

# Light Measurement Report

Print date: 8-4-2025

Measurement date and time: 8-4-2025 11:27:52 – Measurement no. VFR-250408-0633-MS

Measurement tracking No. and Link: [VT250408-008745](#)

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

72 planes – 5°  
5°  
1,99 m  
10,9 W – PF 0,94 – DPF 0,96  
230 V – 0,050 A  
50 Hz  
Lamp stabilized in 15 min 1 sec – 2,0%

## Tested Light Source

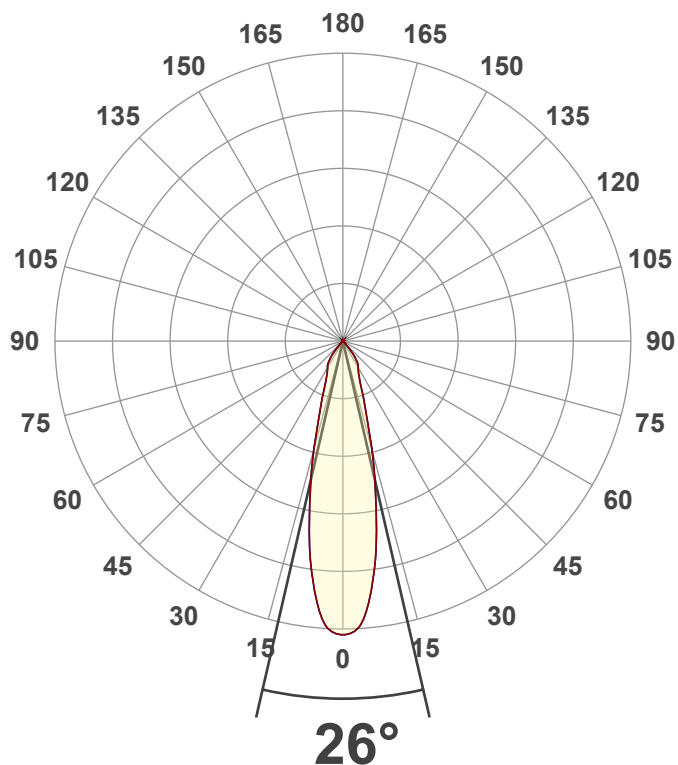
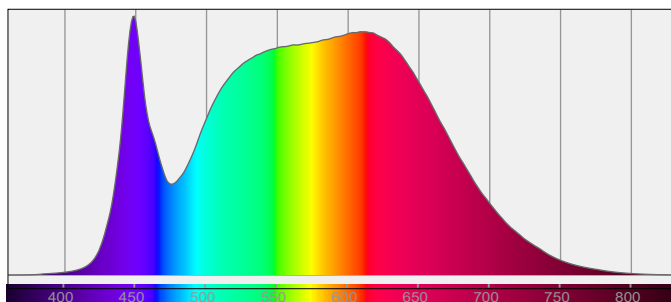
Product Name  
Item No. and Manufacturer  
Product Description (line 1)

810726-4000K  
810726-4000K – Dutchfulfillment  
1-FASE RAILSPOT | PANDO | 10W | ZWART | 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

920 lm – 0,03% / 99,97%  
84 lm/W  
2912 cd – 26°  
CCT = 4000 K / 4131 K  
CRI 90,3  
 $R_f$  90,9 –  $R_g$  98,3  
Duv 0,0052 – SDCM 4,8  
SVM 0,03 – PstLM 0,04



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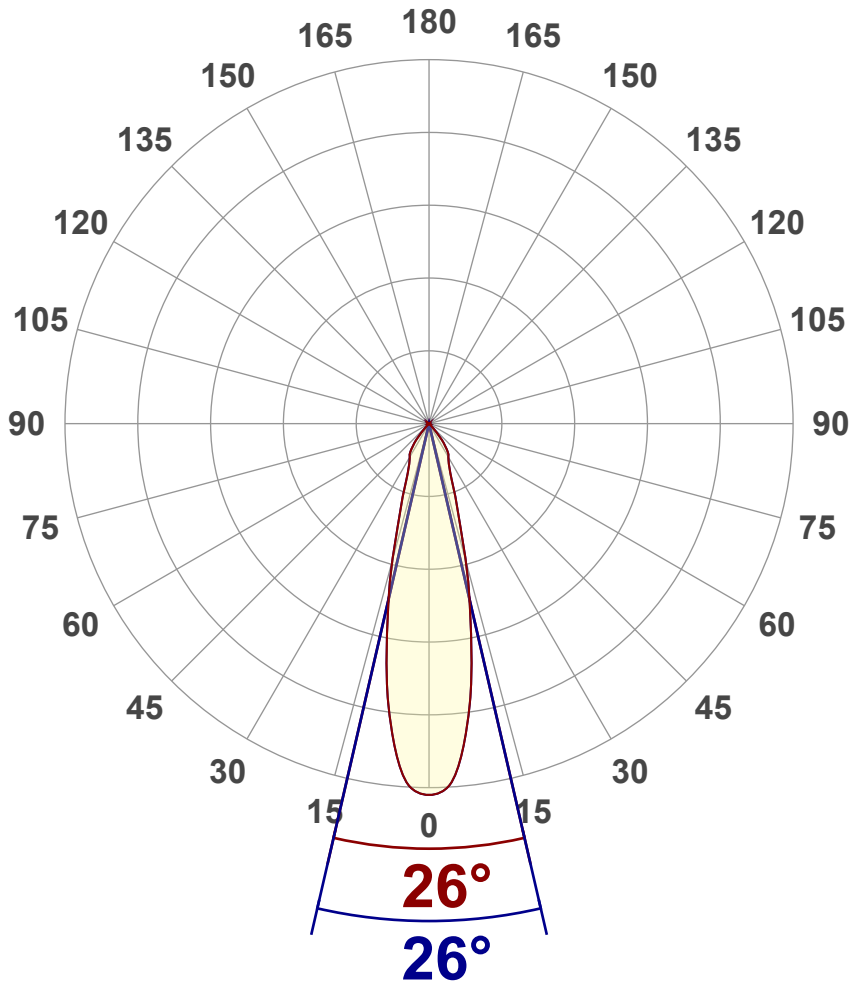
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## Luminous Intensity diagram

