

Light Measurement Report

Print date: 31-10-2024

Measurement date and time: 31-10-2024 10:18:36 – Measurement no. VFR-241031-1754-MS

Measurement tracking No. and Link: [VT241031-001450](#)

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

1,6 W – PF 0,33 – DPF 0,99

230 V – 0,022 A

50 Hz

Not completed – 2,0%

Tested Light Source

Product Name

Item No. and Manufacturer

Product Description (line 1)

FUT061-GROEN

FUT061-GROEN – Dutchfulfillment

MI-LIGHT | DOWNLIGHT | RGB+CCT | Ø110 | 9W | WIT

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

41,8 lm – 0,57% / 99,43%

26 lm/W

15,2 cd – 109,1°

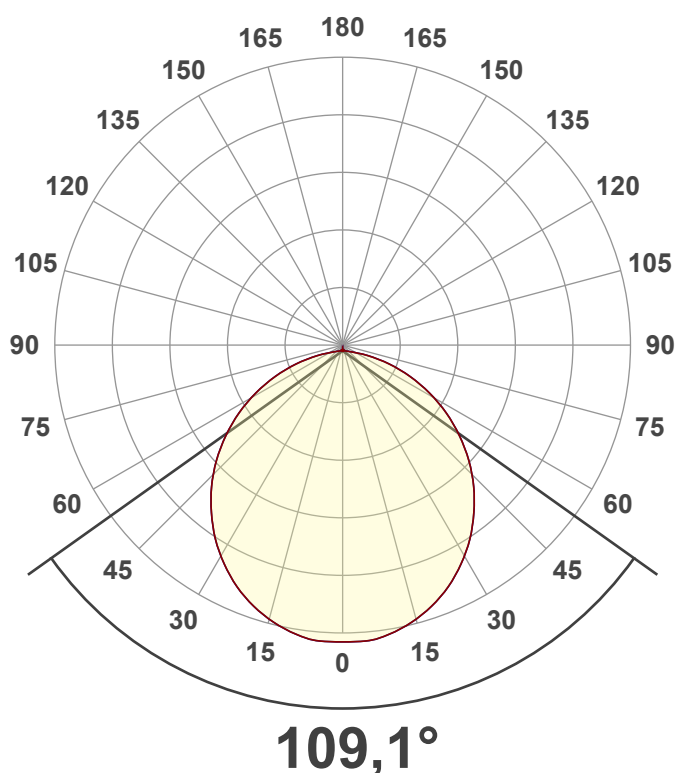
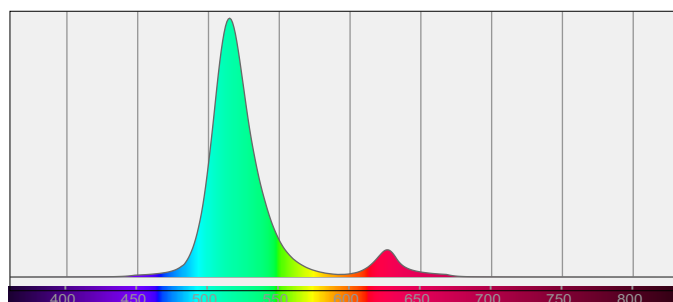
CCT = 0 K / 0 K

CRI 0,0

R_f 0,0 – R_g 0,0

Duv n/a – SDCM n/a

SVM 0 – PstLM 0,07



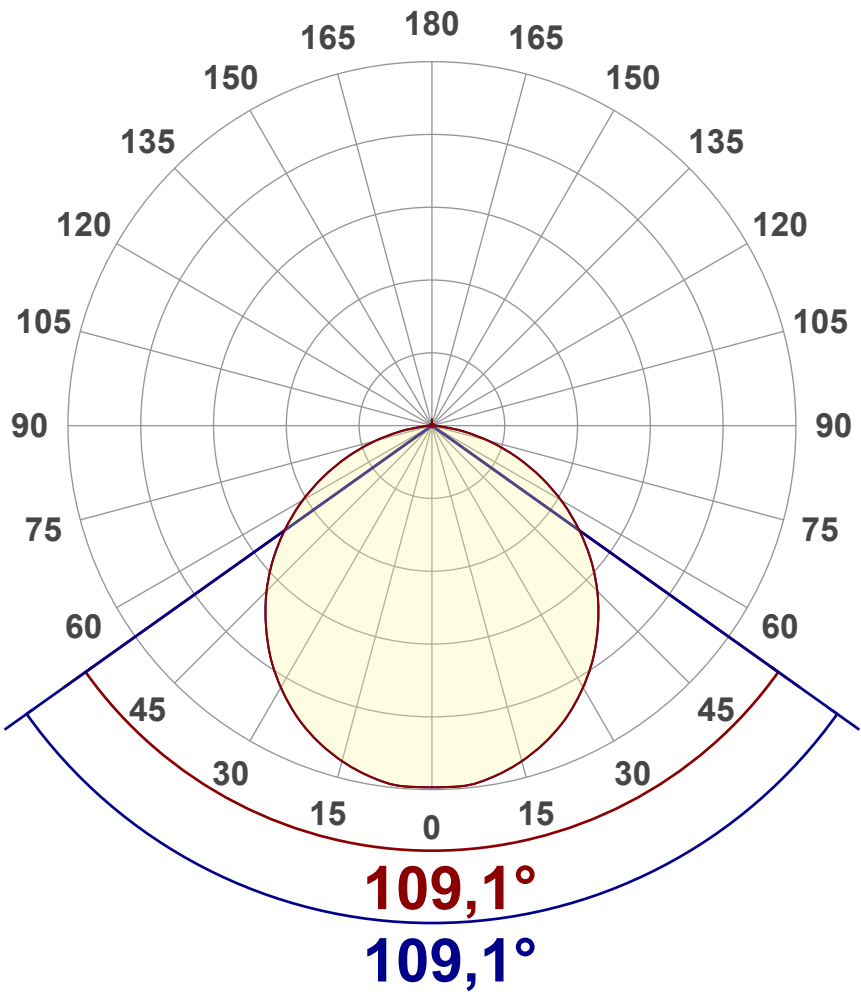
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	41,8 lm
Lumen Up% / Down%	0,57% / 99,43%
Peak Intensity	15,2 cd
Beam Angle (50%)	109,1°
Beam Angle (90%)	109,1°
Beam Angle (10%)	109,1°

