

Light Measurement Report

Print date: 15-11-2024

Measurement date and time: 15-11-2024 11:33:08 – Measurement no. VFR-241115-2022-MS

Measurement tracking No. and Link: [VT241115-001566](#)

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

28 planes – 12,86°
5°
12,13 m
58,2 W – PF 0,97 – DPF 0,98
230 V – 0,260 A
50 Hz
Lamp stabilized in 15 min 1 sec – 2,0%

Tested Light Source

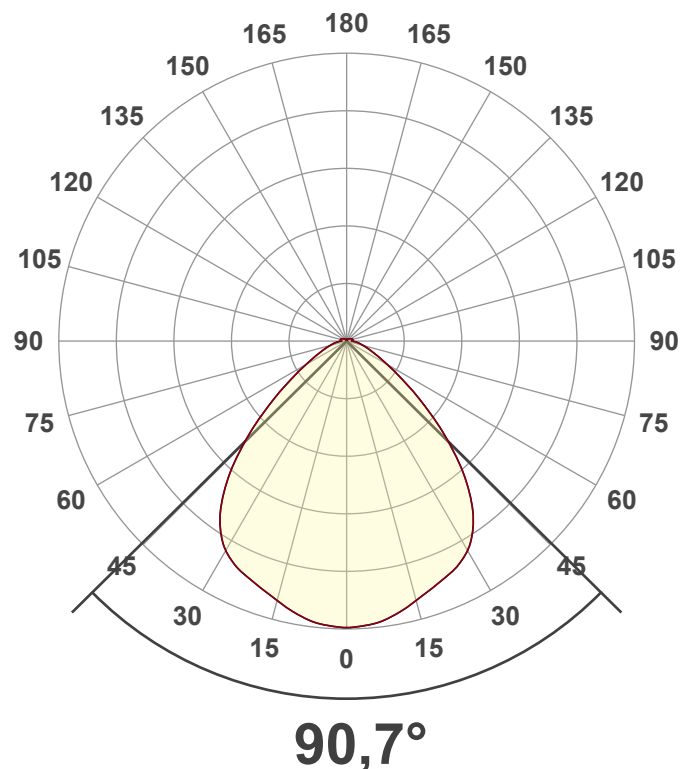
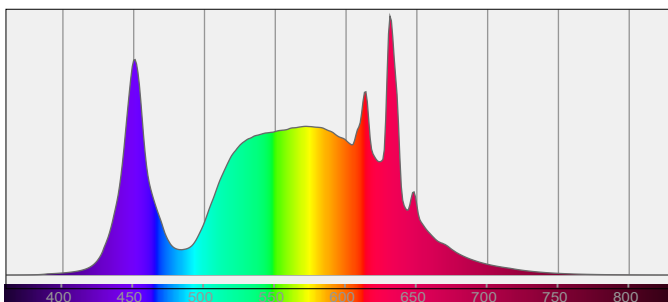
Product Name
Item No. and Manufacturer
Product Description (line 1)

270954-4000K
270954-4000K – Dutchfulfillment
RETROFIT TITAN | LED MODULE | 32W/40W/48W/56W | 90°

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

9647 lm – 4,26% / 95,74%
166 lm/W
4450 cd – 90,7°
CCT = 4000 K / 4134 K
CRI 81,9
 R_f 81,5 – R_g 98,9
Duv 0,0022 – SDCM 3,2
SVM 0,01 – PstLM 0,01



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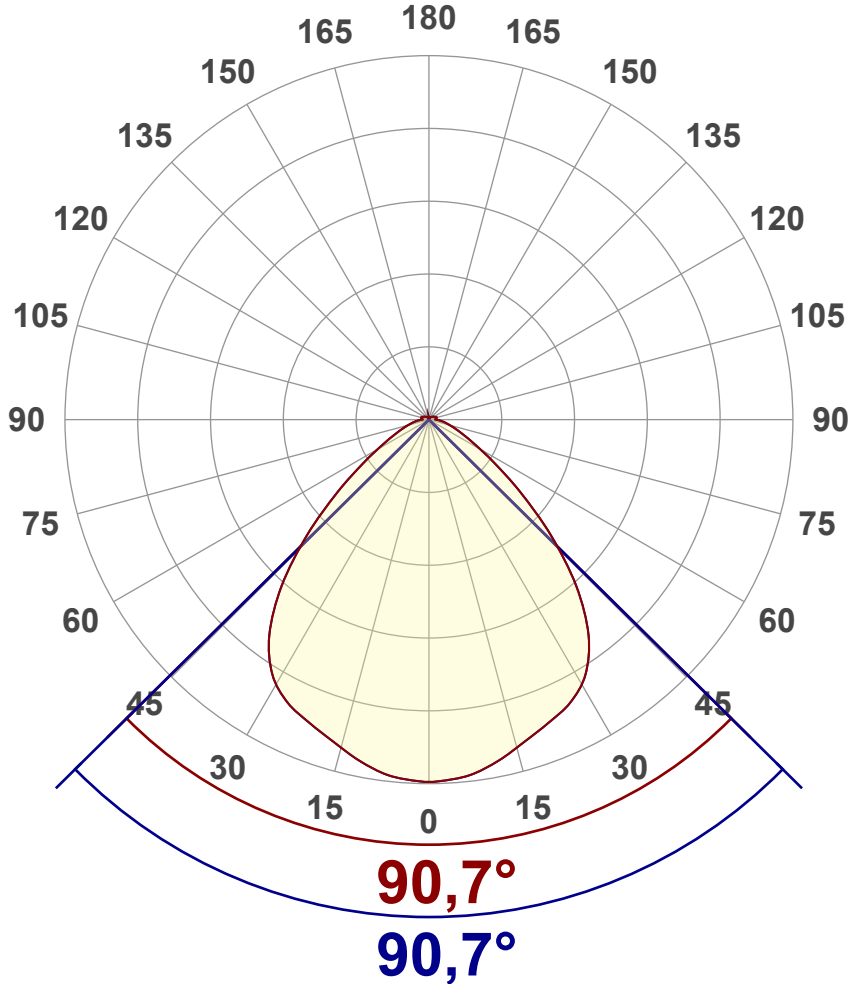
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Operator:



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	9647 lm
Lumen Up% / Down%	4,26% / 95,74%
Peak Intensity	4450 cd
Beam Angle (50%)	90,7°
Beam Angle (90%)	90,7°
Beam Angle (10%)	90,7°

Cut-off Angle

Average 2,5%	175°
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Field Angle

Average 10%	134°
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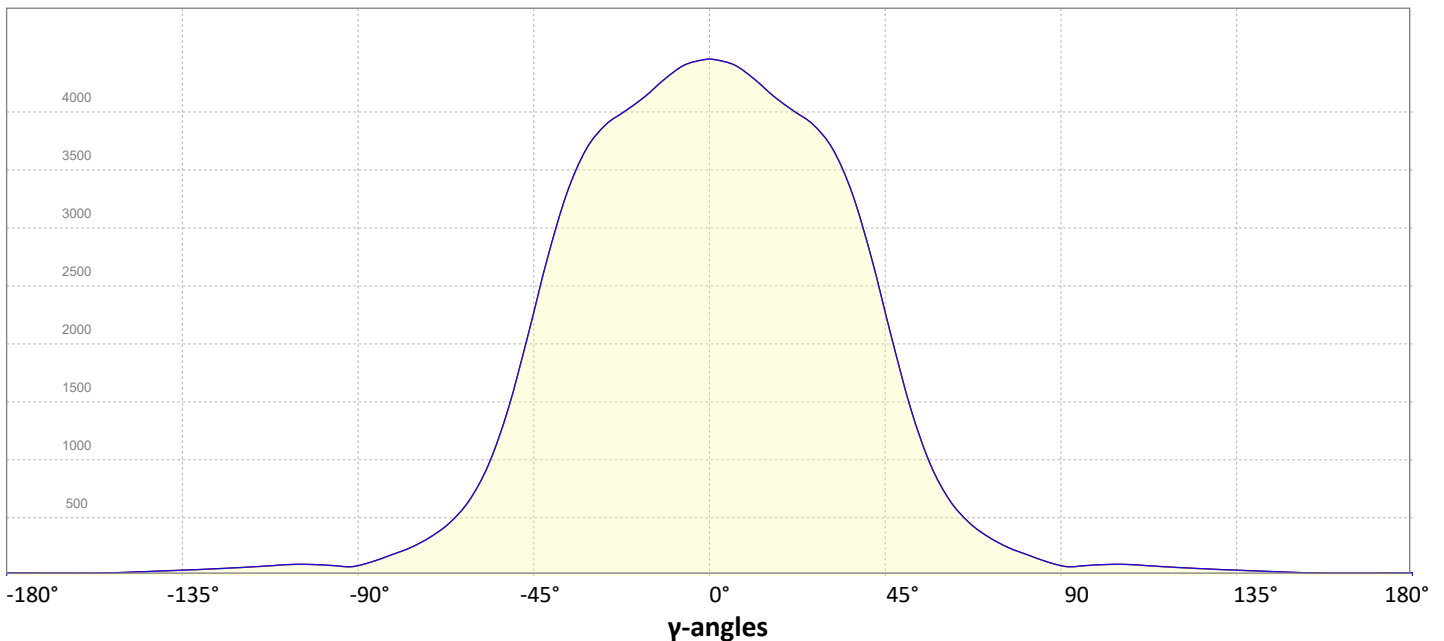
Intensity Ratio