Unit: 0-100% of peak intensity



## Main Values

Output (total Lumen)	920 lm
Lumen Up% / Down%	0,03% / 99,97%
Peak Intensity	2912 cd
Beam Angle (50%)	26°
Beam Angle (90%)	26°
Beam Angle (10%)	26°

## Cut-off Angle

Average 2,5%	83,7°
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## Field Angle

Average 10%	63,8°
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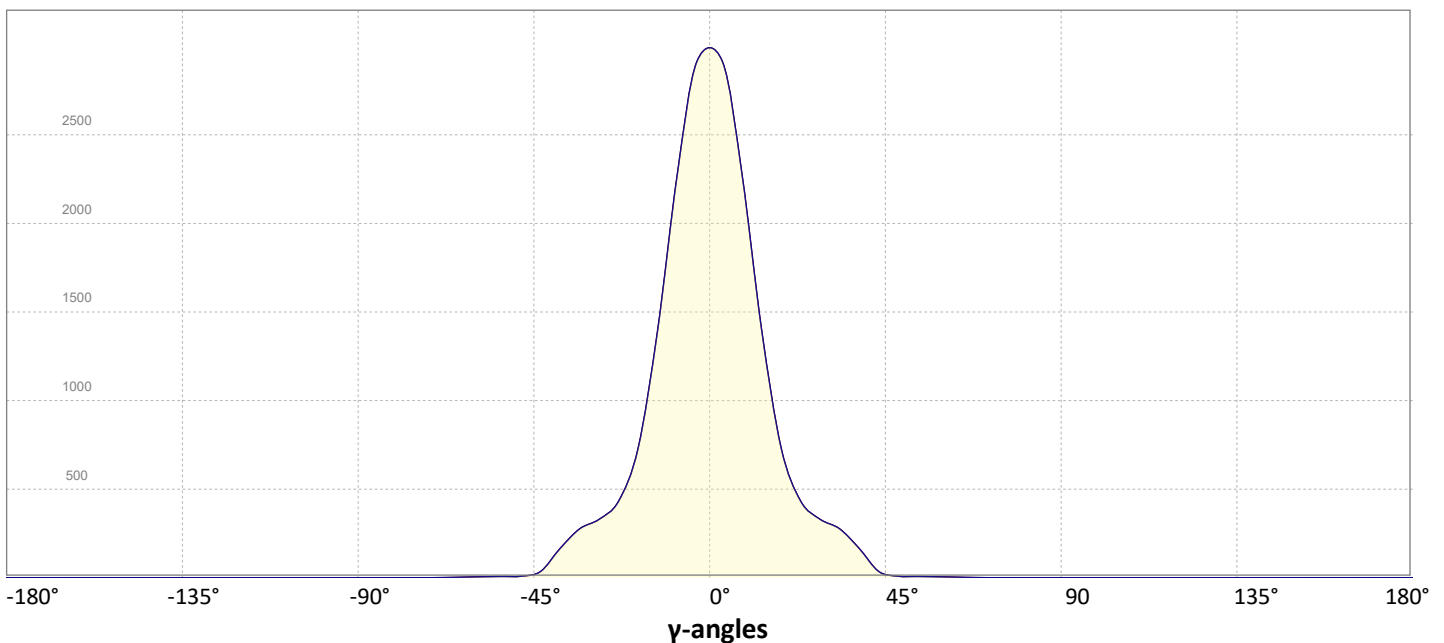
## Intensity Ratio

In 120° cone	99,6%
In 90° cone	98,4%

**C000-C180**

**C090-C270**

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



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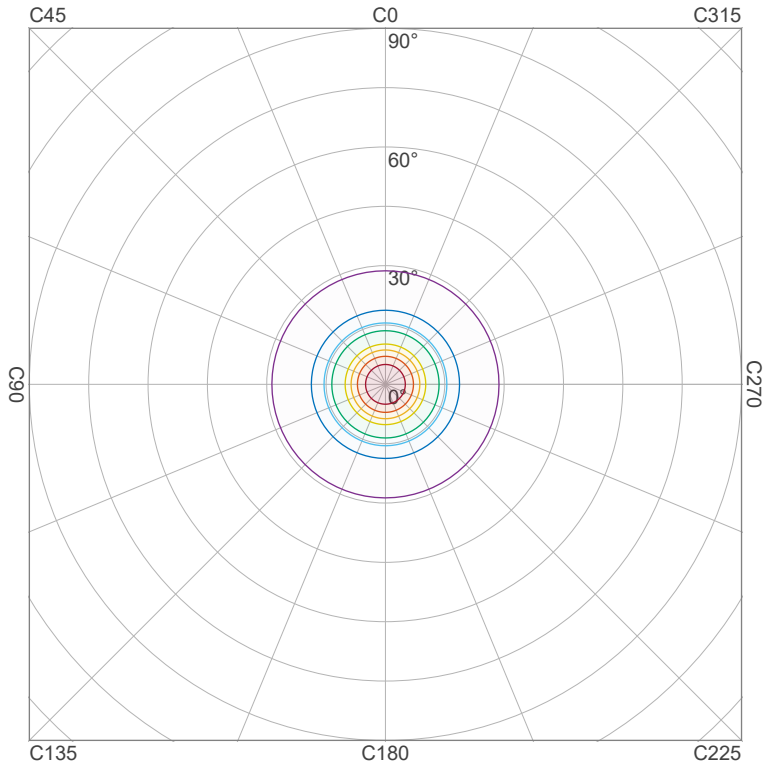
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## Iso-intensity Diagram (Iso-candela)