Cut-off Angle

Average 2,5%	169,2°
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Field Angle

Average 10%	157,8°
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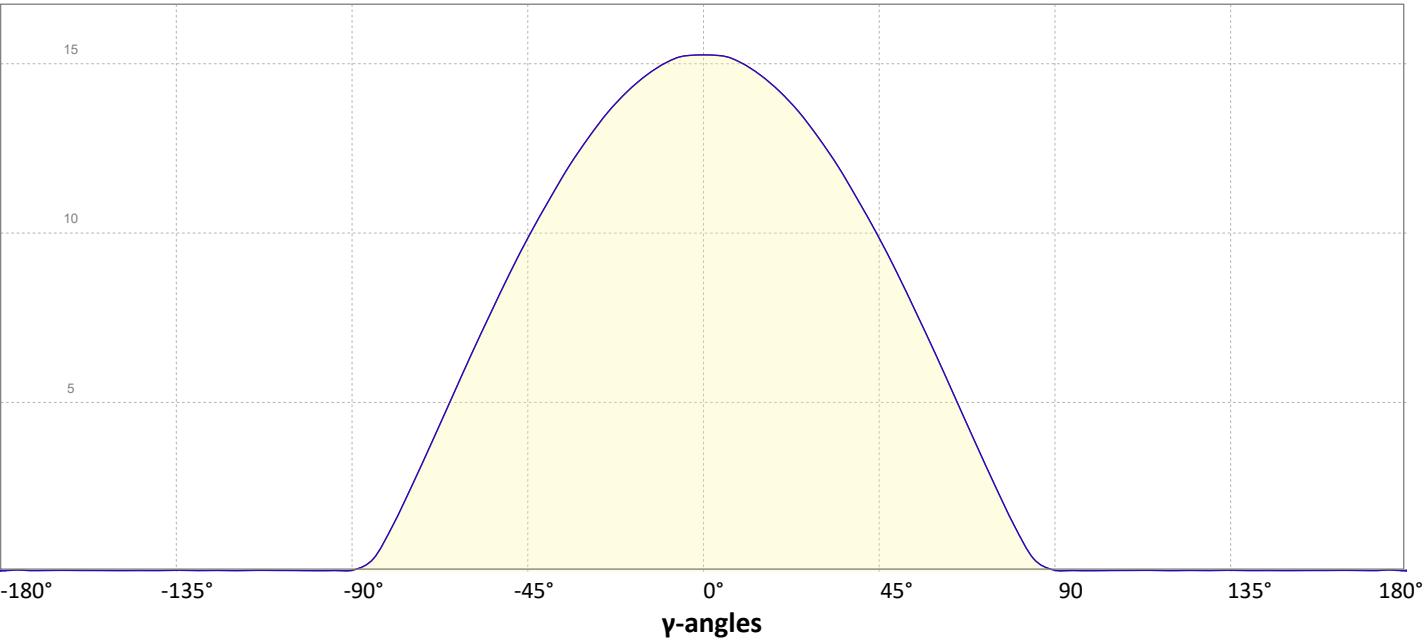
Intensity Ratio

