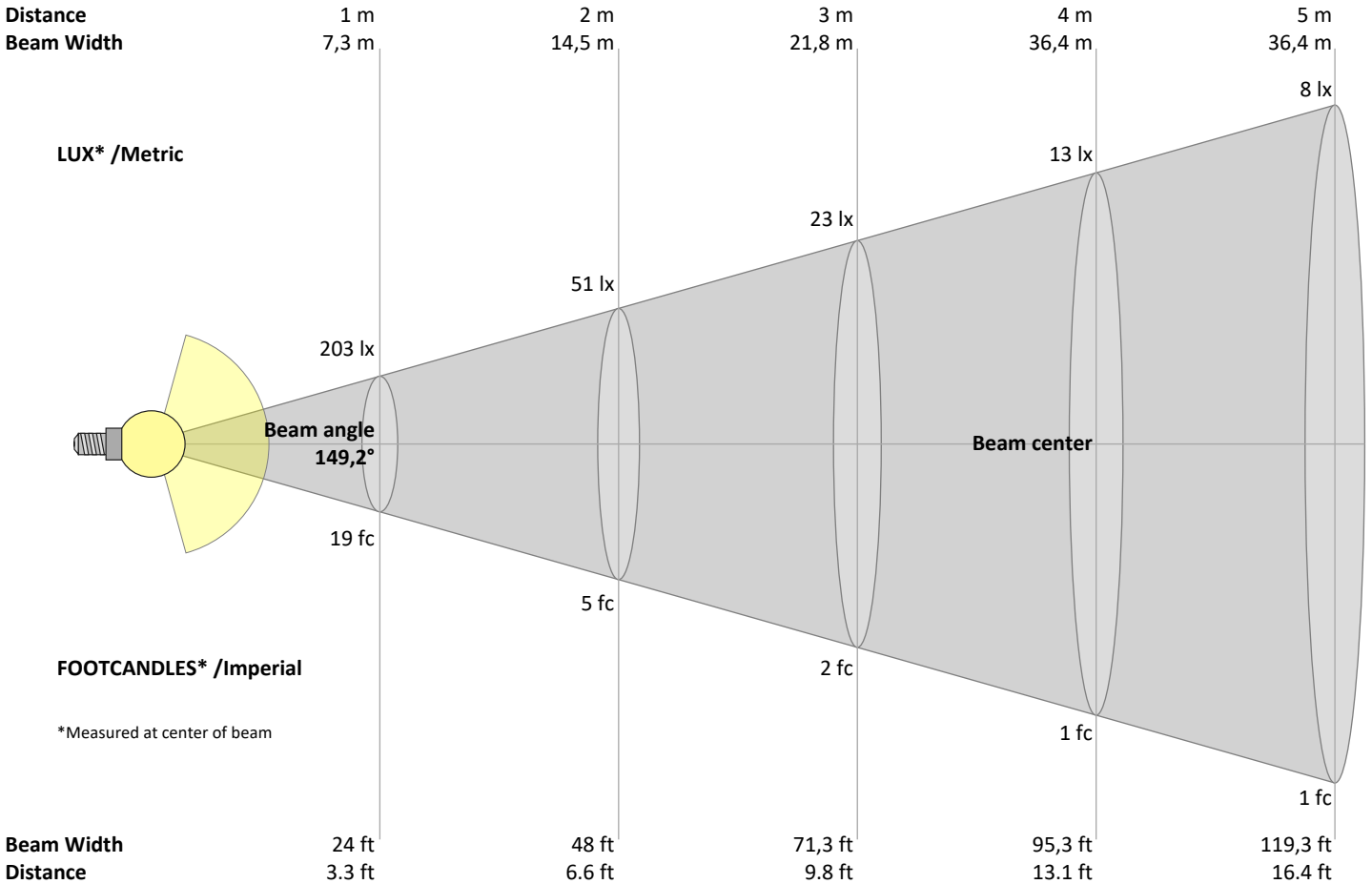
Measurement date and time: 22-9-2025 11:38:05 – Measurement no. VFR-250922-3296-MS

Measurement tracking No. and Link: [VT250922-002972](https://www.viso-systems.com/VT250922-002972)

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
203	51	23	13	8	6	4	3	3	2	2	1	1	1	1	1	1	1	1	1	lux
18,9	4,7	2,1	1,2	0,8	0,5	0,4	0,3	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	fc