In 120° cone	85,8%
In 90° cone	67,3%

C000-C180

C090-C270

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



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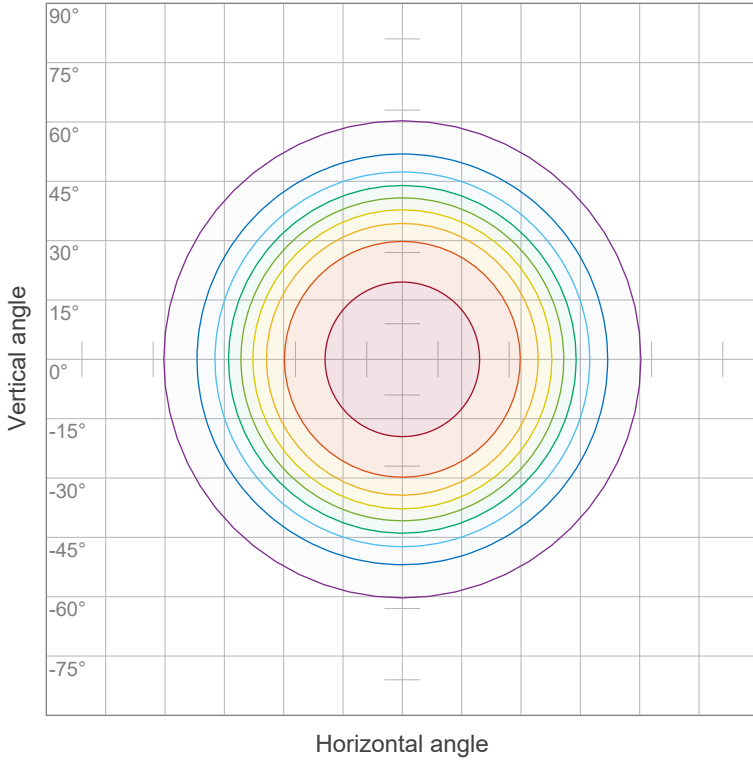
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Iso-intensity Diagram (Iso-candela)

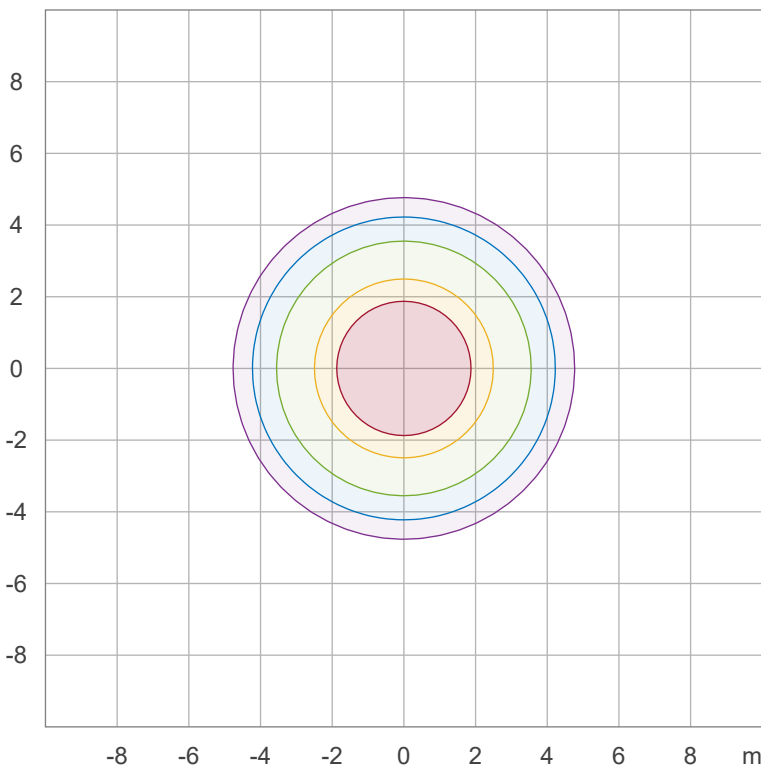


90 %	4004,8 cd
80 %	3559,8 cd
70 %	3114,8 cd
60 %	2669,8 cd
50 %	2224,9 cd
40 %	1779,9 cd
30 %	1334,9 cd
20 %	889,9 cd
10 %	445,0 cd

Peak intensity: 4449,7 cd

Number of c-planes: 28

Iso-illuminance Diagram (Iso-lux)



50,0 %	247,2 lx
30,0 %	148,3 lx
10,0 %	49,4 lx
5,0 %	24,7 lx
3,0 %	14,8 lx

Peak illuminance: 494,4 lx

Mounting height: 3,0 m

Number of c-planes: 28

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Operator:



Color details

Correlated Color Temperature, Target CCT = 4000 K
 Correlated Color Temperature, Measured CCT = 4134 K
 Color Rendering Index CRI 81,9
 Color Rendering Index, R9 (red component) R9 = 29,8
 Color Rendering TM30-18 R_f 81,5 – R_g 98,9
 Color Quality Scale CQS = 81,4

MacAdam Steps SDCM = 3,2
 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 = 0,0022
 Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,225;0,502)

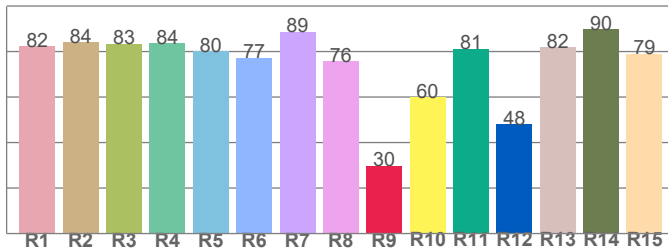
CIE 1931



CIE 1931 – zoomed on Planckian locus



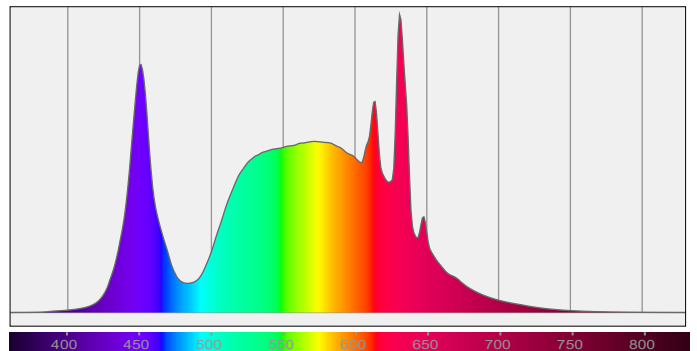
Color Rendering Index per reference color (CIE 1995)