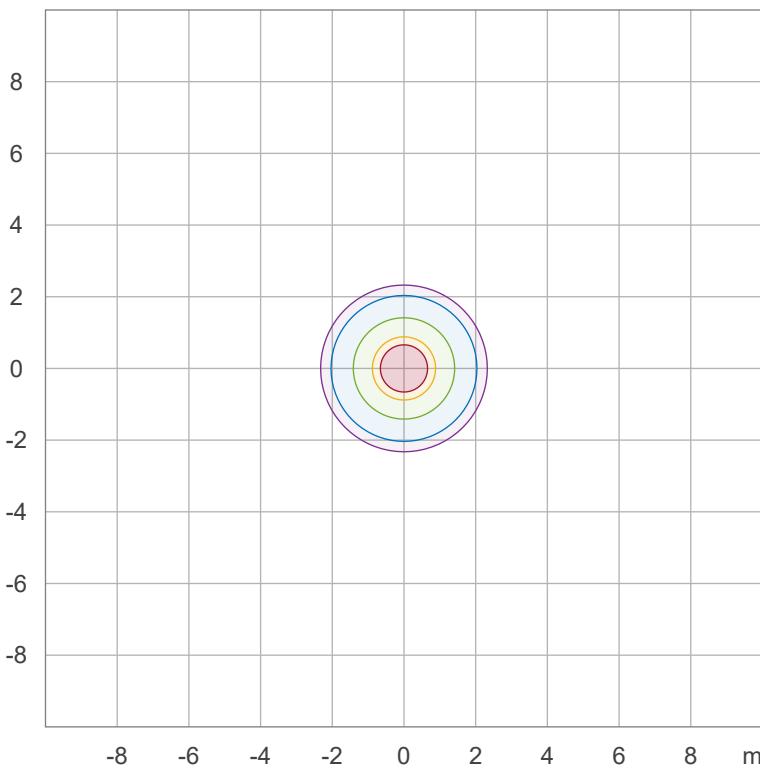


90 %	2620,8 cd
80 %	2329,6 cd
70 %	2038,4 cd
60 %	1747,2 cd
50 %	1456,0 cd
40 %	1164,8 cd
30 %	873,6 cd
20 %	582,4 cd
10 %	291,2 cd

Peak intensity: 2912,0 cd

Number of c-planes: 72

## Iso-illuminance Diagram (Iso-lux)



50,0 %	161,8 lx
30,0 %	97,1 lx
10,0 %	32,4 lx
5,0 %	16,2 lx
3,0 %	9,7 lx

Peak illuminance: 323,6 lx

Mounting height: 3,0 m

Number of c-planes: 72

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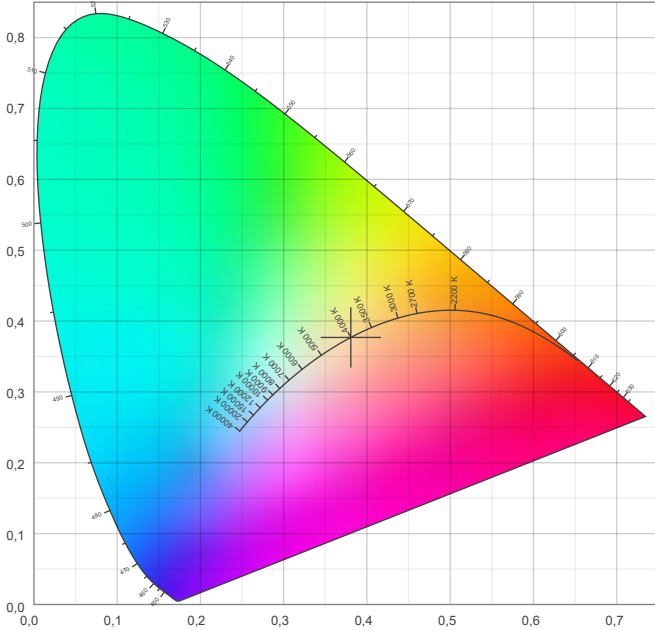


## Color details

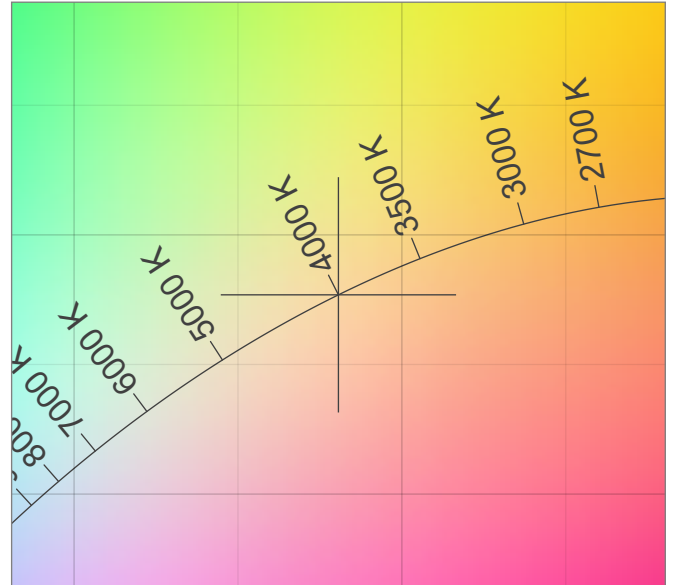
Correlated Color Temperature, Target CCT = 4000 K  
 Correlated Color Temperature, Measured CCT = 4131 K  
 Color Rendering Index CRI 90,3  
 Color Rendering Index, R9 (red component) R9 = 54,9  
 Color Rendering TM30-18 R<sub>f</sub> 90,9 – R<sub>g</sub> 98,3  
 Color Quality Scale CQS = 91,4

MacAdam Steps SDCM = 4,8  
 Color coordinates CIE 1931 (x;y) = (0,381;0,377)  
 Color coordinate CIEs 1960 (u;v) = (0,225;0,334)  
 Color deviation from BBL Duv = 0,0052  
 Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,225;0,502)