In 120° cone	80,1%
In 90° cone	55,1%

C000-C180

C090-C270

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

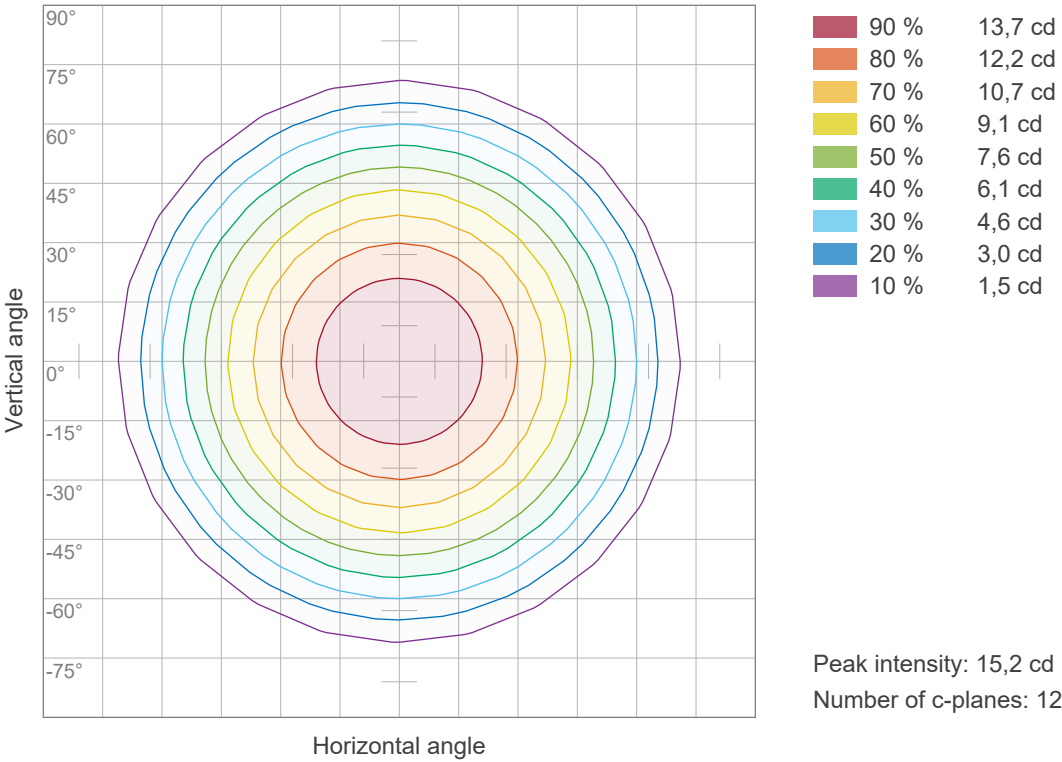


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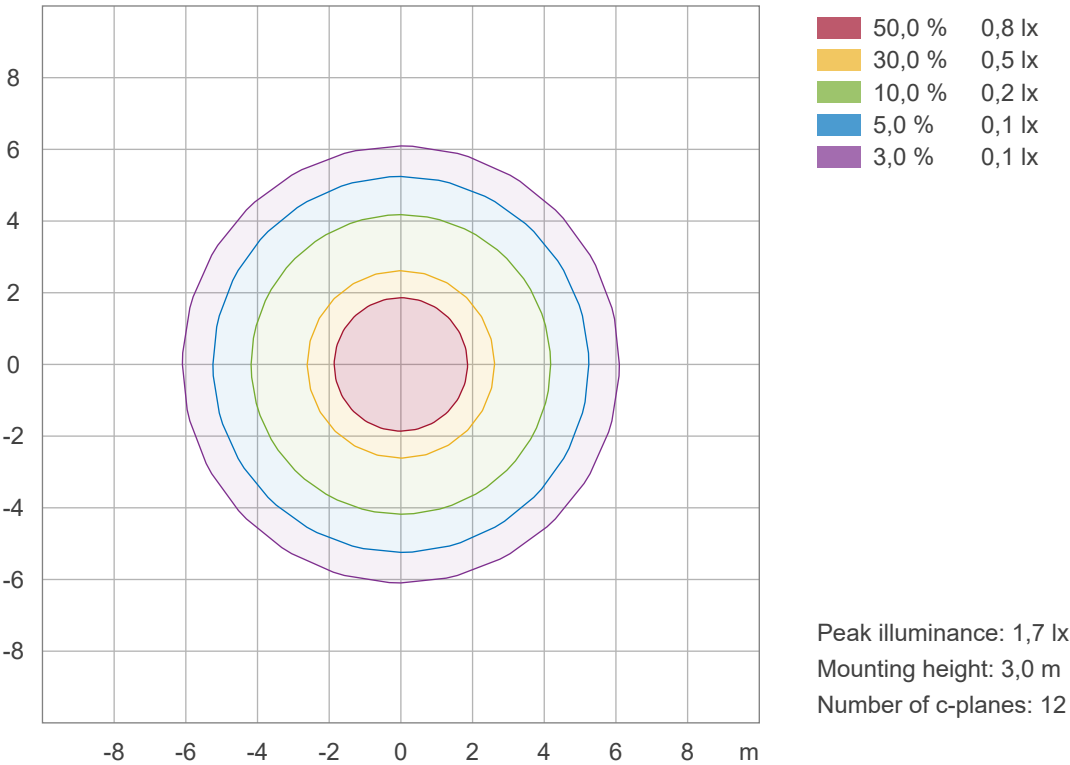
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Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



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Color details

Correlated Color Temperature, Target

Correlated Color Temperature, Measured

Color Rendering Index

Color Rendering Index, R9 (red component)

Color Rendering TM30-18

Color Quality Scale

CCT = 0 K

CCT = 0 K

CRI 0,0

R9 = 0,0

R_f 0,0 – R_g 0,0

CQS = 0,0

MacAdam Steps

Color coordinates CIE 1931

Color coordinate CIEs 1960

Color deviation from BBL

Color coordinate CIEs 1976 (CIELUV)

SDCM = n/a

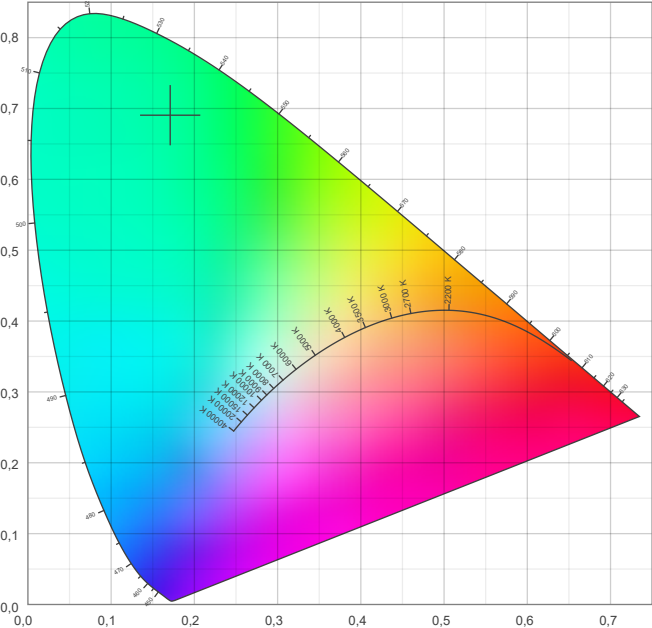
(x;y) = (0,171;0,691)

(u;v) = (0,062;0,379)

