

Light Measurement Report

Print date: 20-11-2024

Measurement date and time: 18-11-2024 14:43:20 – Measurement no. VFR-241118-2063-MS

Measurement tracking No. and Link: [VT241118-002877](https://www.viso-systems.com/track/VT241118-002877)

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

20 planes – 18°
5°
12,13 m
57,6 W – PF 0,97 – DPF 0,98
230 V – 0,257 A
50 Hz
Lamp stabilized in 15 min 1 sec – 2,0%

Tested Light Source

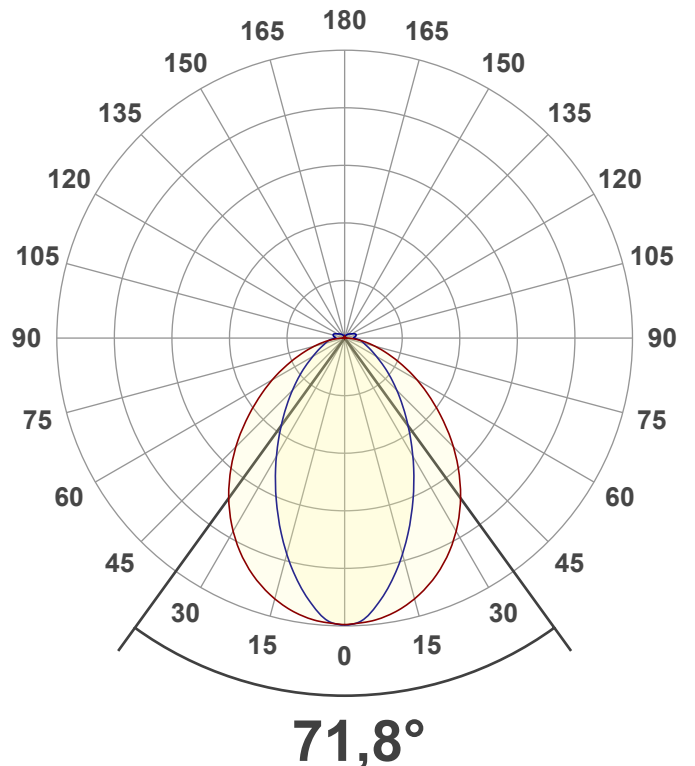
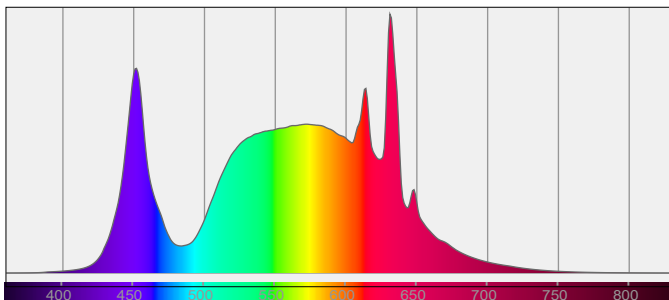
Product Name
Item No. and Manufacturer
Product Description (line 1)

805814-4000K
805814-4000K – Dutchfulfillment
RETROFIT PLUTO | LED MODULE | 32W/40W/48W/55W | 60°

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

9795 lm – 6,16% / 93,84%
170 lm/W
5286 cd – 71,8°
CCT = 4000 K / 4093 K
CRI 82,2
R_f 82,2 – R_g 98,1
Duv 0,0032 – SDCM 3,1
SVM 0 – PstLM 0,01