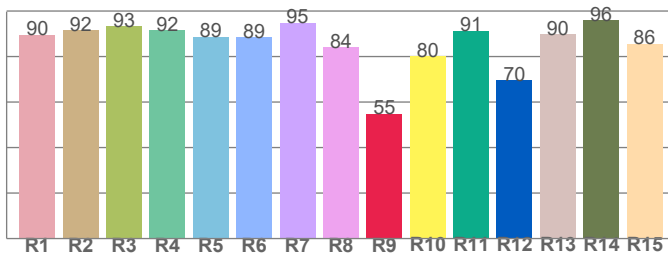
### CIE 1931



### CIE 1931 – zoomed on Planckian locus



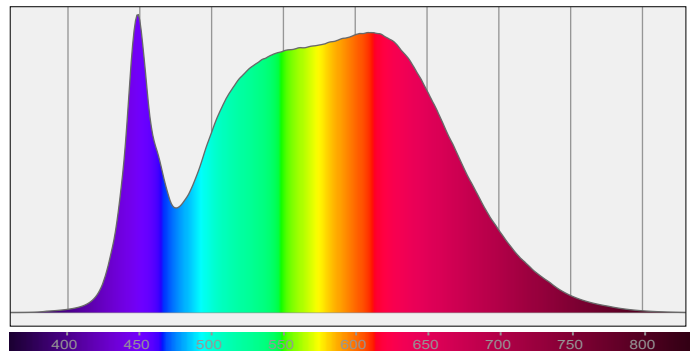
### Color Rendering Index per reference color (CIE 1995)



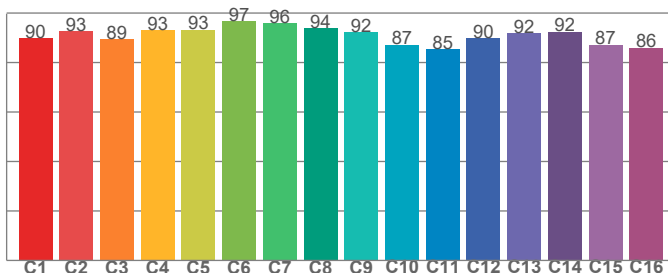
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
89,6	91,6	93,3	91,7	88,8	88,5	94,9	84,0	54,9	80,1	91,3	69,7	89,8	96,1	85,7

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



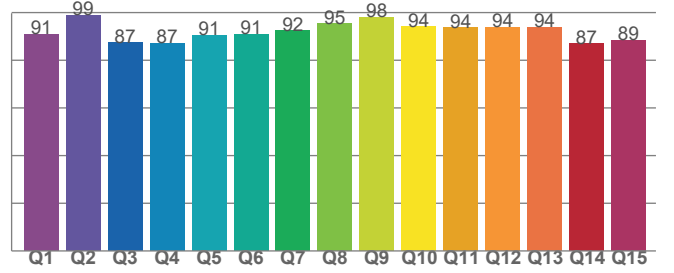
### TM30-18 Rf-values per hue bin



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
89,8	92,6	89,4	93,1	93,3	96,6	96,0	93,9	92,3	87,2	85,4	89,9	91,8	92,4	87,2	86,0

### Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
90,8	98,9	87,3	87,3	90,6	91,0	92,5	95,4	98,0	94,1	93,6	93,8	93,8	86,9	88,5

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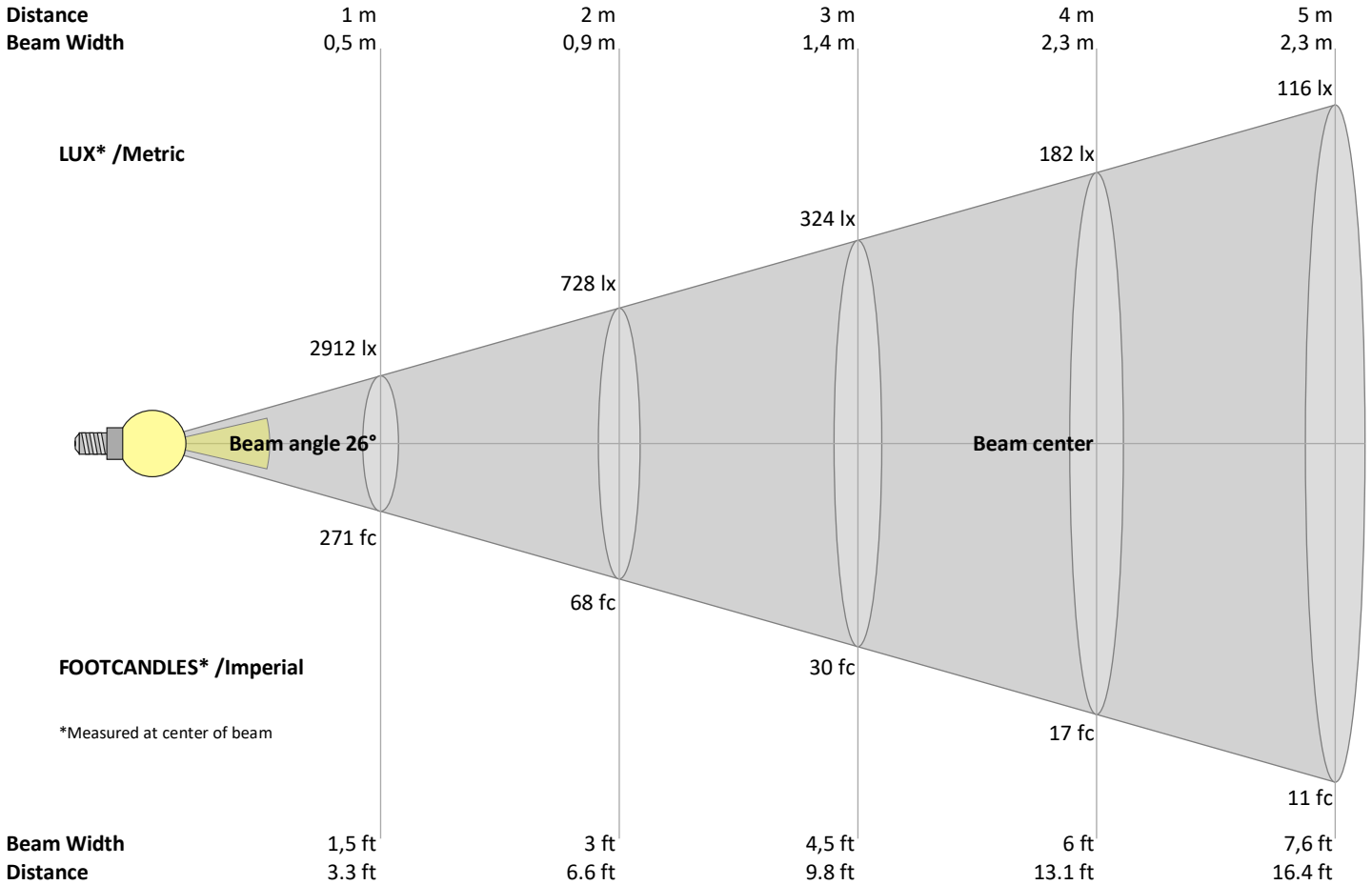
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## Beam Details