### Intensities in 0° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
203	201	196	187	174	160	143	125	107	89	72	56	42	26	16	9	4	1	1	0	cd
100%	99%	96%	92%	86%	79%	70%	62%	53%	44%	35%	28%	21%	13%	8%	5%	2%	0%	0%	0%	of 0°val

### Intensities in 90° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
203	201	196	187	174	160	143	125	107	89	72	56	42	26	16	9	4	1	1	0	cd
100%	99%	96%	92%	86%	79%	70%	62%	53%	44%	35%	28%	21%	13%	8%	5%	2%	0%	0%	0%	of 0°val

### Intensities in 180° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
203	201	196	187	174	160	143	125	107	89	72	56	42	26	16	9	4	1	1	0	cd
100%	99%	96%	92%	86%	79%	70%	62%	53%	44%	35%	28%	21%	13%	8%	5%	2%	0%	0%	0%	of 0°val

### Intensities in 270° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
203	201	196	187	174	160	143	125	107	89	72	56	42	26	16	9	4	1	1	0	cd
100%	99%	96%	92%	86%	79%	70%	62%	53%	44%	35%	28%	21%	13%	8%	5%	2%	0%	0%	0%	of 0°val

# Light Measurement Report

Print date: 23-9-2025

Measurement date and time: 22-9-2025 11:38:05 – Measurement no. VFR-250922-3296-MS

Measurement tracking No. and Link: [VT250922-002972](https://www.viso-systems.com/VT250922-002972)

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	19,9	21,1	20,4	21,6	22,2	21,0	22,2	21,6	22,8	23,4
	3H	21,8	23,0	22,5	23,6	24,2	23,5	24,7	24,1	25,2	25,8
	4H	22,8	24,0	23,5	24,5	25,1	24,8	26,0	25,4	26,5	27,1
	6H	23,9	24,9	24,4	25,5	26,1	26,3	27,3	26,9	27,9	28,6
	8H	24,3	25,4	24,9	25,9	26,6	27,1	28,1	27,7	28,7	29,4
	12H	24,8	25,8	25,4	26,4	27,1	28,0	29,0	28,6	29,5	30,3
4H	2H	20,7	21,9	21,3	22,4	23,0	21,6	22,7	22,2	23,3	23,9
	3H	23,0	24,0	23,6	24,5	25,3	24,3	25,3	24,9	25,9	26,6
	4H	24,0	25,1	24,7	25,6	26,4	25,7	26,8	26,3	27,3	28,1
	6H	25,2	26,0	25,9	26,6	27,3	27,3	28,1	28,0	28,7	29,4
	8H	25,7	26,5	26,4	27,1	27,8	28,1	28,9	28,8	29,6	30,2
	12H	26,2	26,9	26,9	27,6	28,3	29,1	29,8	29,8	30,5	31,2
8H	4H	24,6	25,4	25,3	26,0	26,7	26,0	26,8	26,7	27,4	28,1
	6H	26,0	26,6	26,7	27,3	28,1	27,8	28,4	28,5	29,1	29,9
	8H	26,7	27,2	27,4	28,0	28,8	28,8	29,3	29,5	30,1	31,0
	12H	27,3	27,8	28,1	28,6	29,4	29,9	30,4	30,7	31,1	32,0
12H	4H	24,7	25,4	25,4	26,1	26,8	26,0	26,7	26,7	27,4	28,1
	6H	26,2	26,7	26,9	27,5	28,4	27,9	28,4	28,6	29,2	30,1
	8H	26,9	27,4	27,7	28,2	29,0	28,9	29,4	29,7	30,2	31,0

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

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

## 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	115	115	115	115	110	110	110	110	102	102	102	94	94	94	86	86	86	83
1	101	95	89	84	96	91	86	81	83	79	75	76	73	70	70	67	65	61
2	91	81	72	66	86	77	70	63	71	65	59	65	60	55	59	55	52	48
3	82	70	60	53	78	67	58	51	61	54	48	56	50	45	51	47	42	39
4	74	61	51	44	71	59	50	43	54	46	40	49	43	38	45	40	36	33
5	68	54	44	37	65	52	43	36	48	40	34	44	37	32	40	35	30	28
6	63	48	39	32	59	46	38	31	43	35	30	40	33	28	36	31	26	24
7	58	44	34	28	55	42	33	27	39	31	26	36	29	24	33	27	23	21
8	54	40	31	25	51	38	30	24	35	28	23	33	26	22	30	25	21	18
9	50	36	28	22	48	35	27	21	32	25	20	30	24	19	28	22	18	16
10	47	33	25	20	45	32	24	19	30	23	18	28	22	17	26	21	17	15