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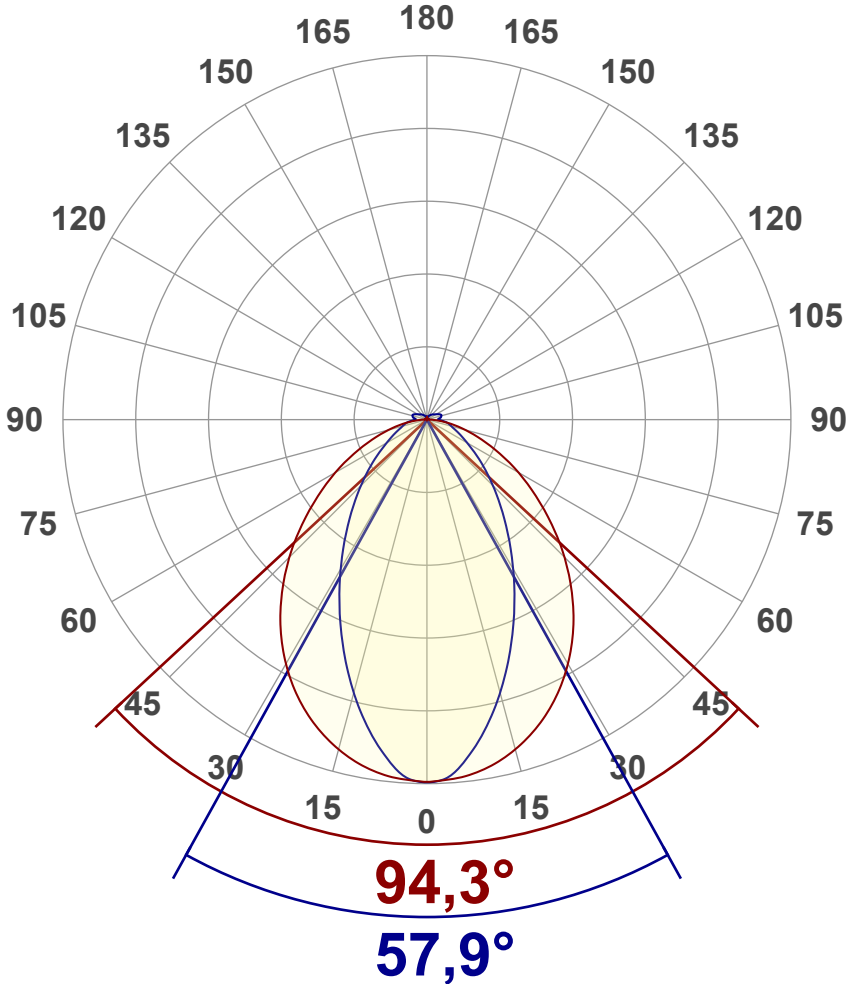
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Operator:



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	9795 lm
Lumen Up% / Down%	6,16% / 93,84%
Peak Intensity	5286 cd
Beam Angle (50%)	71,8°
Beam Angle (90%)	57,9°
Beam Angle (10%)	86,3°

Cut-off Angle

Average 2,5%	216,9°
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Field Angle