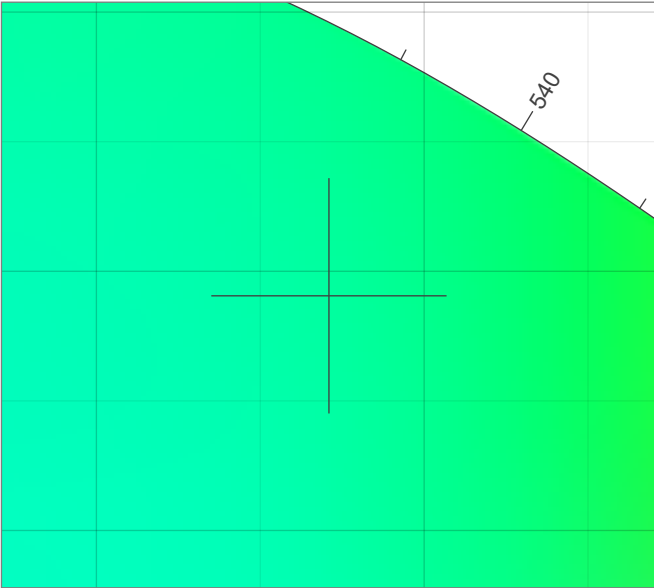
Duv = n/a

(u';v') = (0,062;0,568)

CIE 1931



CIE 1931 – zoomed on Planckian locus



Color Rendering Index per reference color (CIE 1995)

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	

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
0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

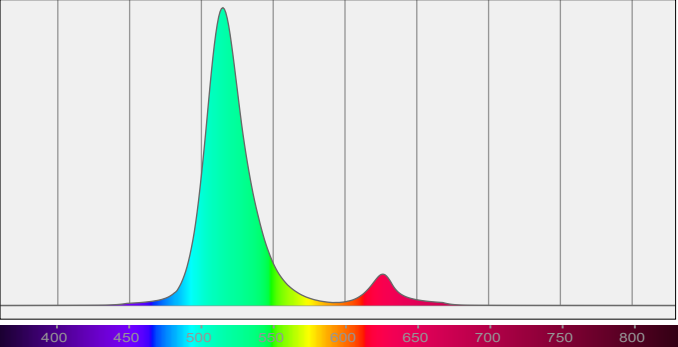
TM30-18 Rf-values per hue bin

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16

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
0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

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



Color Quality Scale by reference color

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	

CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

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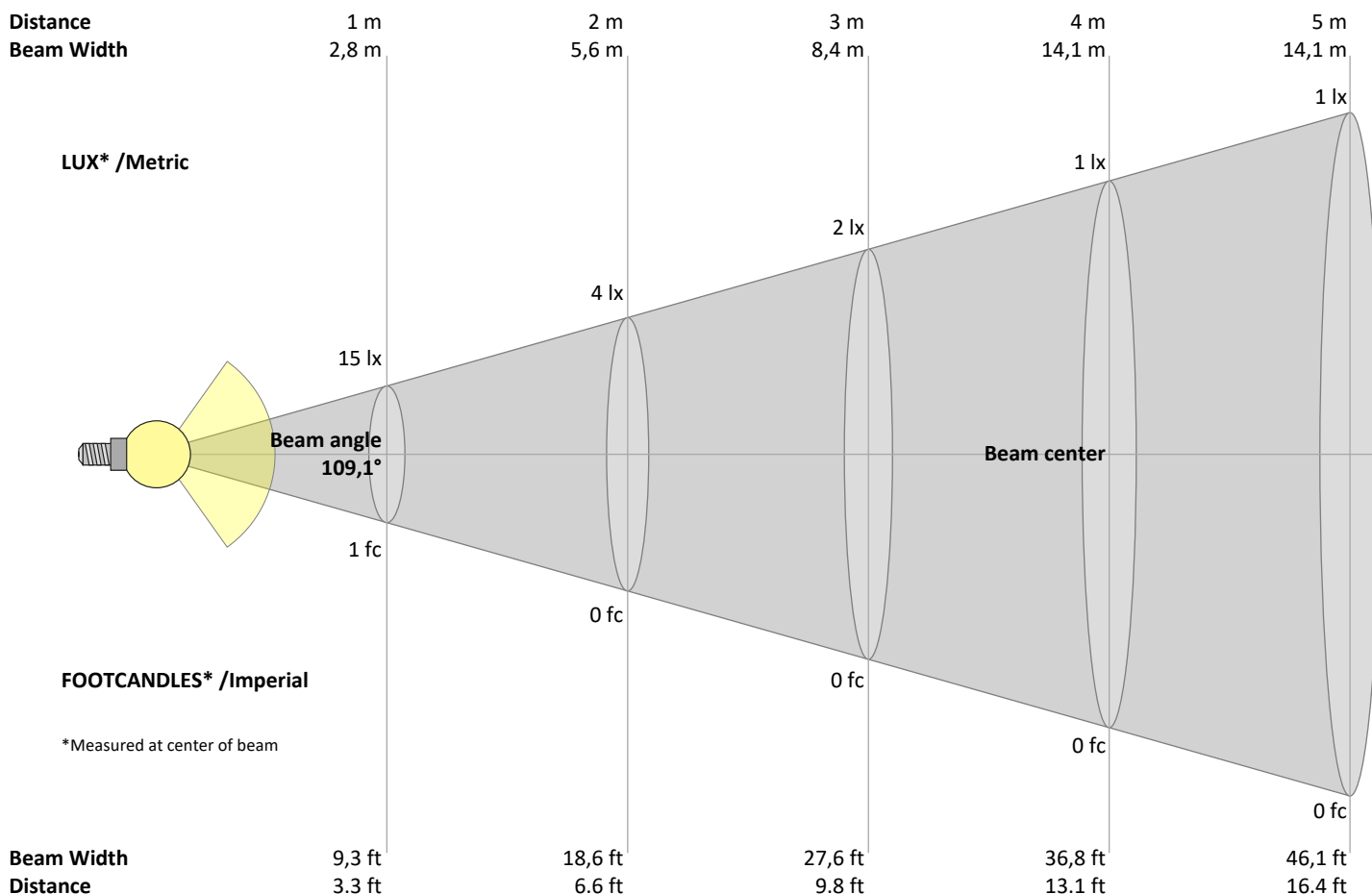
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Beam Details