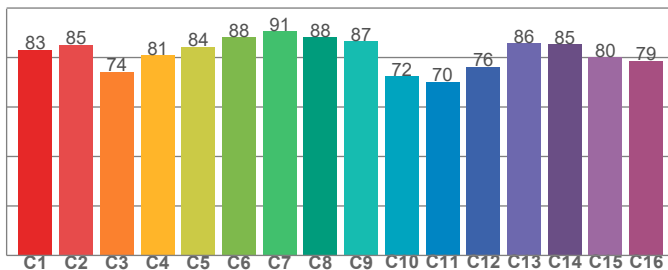
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
82,4	84,1	83,4	83,6	80,3	77,2	88,8	75,7	29,8	60,0	81,3	47,9	82,0	89,9	79,0

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



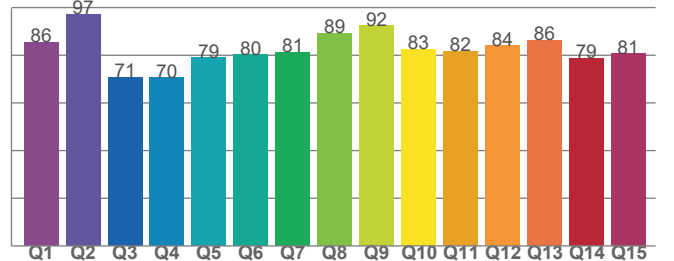
TM30-18 R_f-values per hue bin



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
83,1	85,2	74,3	81,0	84,4	88,3	90,5	88,2	86,6	72,5	70,2	76,3	85,9	85,4	80,2	78,7

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
85,5	97,2	70,7	70,5	78,9	80,3	81,4	89,2	92,4	82,5	81,7	84,0	86,3	78,8	80,7

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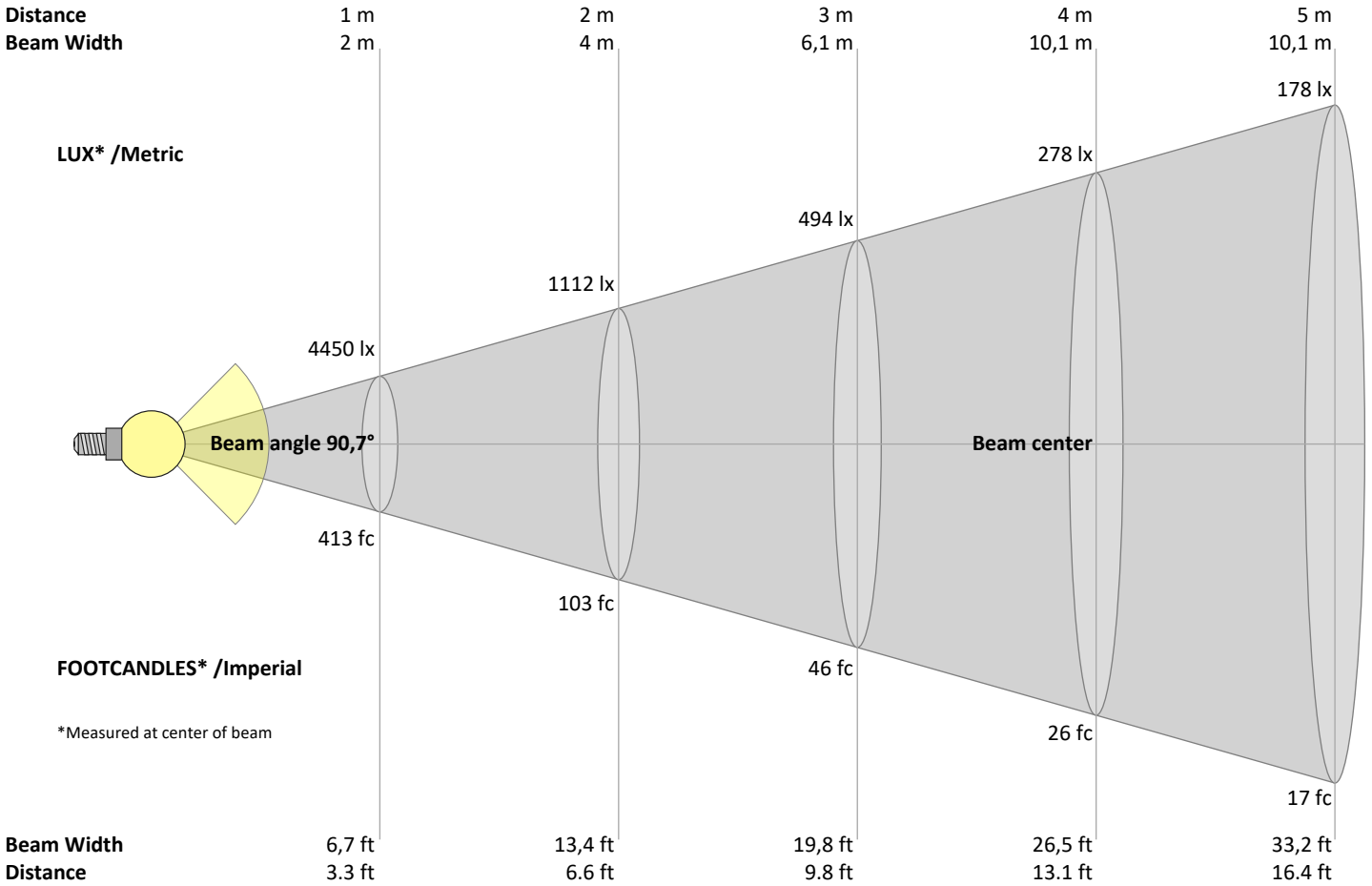
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Operator:



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
4450	1112	494	278	178	124	91	70	55	44	37	31	26	23	20	17	15	14	12	11	lux
413,4	103,3	45,9	25,8	16,5	11,5	8,4	6,5	5,1	4,1	3,4	2,9	2,4	2,1	1,8	1,6	1,4	1,3	1,1	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
4450	4417	4319	4178	4046	3927	3745	3415	2906	2271	1632	1108	745	516	371	270	199	138	91	85	cd
100%	99%	97%	94%	91%	88%	84%	77%	65%	51%	37%	25%	17%	12%	8%	6%	4%	3%	2%	2%	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
4450	4417	4319	4178	4046	3927	3745	3415	2906	2271	1632	1108	745	516	371	270	199	138	91	85	cd
100%	99%	97%	94%	91%	88%	84%	77%	65%	51%	37%	25%	17%	12%	8%	6%	4%	3%	2%	2%	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
4450	4417	4319	4178	4046	3927	3745	3415	2906	2271	1632	1108	745	516	371	270	199	138	91	85	cd
100%	99%	97%	94%	91%	88%	84%	77%	65%	51%	37%	25%	17%	12%	8%	6%	4%	3%	2%	2%	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
4450	4417	4319	4178	4046	3927	3745	3415	2906	2271	1632	1108	745	516	371	270	199	138	91	85	cd
100%	99%	97%	94%	91%	88%	84%	77%	65%	51%	37%	25%	17%	12%	8%	6%	4%	3%	2%	2%	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	22,4	23,4	22,7	23,8	24,1	22,1	23,1	22,3	23,4	23,7
	3H	22,8	23,9	23,3	24,2	24,5	22,4	23,4	22,8	23,7	24,0
	4H	23,1	24,1	23,5	24,4	24,7	22,6	23,6	23,0	23,9	24,2
	6H	23,4	24,3	23,8	24,6	25,1	22,8	23,7	23,2	24,0	24,5
	8H	23,5	24,4	23,9	24,8	25,2	22,9	23,7	23,3	24,1	24,6
	12H	23,7	24,5	24,1	24,9	25,4	22,9	23,7	23,3	24,1	24,7
4H	2H	22,5	23,5	22,9	23,8	24,1	22,1	23,1	22,6	23,5	23,8
	3H	23,2	24,0	23,6	24,4	24,9	22,8	23,6	23,2	24,0	24,5
	4H	23,5	24,2	24,0	24,7	25,3	23,0	23,8	23,5	24,2	24,8
	6H	23,9	24,6	24,4	25,0	25,4	23,3	24,0	23,8	24,4	24,8
	8H	24,1	24,7	24,6	25,2	25,6	23,4	24,0	24,0	24,5	24,9
	12H	24,3	24,8	24,9	25,3	25,9	23,5	24,0	24,1	24,5	25,1
8H	4H	23,5	24,2	24,1	24,6	25,1	23,1	23,7	23,6	24,2	24,6
	6H	24,1	24,5	24,6	25,1	25,7	23,5	24,0	24,1	24,5	25,1
	8H	24,4	24,8	25,0	25,4	26,1	23,7	24,1	24,3	24,7	25,4
	12H	24,7	25,1	25,4	25,7	26,3	23,9	24,3	24,6	24,9	25,5
12H	4H	23,5	24,0	24,1	24,5	25,1	23,1	23,6	23,6	24,1	24,6
	6H	24,1	24,5	24,7	25,1	25,8	23,6	24,0	24,1	24,6	25,3
	8H	24,5	24,8	25,1	25,4	26,0	23,8	24,2	24,4	24,7	25,4

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

S = 1.0H	0,3 / -0,4	0,4 / -0,6
S = 1.5H	1,0 / -1,0	1,1 / -1,2
S = 2.0H	1,9 / -1,5	2,1 / -1,7

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	118	118	118	118	115	115	115	115	109	109	109	103	103	103	98	98	98	96
1	109	105	102	98	106	103	99	97	98	95	93	93	91	89	89	87	86	84
2	101	94	88	83	98	92	87	82	88	83	80	84	80	77	81	78	75	73
3	93	84	77	72	91	83	76	71	79	74	69	76	71	67	73	69	66	64
4	87	76	68	63	84	75	67	62	72	65	61	69	64	59	66	62	58	56
5	80	69	61	55	78	68	60	55	65	59	54	63	57	53	61	56	52	50
6	75	63	55	49	73	62	54	49	59	53	48	57	52	47	56	50	46	44
7	70	57	49	44	68	56	49	44	54	48	43	53	47	42	51	46	42	40
8	65	53	45	40	63	52	44	39	50	44	39	49	43	38	47	42	38	36
9	61	49	41	36	59	48	41	36	46	40	35	45	39	35	44	38	35	33
10	57	45	38	33	56	44	37	33	43	37	32	42	36	32	41	35	32	30