Average 10%	141,9°
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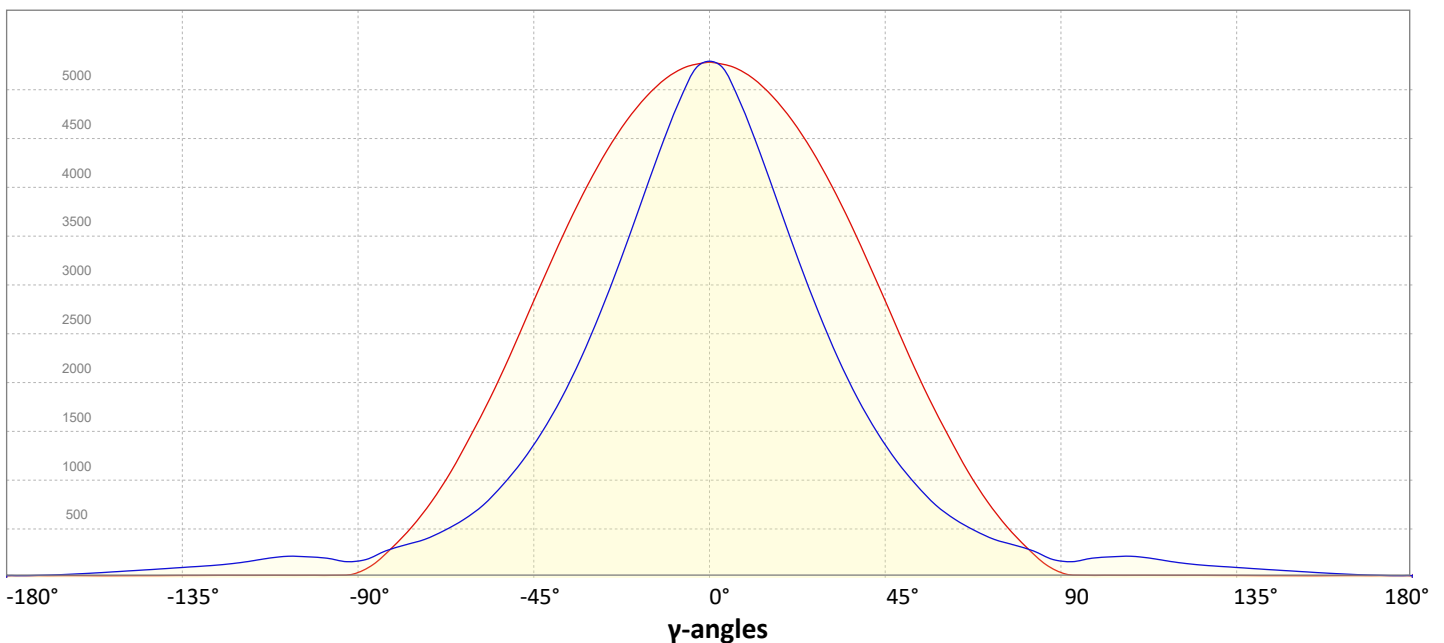
Intensity Ratio

In 120° cone	78,6%
In 90° cone	59,9%

C000-C180

C090-C270

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



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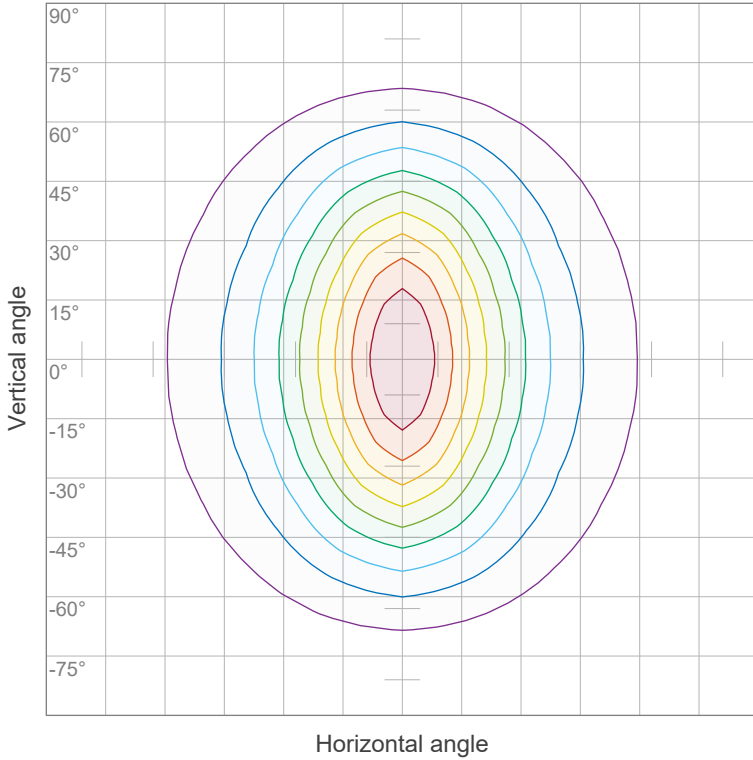
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Iso-intensity Diagram (Iso-candela)