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
15	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	lux
1,4	0,4	0,2	0,1	0,1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
15,2	15,2	15,0	14,6	14,1	13,5	12,7	11,9	10,9	9,8	8,7	7,5	6,3	5,0	3,7	2,5	1,3	0,4	0,1	0,0	cd
100%	100%	98%	96%	93%	89%	84%	78%	71%	65%	57%	49%	41%	33%	24%	16%	8%	2%	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
15,2	15,2	15,0	14,6	14,1	13,5	12,7	11,9	10,9	9,8	8,7	7,5	6,3	5,0	3,7	2,5	1,3	0,4	0,1	0,0	cd
100%	100%	98%	96%	93%	89%	84%	78%	71%	65%	57%	49%	41%	33%	24%	16%	8%	2%	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
15,2	15,2	15,0	14,6	14,1	13,5	12,7	11,9	10,9	9,8	8,7	7,5	6,3	5,0	3,7	2,5	1,3	0,4	0,1	0,0	cd
100%	100%	98%	96%	93%	89%	84%	78%	71%	65%	57%	49%	41%	33%	24%	16%	8%	2%	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
15,2	15,2	15,0	14,6	14,1	13,5	12,7	11,9	10,9	9,8	8,7	7,5	6,3	5,0	3,7	2,5	1,3	0,4	0,1	0,0	cd
100%	100%	98%	96%	93%	89%	84%	78%	71%	65%	57%	49%	41%	33%	24%	16%	8%	2%	0%	0%	of 0°val

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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											
X	Y	Viewed Crosswise					Viewed Endwise				
		(Viewing direction orthogonal to lamp length axis)					(Viewing direction parallel to lamp length axis)				
2H	2H	14,2	15,4	14,4	15,7	15,9	14,2	15,4	14,4	15,7	15,9
	3H	15,4	16,6	15,8	16,9	17,1	15,4	16,6	15,8	16,9	17,1
	4H	15,8	17,0	16,2	17,3	17,5	15,8	17,0	16,2	17,3	17,5
	6H	16,1	17,1	16,4	17,4	17,8	16,1	17,1	16,4	17,4	17,8
	8H	16,1	17,1	16,5	17,5	17,9	16,1	17,1	16,5	17,5	17,9
	12H	16,1	17,1	16,5	17,4	17,9	16,1	17,1	16,5	17,4	17,9
4H	2H	14,7	15,9	15,1	16,1	16,4	14,7	15,9	15,1	16,1	16,4
	3H	16,2	17,2	16,6	17,5	18,0	16,2	17,2	16,6	17,5	18,0
	4H	16,7	17,6	17,1	18,0	18,5	16,7	17,6	17,1	18,0	18,5
	6H	17,0	17,8	17,5	18,2	18,6	17,0	17,8	17,5	18,2	18,6
	8H	17,0	17,8	17,5	18,2	18,6	17,0	17,8	17,5	18,2	18,6
	12H	17,0	17,7	17,5	18,1	18,6	17,0	17,7	17,5	18,1	18,6
8H	4H	16,8	17,6	17,4	18,0	18,4	16,8	17,6	17,4	18,0	18,4
	6H	17,3	17,8	17,8	18,3	18,9	17,3	17,8	17,8	18,3	18,9
	8H	17,4	17,9	17,9	18,4	19,1	17,4	17,9	17,9	18,4	19,1
	12H	17,4	17,8	18,0	18,3	19,0	17,4	17,8	18,0	18,3	19,0
12H	4H	16,8	17,5	17,3	17,9	18,4	16,8	17,5	17,3	17,9	18,4
	6H	17,3	17,8	17,8	18,3	19,0	17,3	17,8	17,8	18,3	19,0
	8H	17,4	17,8	18,0	18,3	19,0	17,4	17,8	18,0	18,3	19,0
Variations with the observer position for the luminaire spacings, S:											
S = 1.0H		0,1 / -0,2					0,1 / -0,2				
S = 1.5H		0,3 / -0,4					0,3 / -0,4				
S = 2.0H		0,6 / -0,8					0,6 / -0,8				

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	99
1	109	104	100	96	106	102	98	95	98	95	92	94	91	89	90	88	86	84
2	99	91	84	79	97	89	83	78	86	80	76	82	78	74	79	76	72	70
3	91	80	72	66	88	79	71	65	76	69	64	73	67	63	70	65	62	59
4	83	71	62	56	81	70	62	55	67	60	55	65	59	54	63	57	53	51
5	76	64	55	48	74	62	54	48	60	53	47	58	52	47	56	51	46	44
6	70	57	48	42	69	56	48	42	54	47	41	53	46	41	51	45	41	38
7	65	52	43	37	64	51	43	37	50	42	37	48	41	36	47	41	36	34
8	61	47	39	33	59	47	39	33	45	38	33	44	37	33	43	37	32	30
9	57	44	35	30	55	43	35	30	42	35	30	41	34	29	40	34	29	27
10	53	40	32	27	52	40	32	27	39	32	27	38	31	27	37	31	27	25