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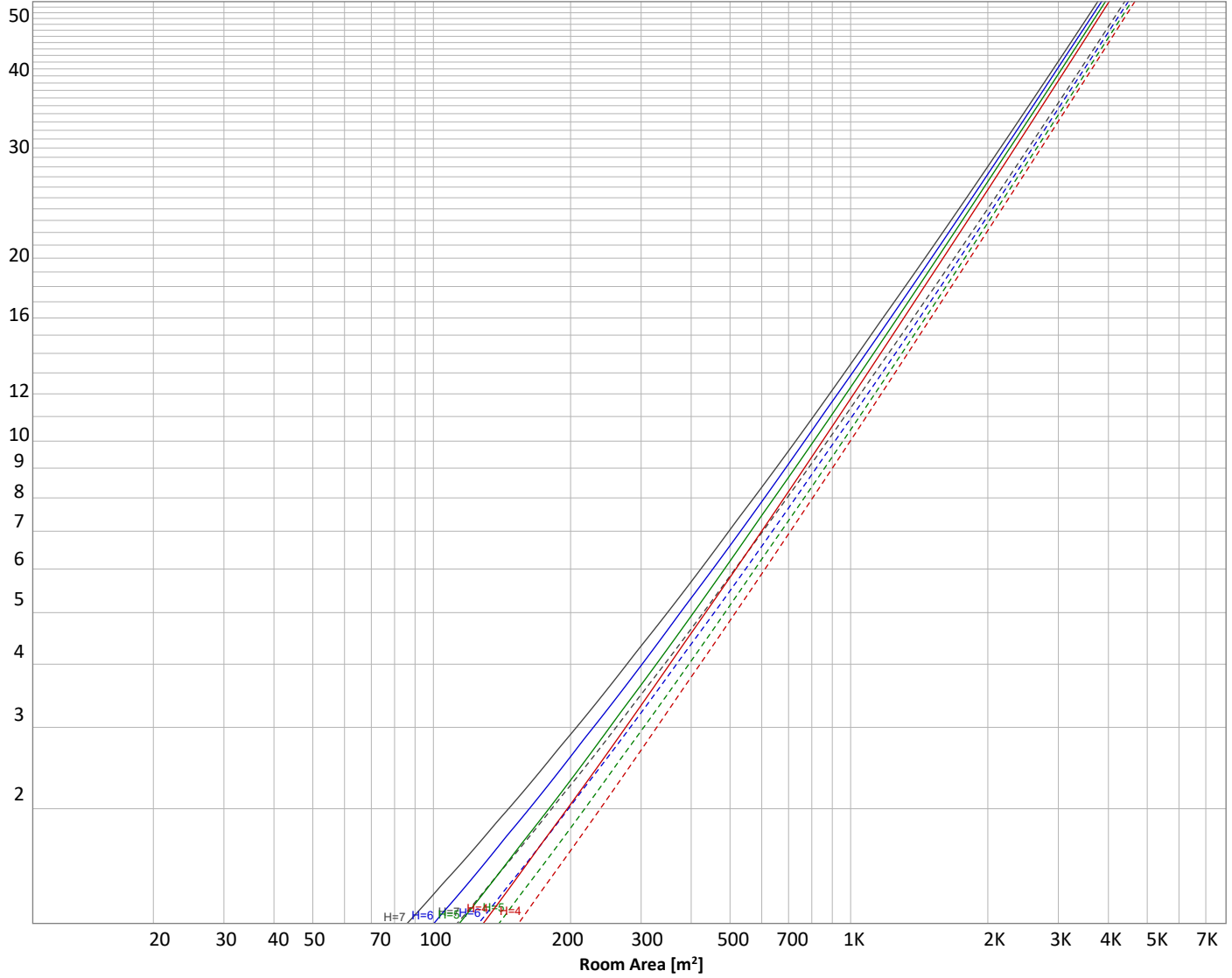
Operator:



Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 9647 lm			
H _{down} = Lamp distance from ceiling =	0.00 m	Line type	Ceiling reflectance	ρ(%) 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°
419 lm	1181 lm	1810 lm	2123 lm	1747 lm	1001 lm	516 lm	288 lm	152 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
92,6 lm	102 lm	80,5 lm	56,3 lm	37,3 lm	22,1 lm	11,5 lm	6,42 lm	2,23 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	419 lm	4,3%
10-20°	1181 lm	12,2%
20-30°	1810 lm	18,8%
30-40°	2123 lm	22,0%
40-50°	1747 lm	18,1%
50-60°	1001 lm	10,4%
60-70°	516 lm	5,3%
70-80°	288 lm	3,0%
80-90°	152 lm	1,6%
90-100°	93 lm	1,0%
100-110°	102 lm	1,1%
110-120°	80 lm	0,8%
120-130°	56 lm	0,6%
130-140°	37 lm	0,4%
140-150°	22 lm	0,2%
150-160°	12 lm	0,1%
160-170°	6 lm	0,1%
170-180°	2 lm	0,0%
Total	9647 lm	100,0%