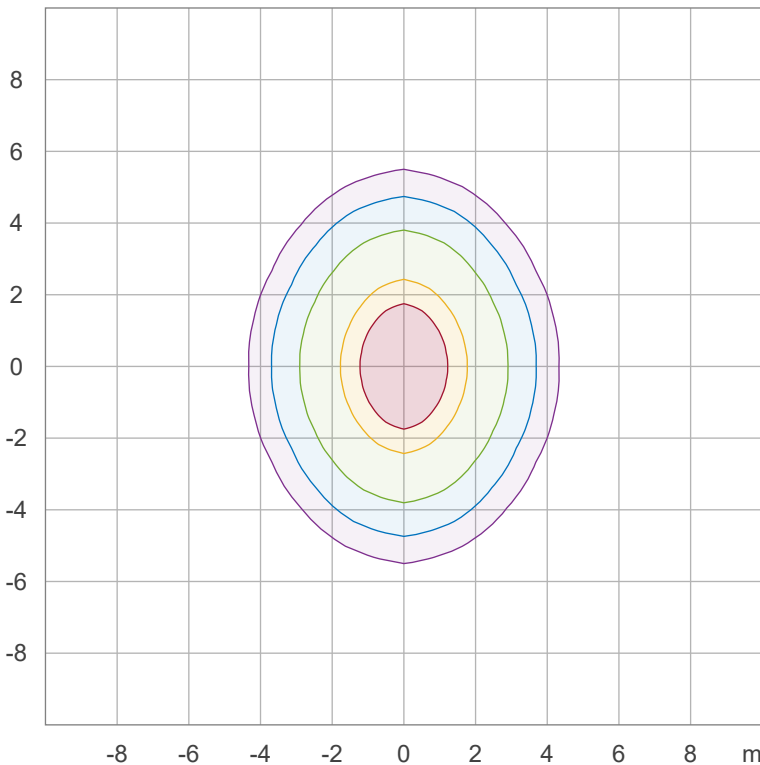


90 %	4748,6 cd
80 %	4220,9 cd
70 %	3693,3 cd
60 %	3165,7 cd
50 %	2638,1 cd
40 %	2110,5 cd
30 %	1582,9 cd
20 %	1055,2 cd
10 %	527,6 cd

Peak intensity: 5276,2 cd

Number of c-planes: 20

Iso-illuminance Diagram (Iso-lux)



50,0 %	293,0 lx
30,0 %	175,8 lx
10,0 %	58,6 lx
5,0 %	29,3 lx
3,0 %	17,6 lx

Peak illuminance: 586,0 lx

Mounting height: 3,0 m

Number of c-planes: 20

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Color details

Correlated Color Temperature, Target CCT = 4000 K
 Correlated Color Temperature, Measured CCT = 4093 K
 Color Rendering Index CRI 82,2
 Color Rendering Index, R9 (red component) R9 = 29,1
 Color Rendering TM30-18 R_f 82,2 – R_g 98,1
 Color Quality Scale CQS = 81,9

MacAdam Steps
 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 = 0,0032
 Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,225;0,502)

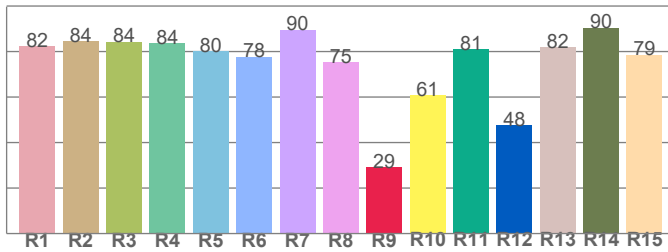
CIE 1931



CIE 1931 – zoomed on Planckian locus



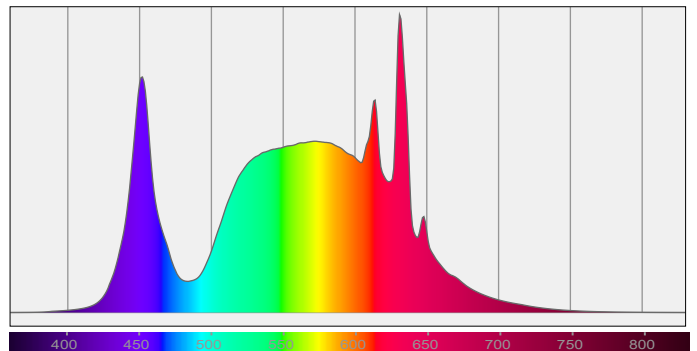
Color Rendering Index per reference color (CIE 1995)