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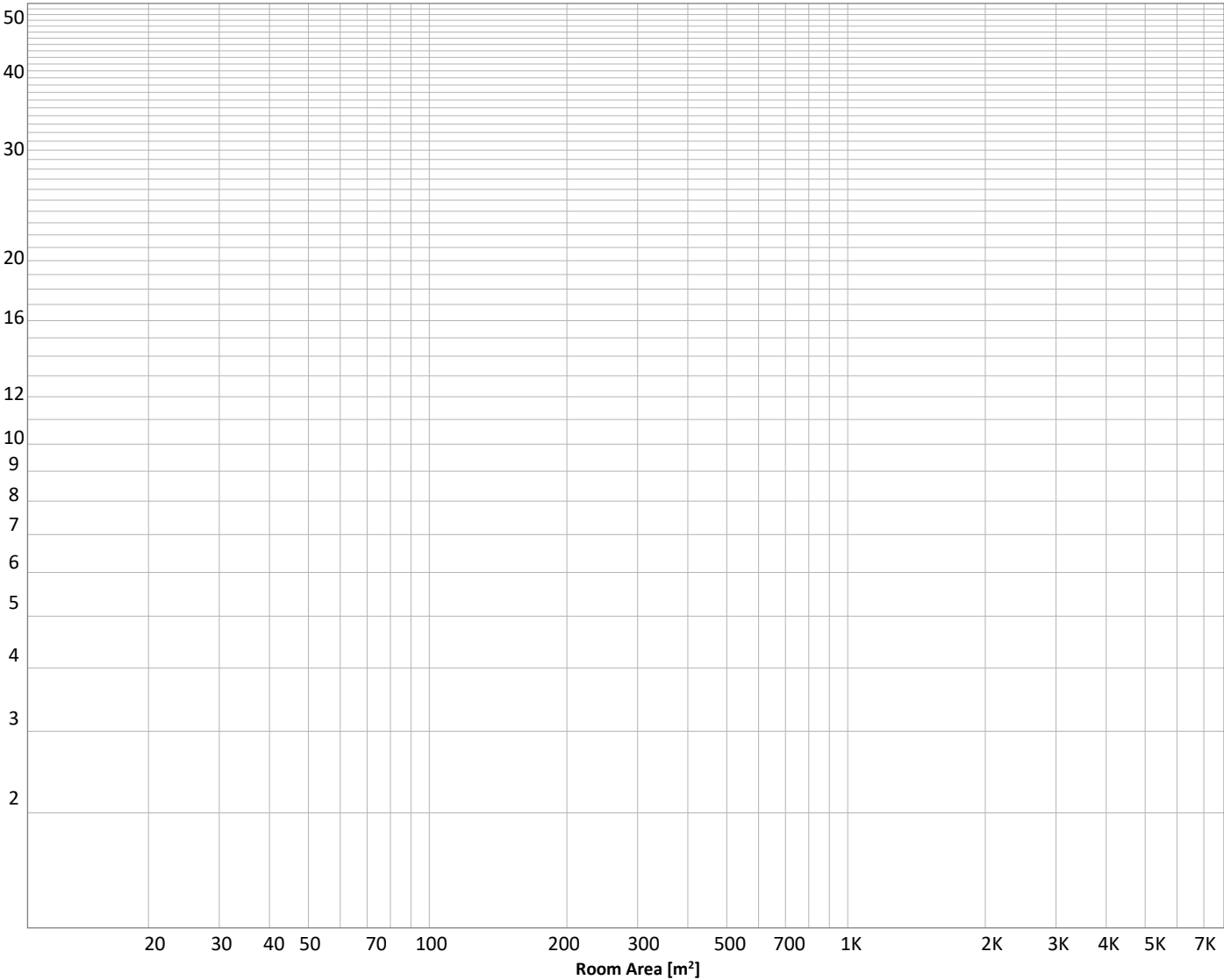
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 41,8 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°
1,44 lm	4,12 lm	6,21 lm	7,41 lm	7,58 lm	6,71 lm	4,94 lm	2,60 lm	0,529 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
0,042 lm	0,039 lm	0,038 lm	0,033 lm	0,030 lm	0,022 lm	0,017 lm	0,011 lm	0,004 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	1 lm	3,5%
10-20°	4 lm	9,9%
20-30°	6 lm	14,9%
30-40°	7 lm	17,7%
40-50°	8 lm	18,1%
50-60°	7 lm	16,1%
60-70°	5 lm	11,8%
70-80°	3 lm	6,2%
80-90°	1 lm	1,3%
90-100°	0 lm	0,1%
100-110°	0 lm	0,1%
110-120°	0 lm	0,1%
120-130°	0 lm	0,1%
130-140°	0 lm	0,1%
140-150°	0 lm	0,1%
150-160°	0 lm	0,0%
160-170°	0 lm	0,0%
170-180°	0 lm	0,0%
Total	42 lm	100,0%

Intensity peaks

Max intensity	15 cd
Intensity, 90°	0 cd
Intensity, 0°	15 cd

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	12 lm	28,2%
0-40°	19 lm	45,9%
0-60°	33 lm	80,1%
60-90°	8 lm	19,3%
70-100°	3 lm	7,6%
90-120°	0 lm	0,3%
0-90°	42 lm	99,4%
90-180°	0 lm	0,6%
0-180°	42 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	6 lm	14,1%
Medium(30-60°)	11 lm	26,0%
High(60-80°)	4 lm	9,0%
Very high(80-90°)	0 lm	0,6%
Back light		
Low(0-30°)	6 lm	14,1%
Medium(30-60°)	11 lm	26,0%
High(60-80°)	4 lm	9,0%
Very high(80-90°)	0 lm	0,6%