### 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
2912	728	324	182	116	81	59	46	36	29	24	20	17	15	13	11	10	9	8	7	lux
270,5	67,6	30,1	16,9	10,8	7,5	5,5	4,2	3,3	2,7	2,2	1,9	1,6	1,4	1,2	1,1	0,9	0,8	0,7	0,7	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
2912	2912	2822	2567	2313	1977	1627	1307	1039	772	631	511	419	377	336	312	290	260	216	172	cd
100%	100%	97%	88%	79%	68%	56%	45%	36%	27%	22%	18%	14%	13%	12%	11%	10%	9%	7%	6%	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
2912	2912	2822	2567	2313	1977	1627	1307	1039	772	631	511	419	377	336	312	290	260	216	172	cd
100%	100%	97%	88%	79%	68%	56%	45%	36%	27%	22%	18%	14%	13%	12%	11%	10%	9%	7%	6%	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
2912	2912	2822	2567	2313	1977	1627	1307	1039	772	631	511	419	377	336	312	290	260	216	172	cd
100%	100%	97%	88%	79%	68%	56%	45%	36%	27%	22%	18%	14%	13%	12%	11%	10%	9%	7%	6%	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
2912	2912	2822	2567	2313	1977	1627	1307	1039	772	631	511	419	377	336	312	290	260	216	172	cd
100%	100%	97%	88%	79%	68%	56%	45%	36%	27%	22%	18%	14%	13%	12%	11%	10%	9%	7%	6%	of 0°val

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## 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	18,9	19,4	19,0	19,7	19,8	18,9	19,4	19,0	19,7	19,8
	3H	18,6	19,3	19,0	19,5	19,7	18,6	19,3	19,0	19,5	19,7
	4H	18,5	19,2	18,9	19,4	19,6	18,5	19,2	18,9	19,4	19,6
	6H	18,5	19,1	18,8	19,4	19,7	18,5	19,1	18,8	19,4	19,7
	8H	18,5	19,0	18,8	19,3	19,7	18,5	19,0	18,8	19,3	19,7
	12H	18,4	18,9	18,8	19,3	19,7	18,4	18,9	18,8	19,3	19,7
4H	2H	18,5	19,2	18,9	19,4	19,6	18,5	19,2	18,9	19,4	19,6
	3H	18,5	18,9	18,8	19,3	19,7	18,5	18,9	18,8	19,3	19,7
	4H	18,3	18,8	18,7	19,2	19,7	18,3	18,8	18,7	19,2	19,7
	6H	18,2	18,7	18,7	19,1	19,4	18,2	18,7	18,7	19,1	19,4
	8H	18,2	18,6	18,7	19,0	19,3	18,2	18,6	18,7	19,0	19,3
	12H	18,1	18,5	18,6	18,9	19,3	18,1	18,5	18,6	18,9	19,3
8H	4H	18,2	18,6	18,7	19,0	19,3	18,2	18,6	18,7	19,0	19,3
	6H	18,1	18,4	18,6	18,9	19,4	18,1	18,4	18,6	18,9	19,4
	8H	18,1	18,3	18,6	18,8	19,5	18,1	18,3	18,6	18,8	19,5
	12H	18,0	18,2	18,6	18,7	19,3	18,0	18,2	18,6	18,7	19,3
12H	4H	18,1	18,5	18,6	18,9	19,3	18,1	18,5	18,6	18,9	19,3
	6H	18,1	18,3	18,6	18,8	19,5	18,1	18,3	18,6	18,8	19,5
	8H	18,0	18,2	18,6	18,7	19,3	18,0	18,2	18,6	18,7	19,3

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

S = 1.0H	4,7 / -12,3	4,7 / -12,3
S = 1.5H	7,3 / -13,9	7,3 / -13,9
S = 2.0H	9,3 / -17,6	9,3 / -17,6

## 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	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	114	112	110	108	112	110	108	106	106	104	103	102	101	100	99	98	97	95
2	110	105	102	99	108	104	101	98	101	98	96	98	96	94	95	93	92	90
3	105	100	96	92	103	98	95	91	96	93	90	94	91	89	91	89	87	86
4	101	95	90	86	99	94	89	86	91	88	85	90	86	84	88	85	83	82
5	97	90	85	82	96	89	85	81	87	83	80	86	82	80	84	81	79	78
6	93	86	81	77	92	85	80	77	84	80	77	82	79	76	81	78	76	74
7	90	82	77	74	89	81	77	73	80	76	73	79	75	73	78	75	72	71
8	87	79	74	70	86	78	73	70	77	73	70	76	72	70	75	72	69	68
9	84	76	71	67	83	75	70	67	74	70	67	73	70	67	73	69	67	65
10	81	73	68	65	80	72	68	65	71	67	64	71	67	64	70	67	64	63