Intensity peaks

Max intensity	4450 cd
Intensity, 90°	91 cd
Intensity, 0°	4450 cd

Zonal Lumen summary

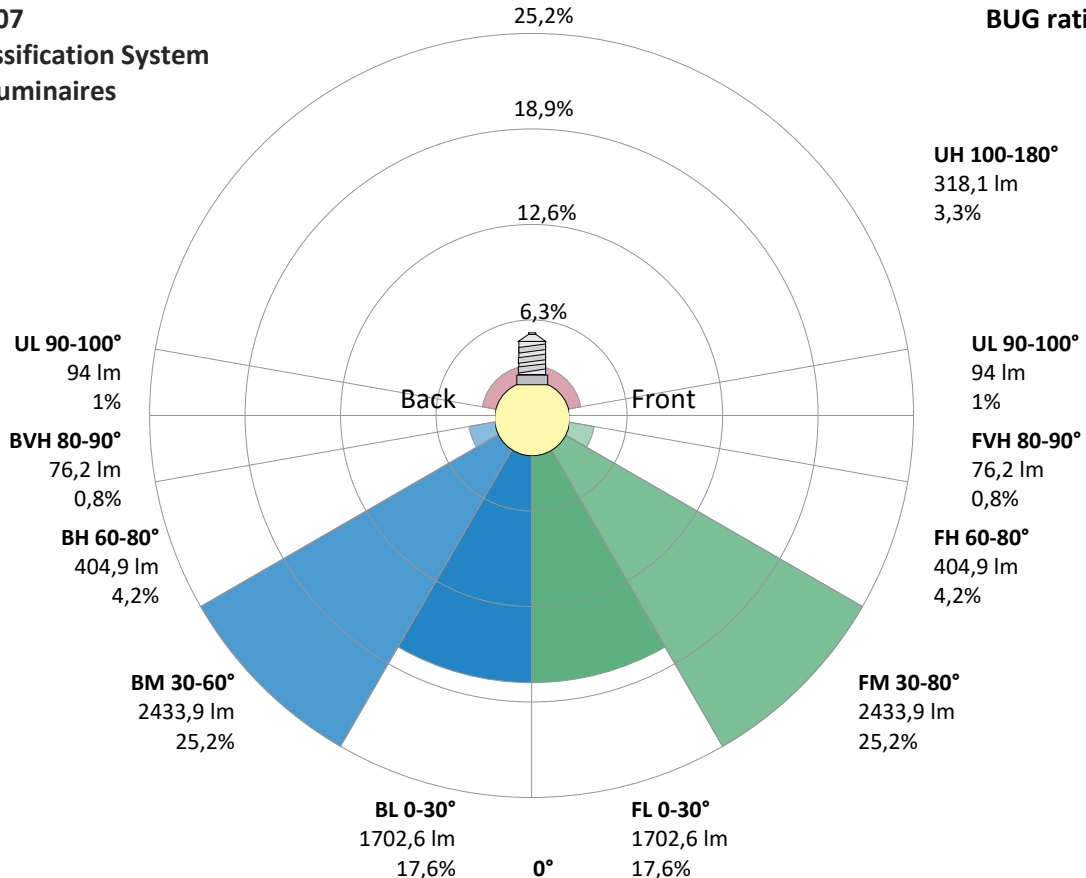
Zone (γ)	Lumen	% Total
0-30°	3409 lm	35,3%
0-40°	5533 lm	57,3%
0-60°	8280 lm	85,8%
60-90°	956 lm	9,9%
70-100°	532 lm	5,5%
90-120°	275 lm	2,9%
0-90°	9236 lm	95,7%
90-180°	411 lm	4,3%
0-180°	9647 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	1703 lm	17,6%
Medium(30-60°)	2434 lm	25,2%
High(60-80°)	405 lm	4,2%
Very high(80-90°)	76 lm	0,8%
Back light		
Low(0-30°)	1703 lm	17,6%
Medium(30-60°)	2434 lm	25,2%
High(60-80°)	405 lm	4,2%
Very high(80-90°)	76 lm	0,8%
Uplight		
Low(90-100°)	94 lm	1,0%
High(100-180°)	318 lm	3,3%

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

BUG rating B3 U3 G1



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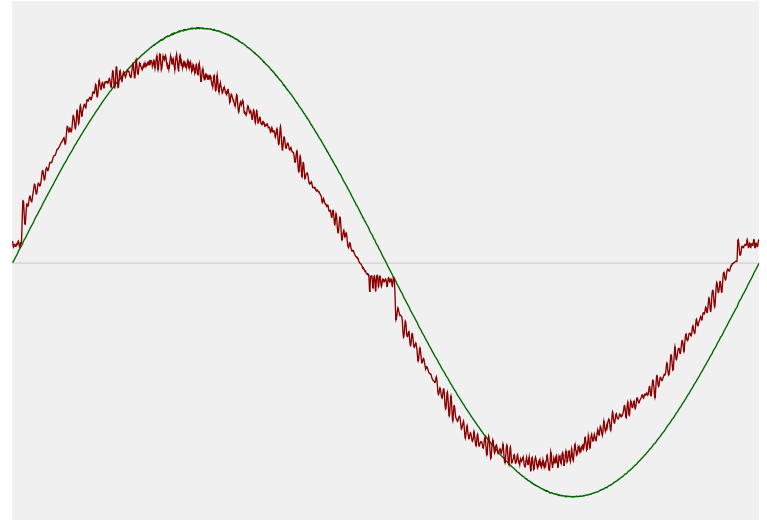