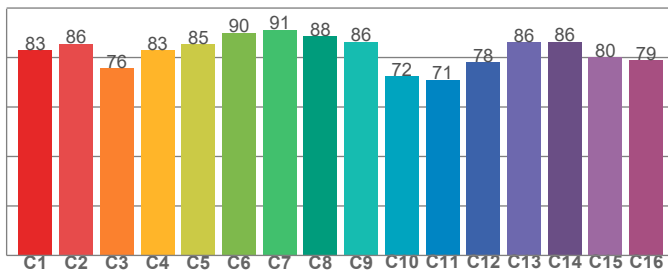
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
82,2	84,4	84,3	83,6	80,0	77,7	89,6	75,4	29,1	60,9	81,0	47,7	82,0	90,5	78,6

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



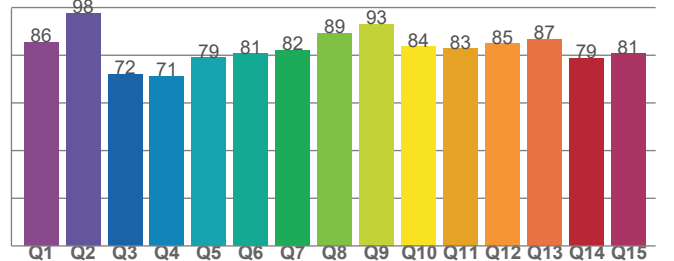
TM30-18 Rf-values per hue bin



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
83,0	85,6	75,8	82,8	85,4	90,0	91,2	88,5	86,4	72,4	71,1	78,1	86,2	86,3	80,2	78,8

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
85,6	97,7	72,0	71,1	79,0	80,6	82,1	89,3	93,0	83,7	82,8	84,8	86,7	78,8	80,7