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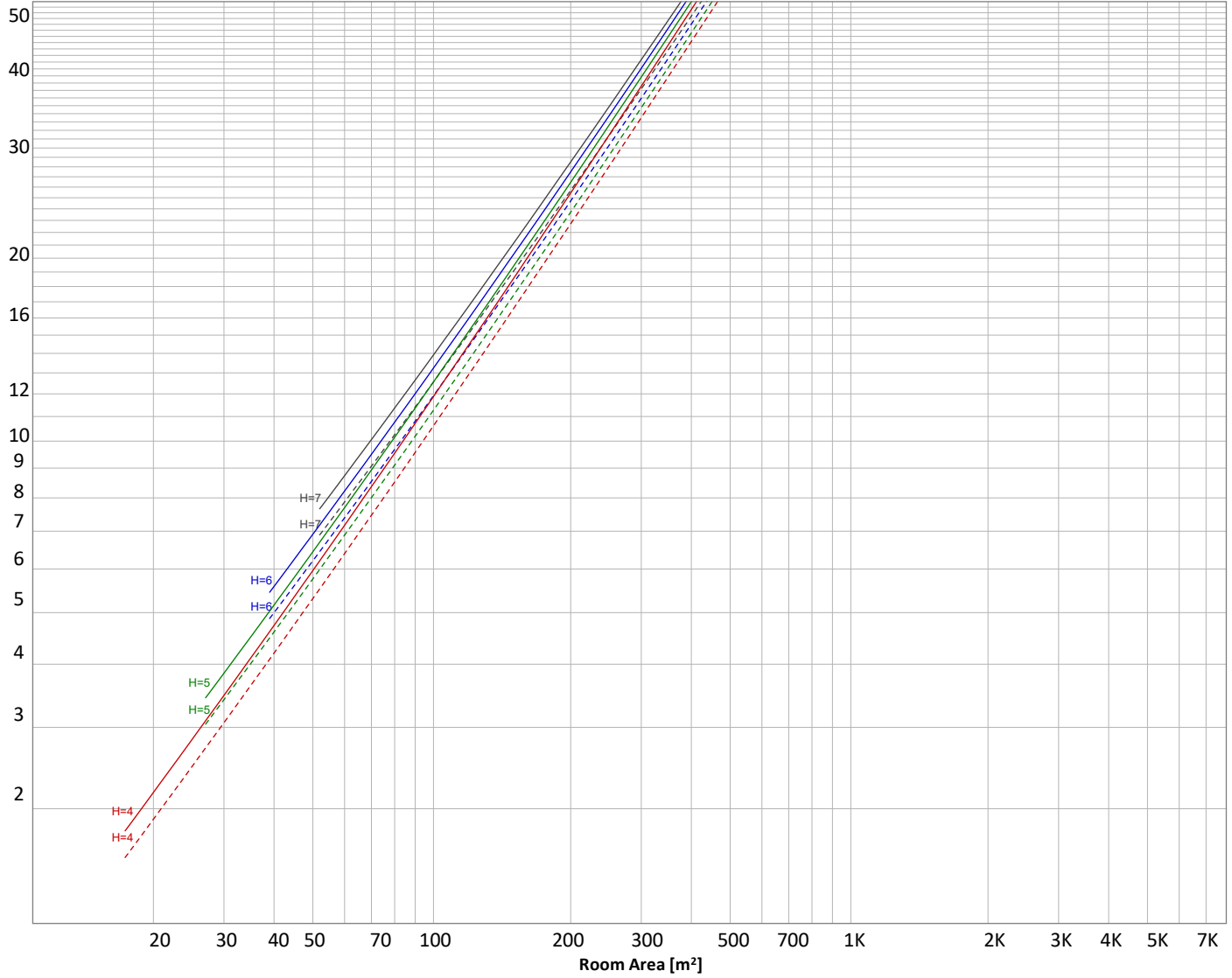
Operator:



## Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



### Conditions

H = Room height	Flux = 920 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°
238 lm	316 lm	187 lm	144 lm	25,4 lm	5,95 lm	2,64 lm	0,384 lm	0,031 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
0,002 lm	0,003 lm	0,011 lm	0,005 lm	0,019 lm	0,041 lm	0,090 lm	0,108 lm	0,029 lm

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## Outdoor Light Planning

### Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	{LUM00-10} lm	#VALUE!
10-20°	{LUM10-20} lm	#VALUE!
20-30°	{LUM20-30} lm	#VALUE!
30-40°	{LUM30-40} lm	#VALUE!
40-50°	{LUM40-50} lm	#VALUE!
50-60°	{LUM50-60} lm	#VALUE!
60-70°	{LUM60-70} lm	#VALUE!
70-80°	{LUM70-80} lm	#VALUE!
80-90°	{LUM80-90} lm	#VALUE!
90-100°	{LUM90-100} lm	#VALUE!
100-110°	{LUM100-110} lm	#VALUE!
110-120°	{LUM110-120} lm	#VALUE!
120-130°	{LUM120-130} lm	#VALUE!
130-140°	{LUM130-140} lm	#VALUE!
140-150°	{LUM140-150} lm	#VALUE!
150-160°	{LUM150-160} lm	#VALUE!
160-170°	{LUM160-170} lm	#VALUE!
170-180°	{LUM170-180} lm	#VALUE!
<b>Total</b>	<b>0 lm</b>	<b>#VALUE!</b>

### Intensity peaks

Max intensity	{PEAK} cd
Intensity, 90°	{INT90} cd
Intensity, 0°	{INT0} cd

### Zonal Lumen summary

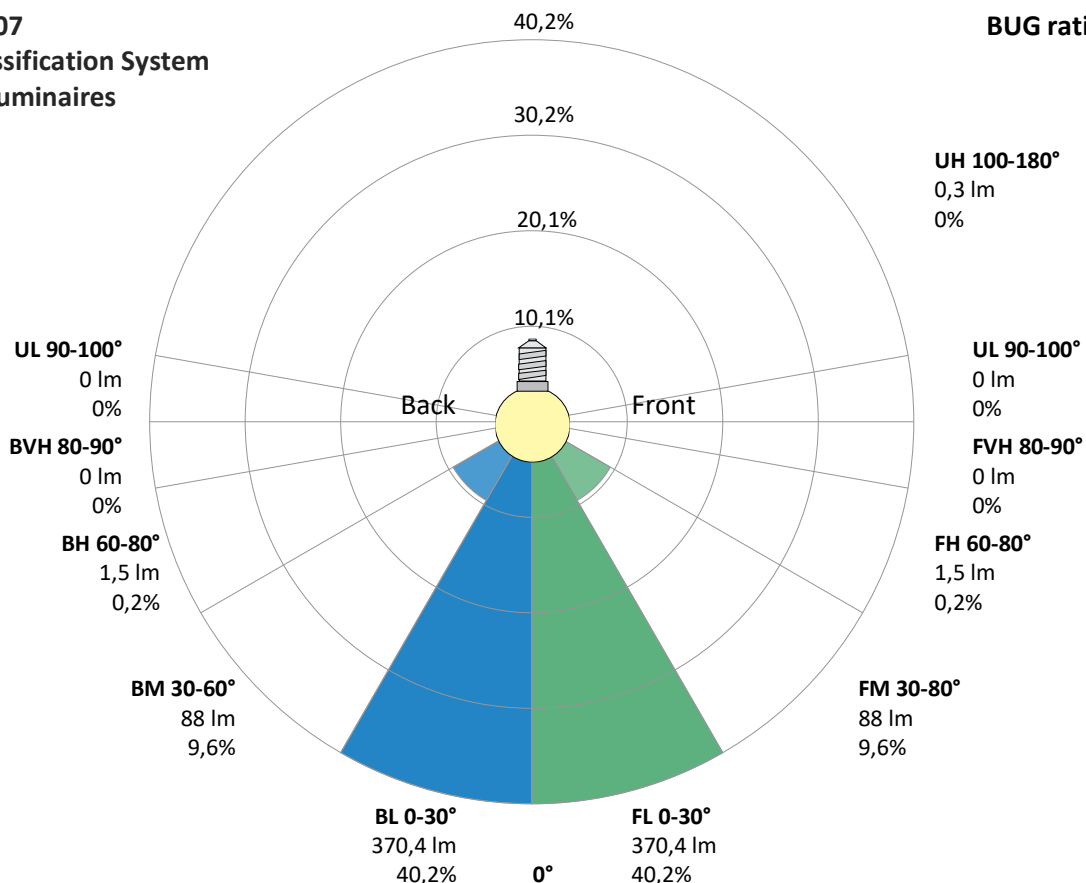
Zone (γ)	Lumen	% Total
0-30°	{LUM00-30} lm	#VALUE!
0-40°	{LUM00-40} lm	#VALUE!
0-60°	{LUM00-60} lm	#VALUE!
60-90°	{LUM60-90} lm	#VALUE!
70-100°	{LUM70-100} lm	#VALUE!
90-120°	{LUM90-120} lm	#VALUE!
0-90°	{LUM00-90} lm	#VALUE!
90-180°	{LUM90-180} lm	#VALUE!
0-180°	{LUM00-180} lm	#VALUE!

### BUG rating

	Lumen	% Total
<b>Forward light</b>		
Low(0-30°)	{BUG0} lm	#VALUE!
Medium(30-60°)	{BUG1} lm	#VALUE!
High(60-80°)	{BUG2} lm	#VALUE!
Very high(80-90°)	{BUG3} lm	#VALUE!
<b>Back light</b>		
Low(0-30°)	{BUG4} lm	#VALUE!
Medium(30-60°)	{BUG5} lm	#VALUE!
High(60-80°)	{BUG6} lm	#VALUE!
Very high(80-90°)	{BUG7} lm	#VALUE!
<b>Uplight</b>		
Low(90-100°)	{BUG8} lm	#VALUE!
High(100-180°)	{BUG9} lm	#VALUE!

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

**BUG rating B1 U0 G0**



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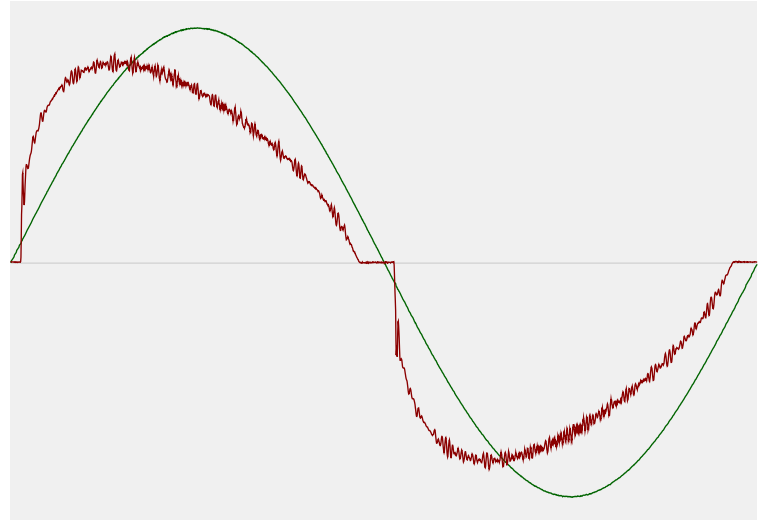


## Power Details

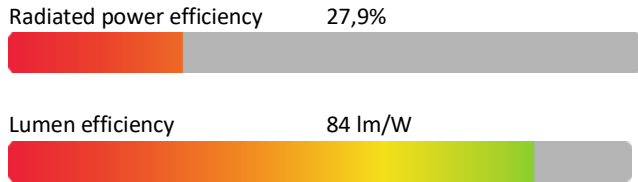
### Input Power

Power feed to light source	10,9 W
Frequency of input power	50 Hz
RMS Input voltage feed, $V_{RMS}$	230 V
RMS Input current feed, $I_{RMS}$	0,050 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	11,57 VA
Displacement factor of AC power feed	0,96
Power factor of AC current feed	0,94
Total harmonic distortion of the current	17,71%
Total harmonic distortion of the voltage	0,13%

### 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	4000 K
CCT shift	+0 K
CCT end	4000 K

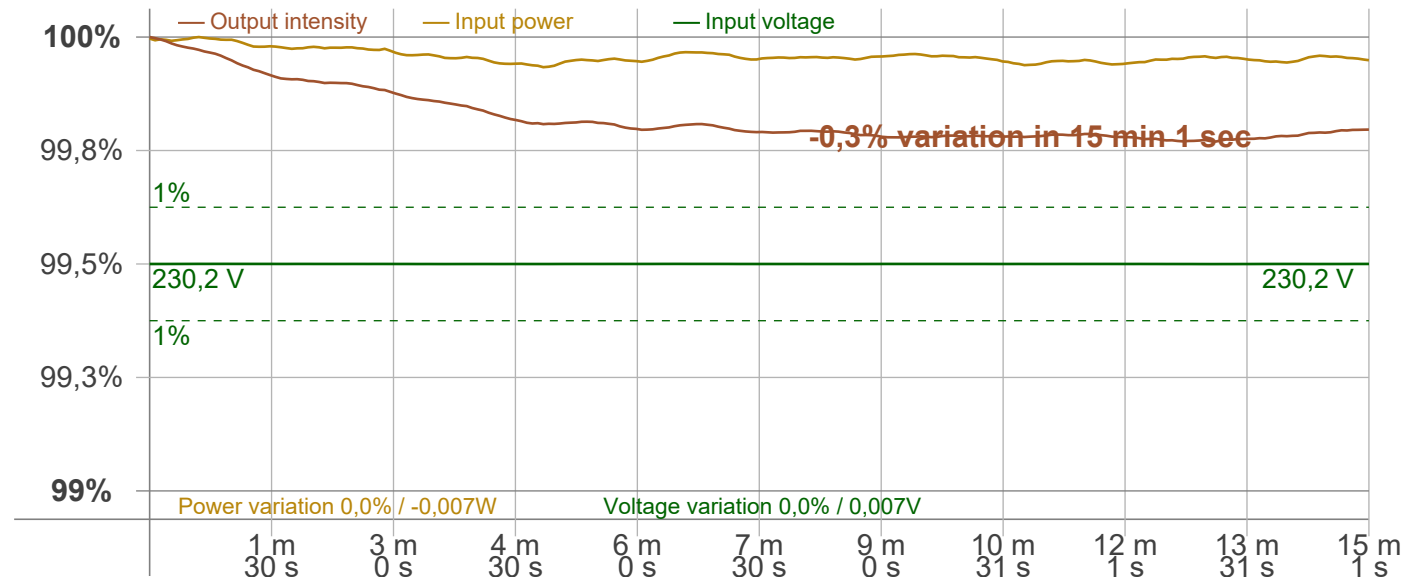
### Warmup Result

Total warmup time	Lamp stabilized in 15 min 1 sec
Warmup variation	-0,3%

### Output Change

Output start	922 lm
Output change	-2 lm
Output end	920 lm

### Stabilization Curve



# Light Measurement Report

Print date: 8-4-2025

Measurement date and time: 8-4-2025 11:27:52 – Measurement no. VFR-250408-0633-MS

Measurement tracking No. and Link: [VT250408-008745](#)

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 0,8 %  
 Flicker index 0

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

JA8/10 40 Hz 0,06 %  
 JA8/10 90 Hz 0,06 %  
 JA8/10 200 Hz 0,79 %  
 JA8/10 400 Hz 0,79 %  
 JA8/10 1000 Hz 0,79 %

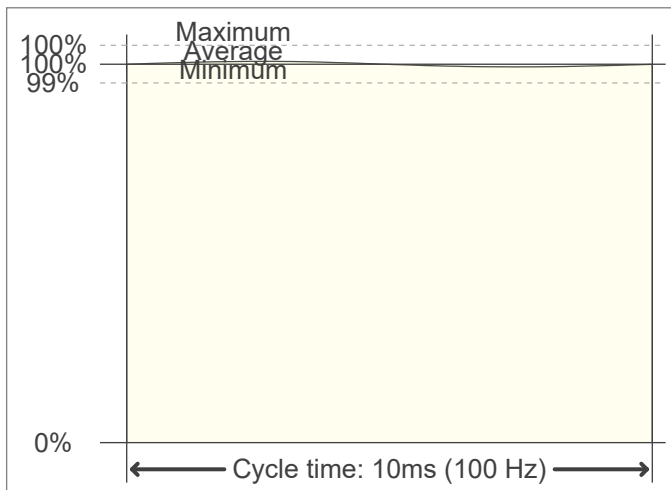
### TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

PstLM value (F < 80 Hz) 0,04  
 SVM value (80 < F < 2000 Hz) 0,03

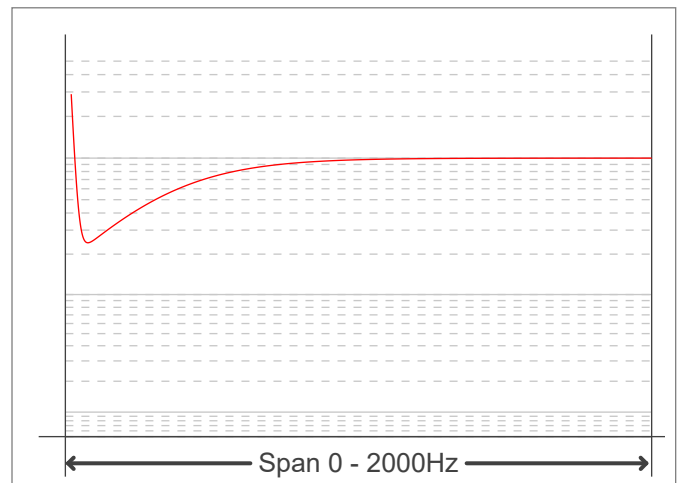
### Flicker indices according to Lighting Research Center (2015)

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