# Light Measurement Report

Print date: 23-9-2025

Measurement date and time: 22-9-2025 11:38:05 – Measurement no. VFR-250922-3296-MS

Measurement tracking No. and Link: [VT250922-002972](https://www.viso-systems.com/VT250922-002972)

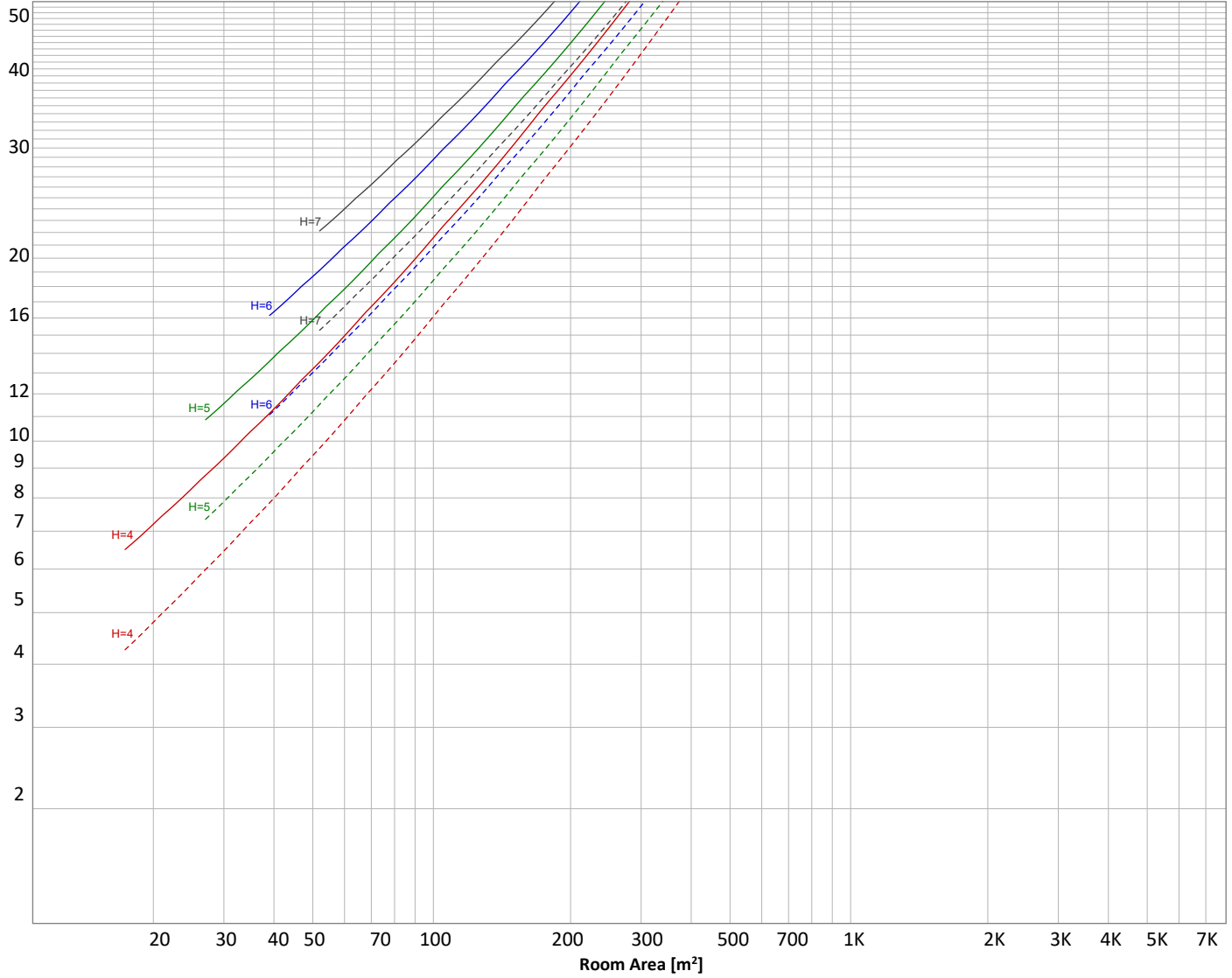
Operator:



## Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



### Conditions

H = Room height	Flux = 1010 lm				
H <sub>down</sub> = Lamp distance from ceiling =	0.00 m	Line type	Ceiling reflectance	Wall reflectance	Floor reflectance
H <sub>work</sub> = Work area height from floor =	0.00 m	-----	70	50	30
E <sub>work</sub> = 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°
19,3 lm	55,9 lm	87,2 lm	110 lm	123 lm	126 lm	120 lm	106 lm	88,3 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
68,6 lm	49,3 lm	29,2 lm	15,5 lm	7,26 lm	2,19 lm	0,257 lm	0,144 lm	0,046 lm

# Light Measurement Report

Print date: 23-9-2025

Measurement date and time: 22-9-2025 11:38:05 – Measurement no. VFR-250922-3296-MS

Measurement tracking No. and Link: [VT250922-002972](https://www.viso-systems.com/VT250922-002972)

Operator:



## Outdoor Light Planning

### Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	19 lm	1,9%
10-20°	56 lm	5,5%
20-30°	87 lm	8,6%
30-40°	110 lm	10,9%
40-50°	123 lm	12,2%
50-60°	126 lm	12,5%
60-70°	120 lm	11,9%
70-80°	106 lm	10,5%
80-90°	88 lm	8,7%
90-100°	69 lm	6,8%
100-110°	49 lm	4,9%
110-120°	29 lm	2,9%
120-130°	16 lm	1,5%
130-140°	7 lm	0,7%
140-150°	2 lm	0,2%
150-160°	0 lm	0,0%
160-170°	0 lm	0,0%
170-180°	0 lm	0,0%
<b>Total</b>	<b>1010 lm</b>	<b>100,0%</b>

### Intensity peaks

Max intensity	203 cd
Intensity, 90°	72 cd
Intensity, 0°	203 cd

### Zonal Lumen summary

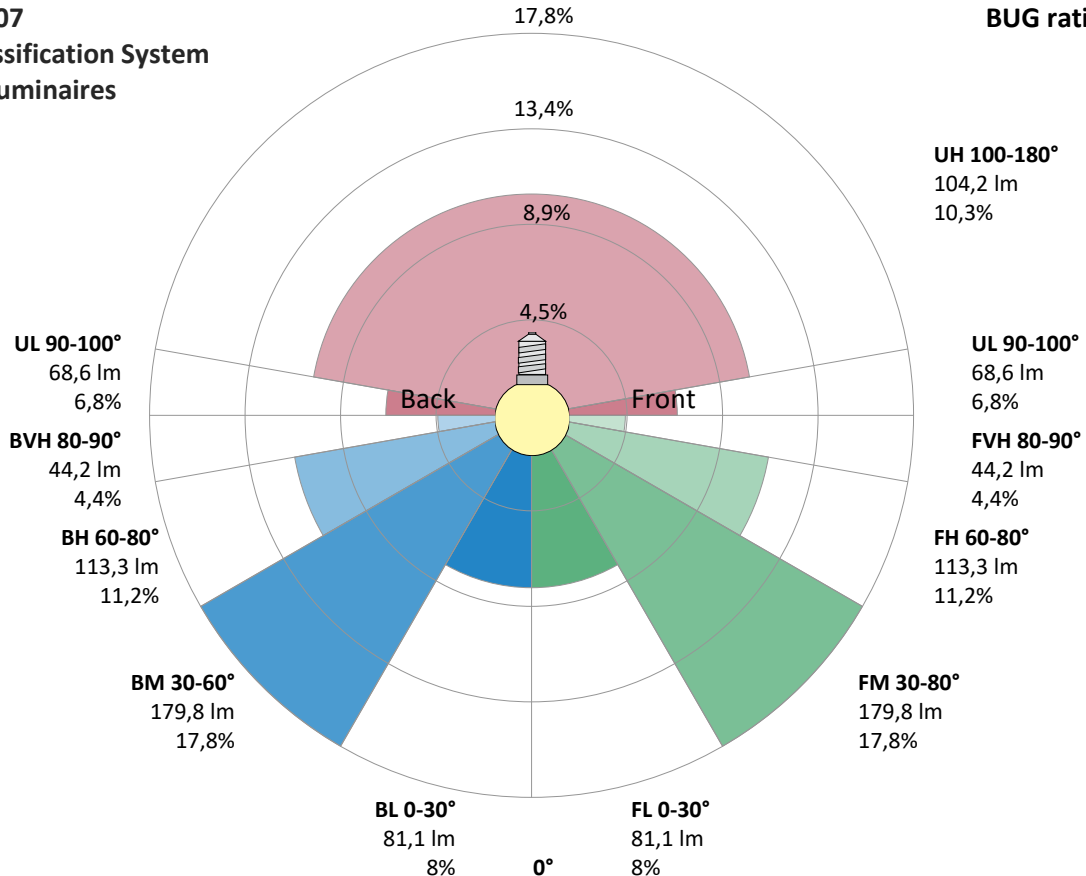
Zone (γ)	Lumen	% Total
0-30°	162 lm	16,1%
0-40°	273 lm	27,0%
0-60°	522 lm	51,7%
60-90°	315 lm	31,2%
70-100°	263 lm	26,1%
90-120°	147 lm	14,6%
0-90°	837 lm	82,9%
90-180°	172 lm	17,1%
0-180°	1010 lm	100,0%