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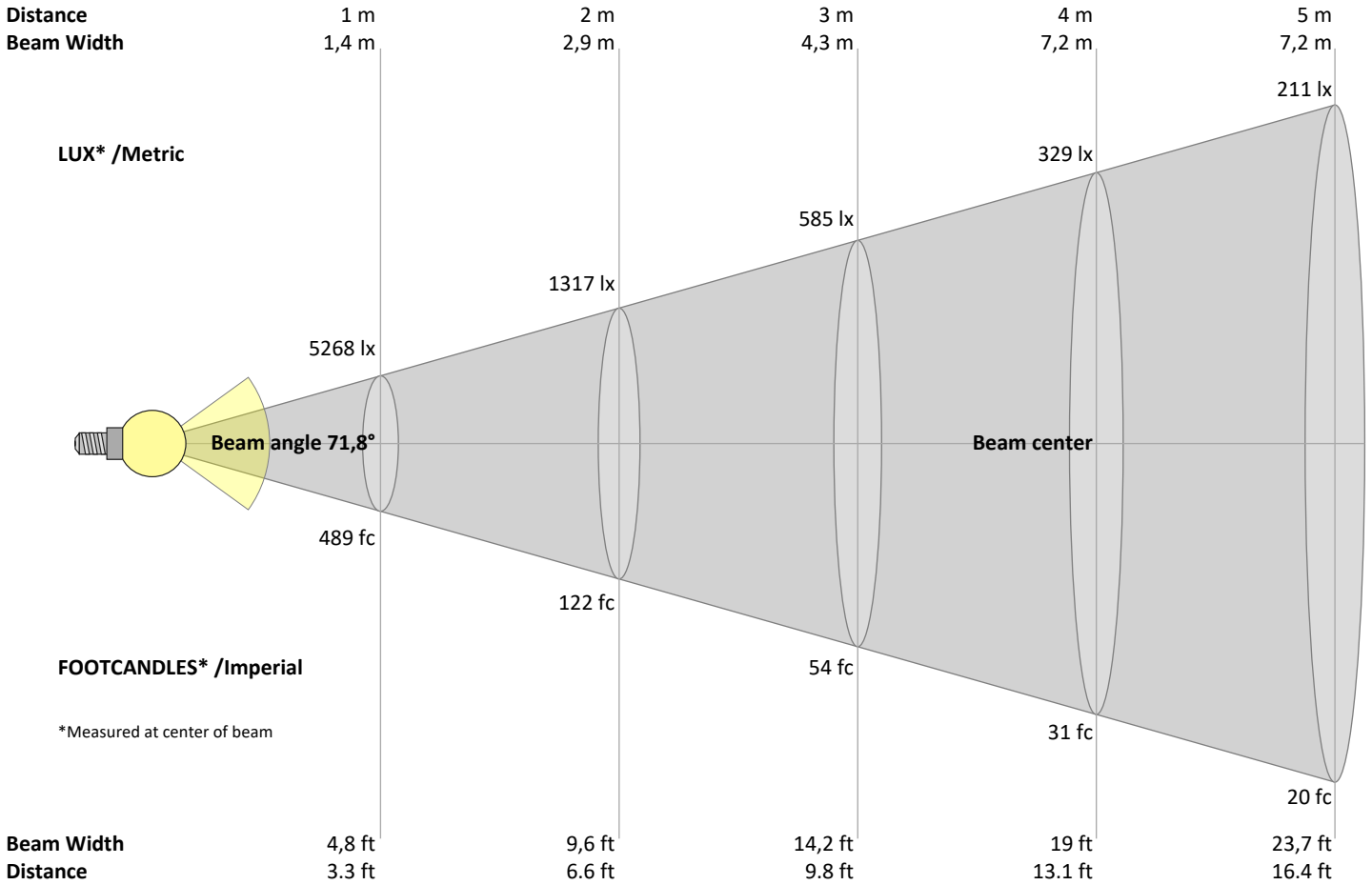
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Operator:



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
5268	1317	585	329	211	146	108	82	65	53	44	37	31	27	23	21	18	16	15	13	lux
489,5	122,4	54,4	30,6	19,6	13,6	10	7,6	6	4,9	4	3,4	2,9	2,5	2,2	1,9	1,7	1,5	1,4	1,2	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
5268	5241	5142	4973	4742	4453	4108	3717	3286	2836	2377	1941	1545	1175	853	583	362	176	61	28	cd
100%	99%	98%	94%	90%	85%	78%	71%	62%	54%	45%	37%	29%	22%	16%	11%	7%	3%	1%	1%	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
5268	5086	4652	4121	3563	3022	2523	2077	1693	1368	1095	866	683	550	446	369	311	239	178	180	cd
100%	97%	88%	78%	68%	57%	48%	39%	32%	26%	21%	16%	13%	10%	8%	7%	6%	5%	3%	3%	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
5268	5241	5142	4973	4742	4453	4108	3717	3286	2836	2377	1941	1545	1175	853	583	362	176	61	28	cd
100%	99%	98%	94%	90%	85%	78%	71%	62%	54%	45%	37%	29%	22%	16%	11%	7%	3%	1%	1%	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
5268	5086	4652	4121	3563	3022	2523	2077	1693	1368	1095	866	683	550	446	369	311	239	178	180	cd
100%	97%	88%	78%	68%	57%	48%	39%	32%	26%	21%	16%	13%	10%	8%	7%	6%	5%	3%	3%	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	24,0	25,0	24,3	25,4	25,7	20,0	21,0	20,3	21,4	21,7
	3H	25,2	26,3	25,7	26,6	27,0	20,9	22,0	21,4	22,3	22,6
	4H	25,7	26,8	26,2	27,1	27,5	21,4	22,4	21,9	22,8	23,2
	6H	26,2	27,1	26,6	27,5	28,0	22,1	23,0	22,5	23,4	23,8
	8H	26,4	27,3	26,8	27,7	28,2	22,4	23,2	22,8	23,6	24,2
	12H	26,5	27,4	26,9	27,8	28,3	22,6	23,5	23,1	23,9	24,5
4H	2H	24,0	25,0	24,5	25,4	25,8	20,7	21,7	21,2	22,1	22,5
	3H	25,5	26,4	26,0	26,8	27,4	21,9	22,8	22,4	23,2	23,8
	4H	26,1	27,0	26,7	27,4	28,1	22,5	23,4	23,0	23,8	24,4
	6H	26,7	27,5	27,3	27,9	28,4	23,2	24,0	23,8	24,4	24,9
	8H	27,0	27,6	27,6	28,1	28,6	23,6	24,3	24,2	24,7	25,2
	12H	27,1	27,7	27,7	28,2	28,8	23,9	24,5	24,5	25,0	25,6
8H	4H	26,2	26,9	26,8	27,4	27,9	23,0	23,6	23,5	24,1	24,6
	6H	27,0	27,5	27,5	28,0	28,7	23,9	24,4	24,5	25,0	25,6
	8H	27,3	27,7	27,9	28,4	29,1	24,4	24,8	25,0	25,4	26,2
	12H	27,6	28,0	28,3	28,6	29,3	24,9	25,2	25,5	25,8	26,5
12H	4H	26,2	26,8	26,8	27,3	27,9	23,0	23,6	23,6	24,1	24,7
	6H	27,0	27,4	27,6	28,1	28,8	24,1	24,5	24,7	25,1	25,8
	8H	27,4	27,7	28,0	28,3	29,0	24,6	25,0	25,3	25,6	26,3