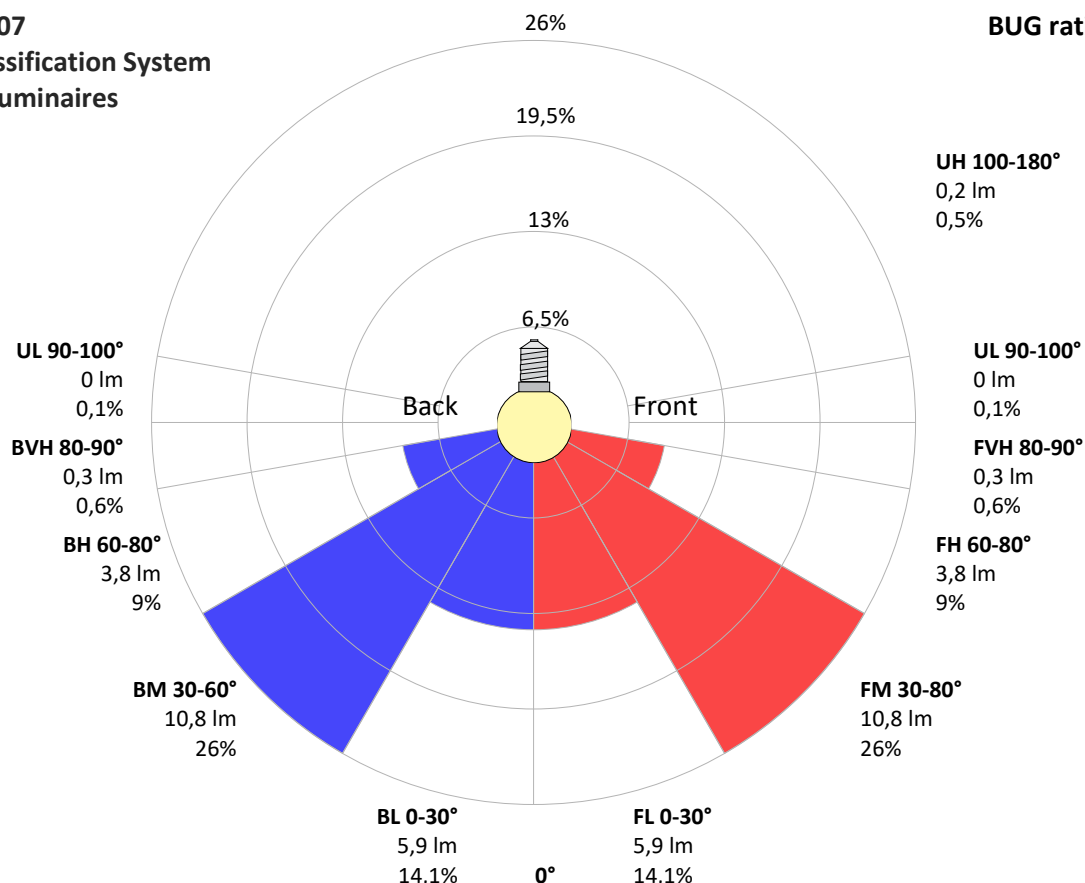
Uplight

Low(90-100°)	0 lm	0,1%
High(100-180°)	0 lm	0,5%

IESNA TM-15-07

Luminaire Classification System For Outdoor Luminaires

BUG rating B0 U0 G0



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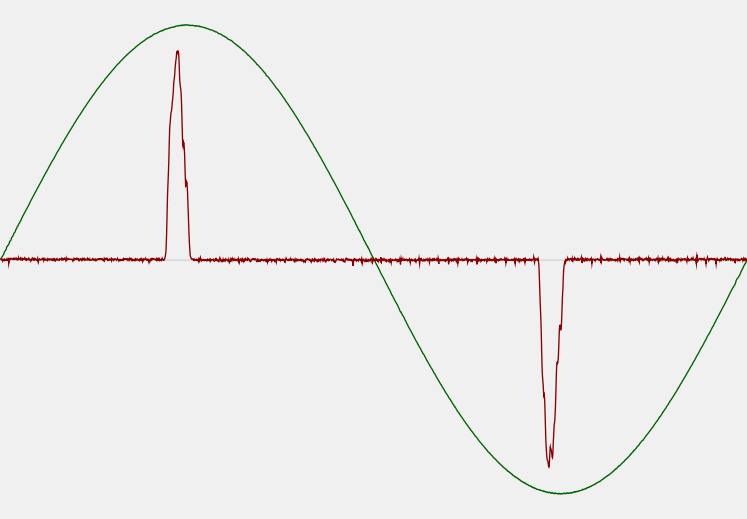


Power Details

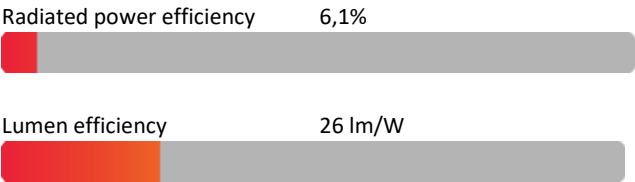
Input Power

Power feed to light source	1,6 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,022 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	4,96 VA
Displacement factor of AC power feed	0,99
Power factor of AC current feed	0,33
Total harmonic distortion of the current	284,24%
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	0 K
CCT shift	0 K
CCT end	0 K