### BUG rating

	Lumen	% Total
<b>Forward light</b>		
Low(0-30°)	81 lm	8,0%
Medium(30-60°)	180 lm	17,8%
High(60-80°)	113 lm	11,2%
Very high(80-90°)	44 lm	4,4%
<b>Back light</b>		
Low(0-30°)	81 lm	8,0%
Medium(30-60°)	180 lm	17,8%
High(60-80°)	113 lm	11,2%
Very high(80-90°)	44 lm	4,4%
<b>Uplight</b>		
Low(90-100°)	69 lm	6,8%
High(100-180°)	104 lm	10,3%

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

**BUG rating B1 U3 G1**



# Light Measurement Report

Print date: 23-9-2025

Measurement date and time: 22-9-2025 11:38:05 – Measurement no. VFR-250922-3296-MS

Measurement tracking No. and Link: [VT250922-002972](#)

Operator:

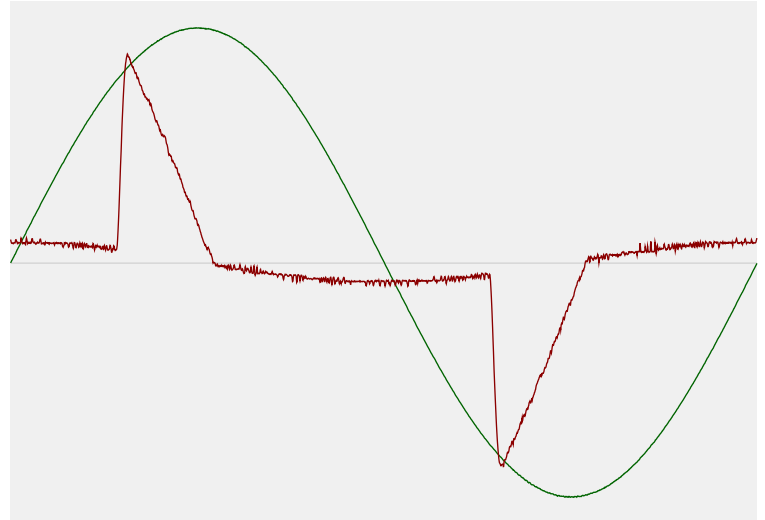


## Power Details

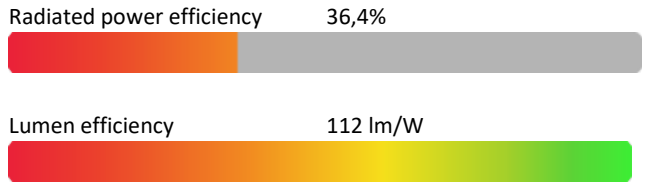
### Input Power

Power feed to light source	9,0 W
Frequency of input power	50 Hz
RMS Input voltage feed, $V_{RMS}$	230 V
RMS Input current feed, $I_{RMS}$	0,074 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	16,97 VA
Displacement factor of AC power feed	0,78
Power factor of AC current feed	0,53
Total harmonic distortion of the current	105,97%
Total harmonic distortion of the voltage	0,08%

### 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	6473 K
CCT shift	+27 K
CCT end	6500 K

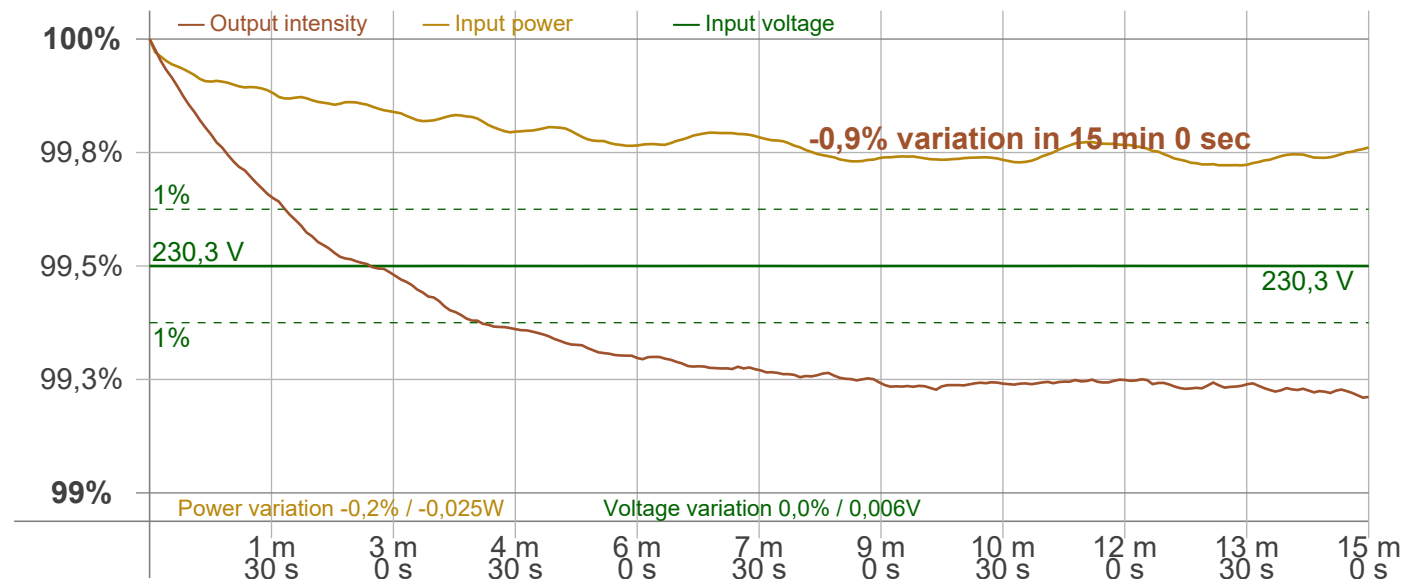
### Warmup Result

Total warmup time	Lamp stabilized in 15 min 0 sec
Warmup variation	-0,9%

### Output Change

Output start	1018 lm
Output change	-9 lm
Output end	1010 lm

### Stabilization Curve



# Light Measurement Report

Print date: 23-9-2025

Measurement date and time: 22-9-2025 11:38:05 – Measurement no. VFR-250922-3296-MS

Measurement tracking No. and Link: [VT250922-002972](https://www.viso-systems.com/VT250922-002972)

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 298,51 Hz  
 Percent Flicker 0,15 %  
 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 0,07 %  
 JA8/10 400 Hz 0,11 %  
 JA8/10 1000 Hz 0,15 %

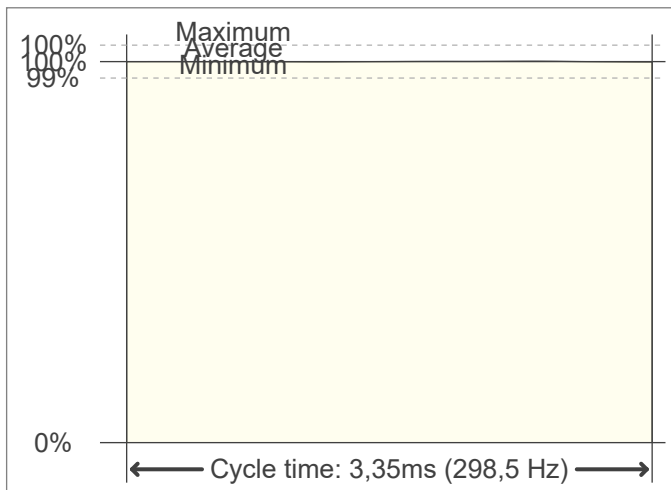
### TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

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