Power Details

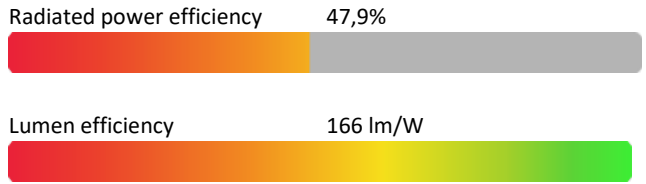
Input Power

Power feed to light source	58,2 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,260 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	59,8 VA
Displacement factor of AC power feed	0,98
Power factor of AC current feed	0,97
Total harmonic distortion of the current	5,78%
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	4009 K
CCT shift	-9 K
CCT end	4000 K

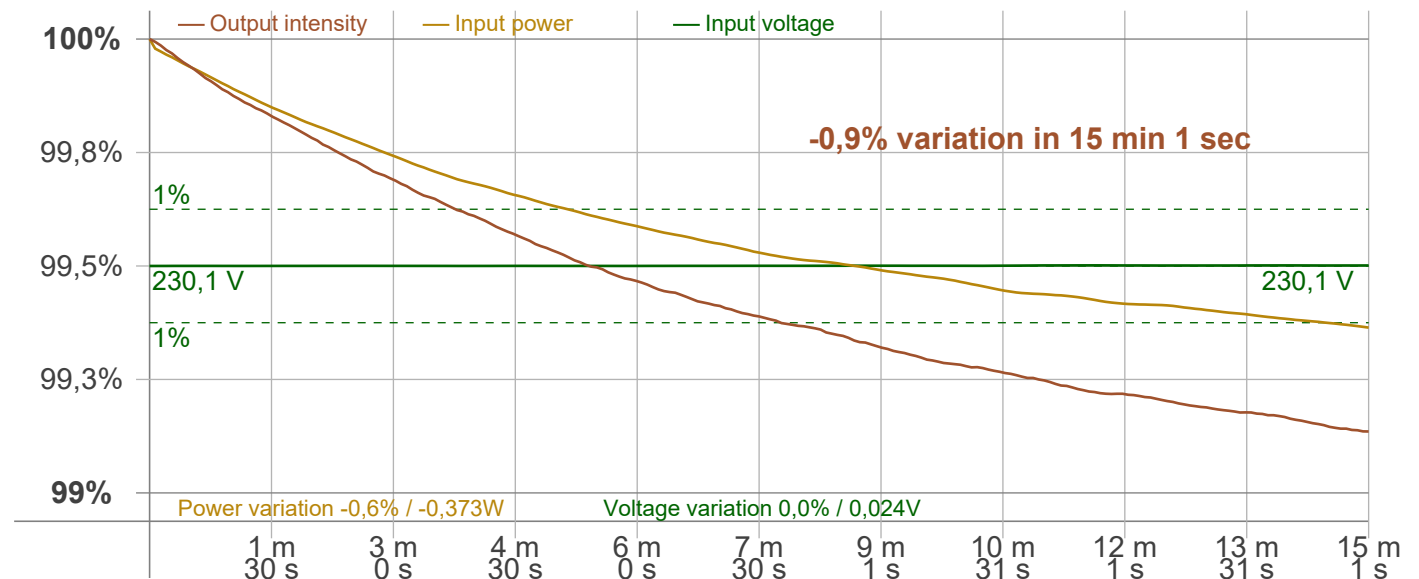
Warmup Result

Total warmup time	Lamp stabilized in 15 min 1 sec
Warmup variation	-0,9%

Output Change

Output start	9733 lm
Output change	-85 lm
Output end	9647 lm

Stabilization Curve



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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: 99,01 Hz
 Percent Flicker: 0,17 %
 Flicker index: 0

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

JA8/10 40 Hz: 0,01 %
 JA8/10 90 Hz: 0,02 %
 JA8/10 200 Hz: 0,14 %
 JA8/10 400 Hz: 0,15 %
 JA8/10 1000 Hz: 0,16 %

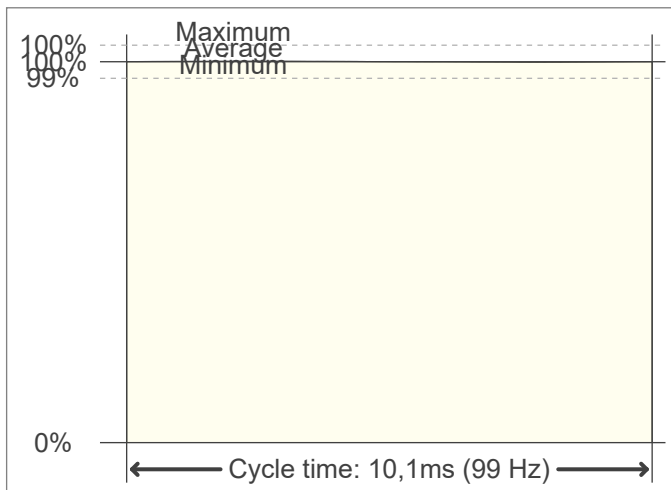
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

PstLM value (F < 80 Hz): 0,01
 SVM value (80 < F < 2000 Hz): 0,01

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