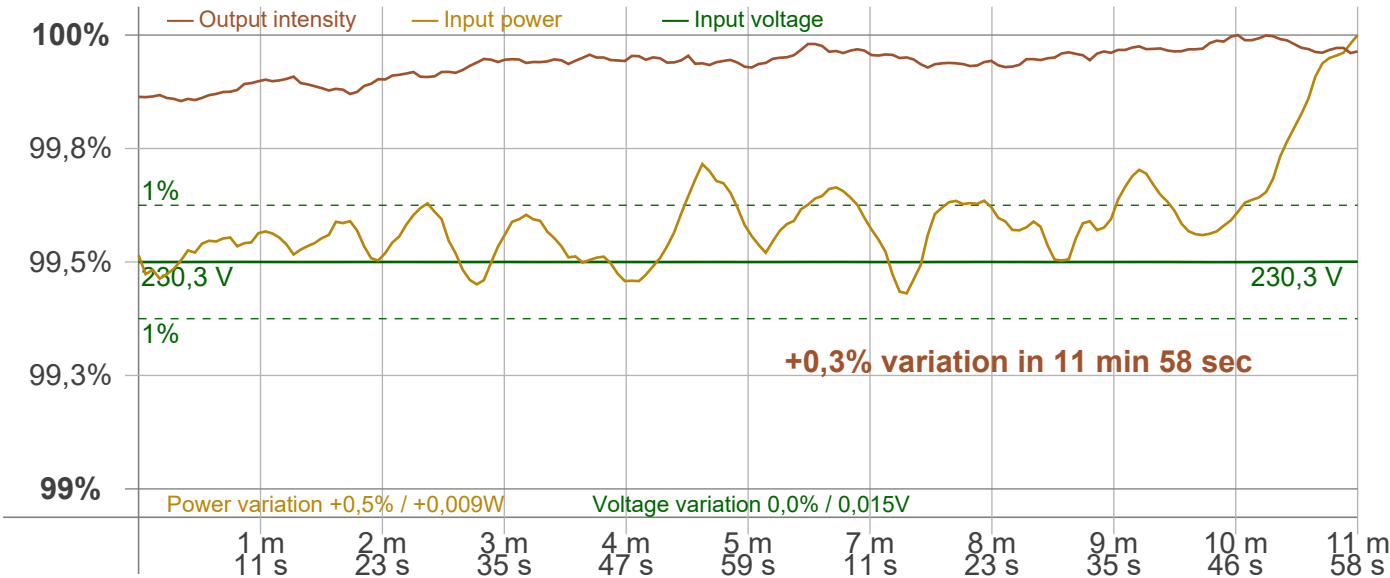
Warmup Result

Total warmup time	Not completed
Warmup variation	+0,3%

Output Change

Output start	41,7 lm
Output change	+0,0 lm
Output end	41,8 lm

Stabilization Curve



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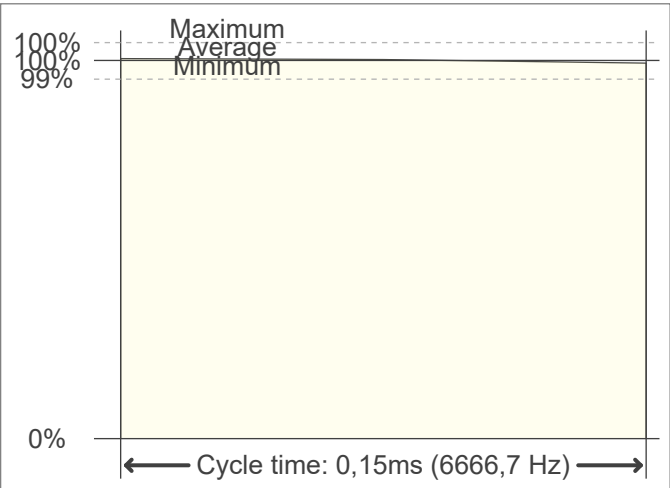
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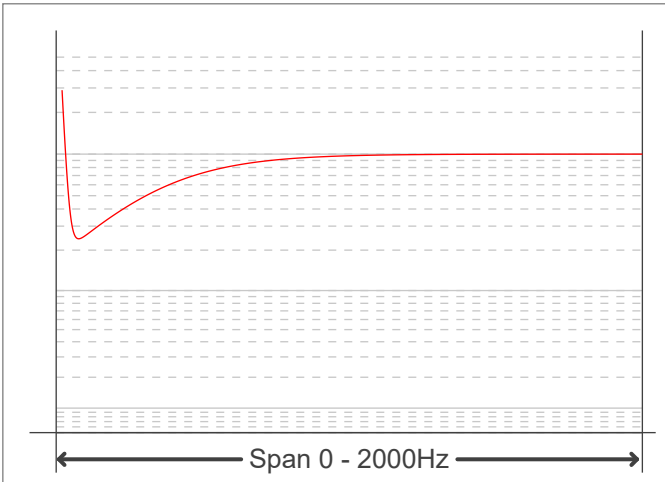
Flicker /TLA details

Flicker Meter Type	Viso Systems LabFlicker	Measurement time	
Frequency of input power	50 Hz	PstLM	180 sec
Flicker/TLA sample rate	20000 samples/s	All other indices	1,2 sec
Flicker indices according to Illuminating Engineering Society (IES)		Flicker indices according to California Energy Commission (CEC) 2016b	
Flicker frequency	6666,67 Hz	JA8/10 40 Hz	0,08 %
Percent Flicker	0,98 %	JA8/10 90 Hz	0,1 %
Flicker index	0	JA8/10 200 Hz	0,14 %
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)		JA8/10 400 Hz	0,15 %
PstLM value (F < 80 Hz)	0,07	JA8/10 1000 Hz	0,17 %
SVM value (80 < F < 2000 Hz)	0	Flicker indices according to Lighting Research Center (2015)	
		Perception metric, Assist Mp	0,04

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot