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

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

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	118	118	118	118	114	114	114	114	108	108	108	102	102	102	96	96	96	94
1	108	104	100	96	105	101	97	94	95	93	90	91	88	86	86	84	82	80
2	99	92	86	80	96	89	84	79	85	80	76	81	77	74	77	74	71	69
3	91	82	74	68	89	80	73	67	76	70	66	73	68	64	69	65	62	60
4	85	74	66	59	82	72	64	59	69	62	57	66	60	56	63	58	54	52
5	78	67	58	52	76	65	57	52	62	56	51	60	54	49	57	52	48	46
6	73	61	52	46	71	59	52	46	57	50	45	55	49	44	53	48	43	41
7	68	55	47	42	66	54	47	41	52	46	41	50	44	40	49	43	39	37
8	64	51	43	38	62	50	43	37	48	42	37	47	41	36	45	40	36	34
9	60	47	40	34	58	46	39	34	45	38	34	43	37	33	42	37	33	31
10	56	44	37	32	55	43	36	31	42	35	31	41	35	31	39	34	30	29

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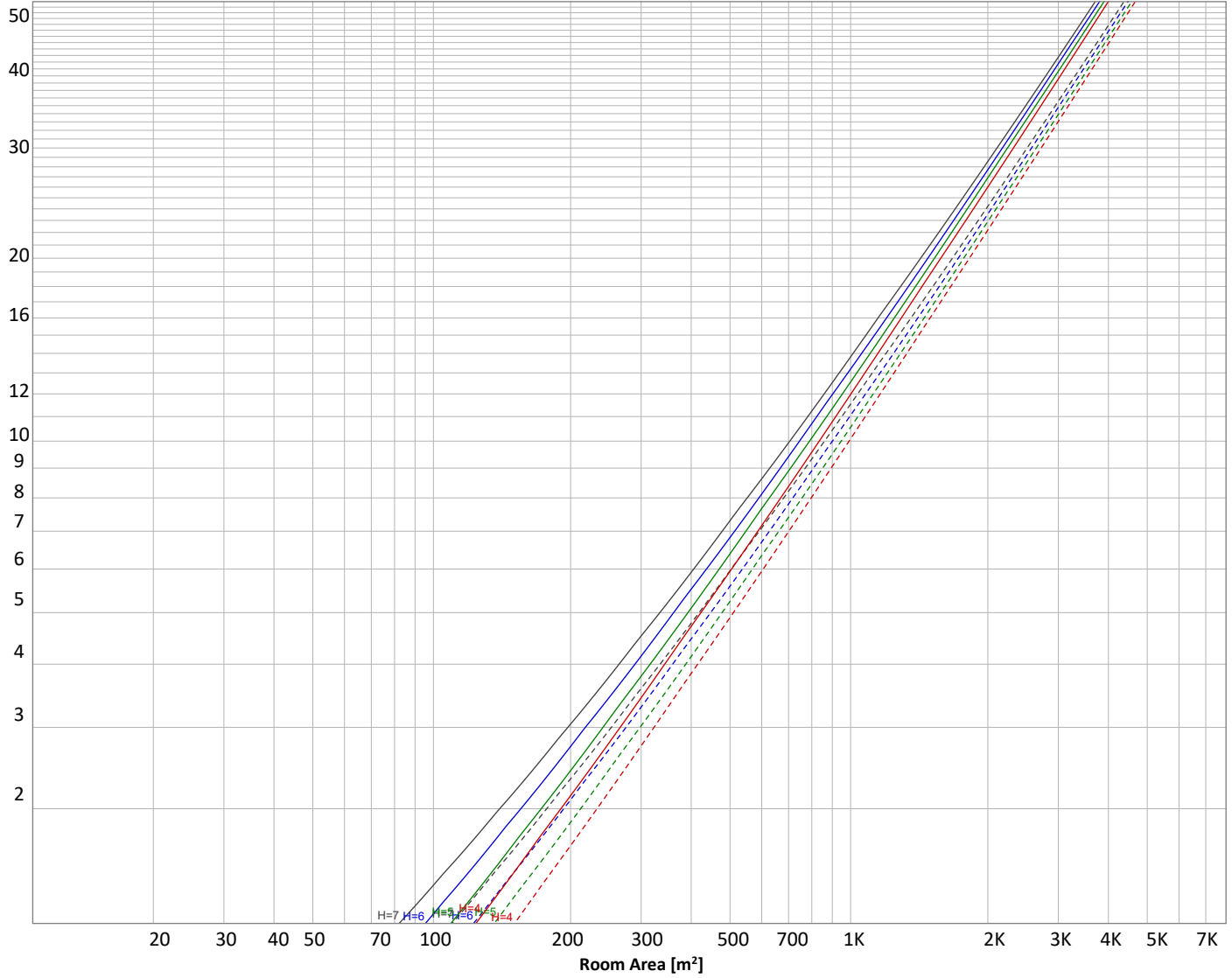
Operator:



Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 9795 lm				
H _{down} = Lamp distance from ceiling =	0.00 m	Line type	Ceiling reflectance	ρ(%) 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°
486 lm	1260 lm	1656 lm	1691 lm	1472 lm	1130 lm	773 lm	477 lm	247 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
144 lm	151 lm	116 lm	78,9 lm	53,2 lm	32,5 lm	17,4 lm	7,89 lm	2,16 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	486 lm	5,0%
10-20°	1260 lm	12,9%
20-30°	1656 lm	16,9%
30-40°	1691 lm	17,3%
40-50°	1472 lm	15,0%
50-60°	1130 lm	11,5%
60-70°	773 lm	7,9%
70-80°	477 lm	4,9%
80-90°	247 lm	2,5%
90-100°	144 lm	1,5%
100-110°	151 lm	1,5%
110-120°	116 lm	1,2%
120-130°	79 lm	0,8%
130-140°	53 lm	0,5%
140-150°	33 lm	0,3%
150-160°	17 lm	0,2%
160-170°	8 lm	0,1%
170-180°	2 lm	0,0%
Total	9795 lm	100,0%

Intensity peaks

Max intensity	5286 cd
Intensity, 90°	61 cd
Intensity, 0°	5268 cd

Zonal Lumen summary

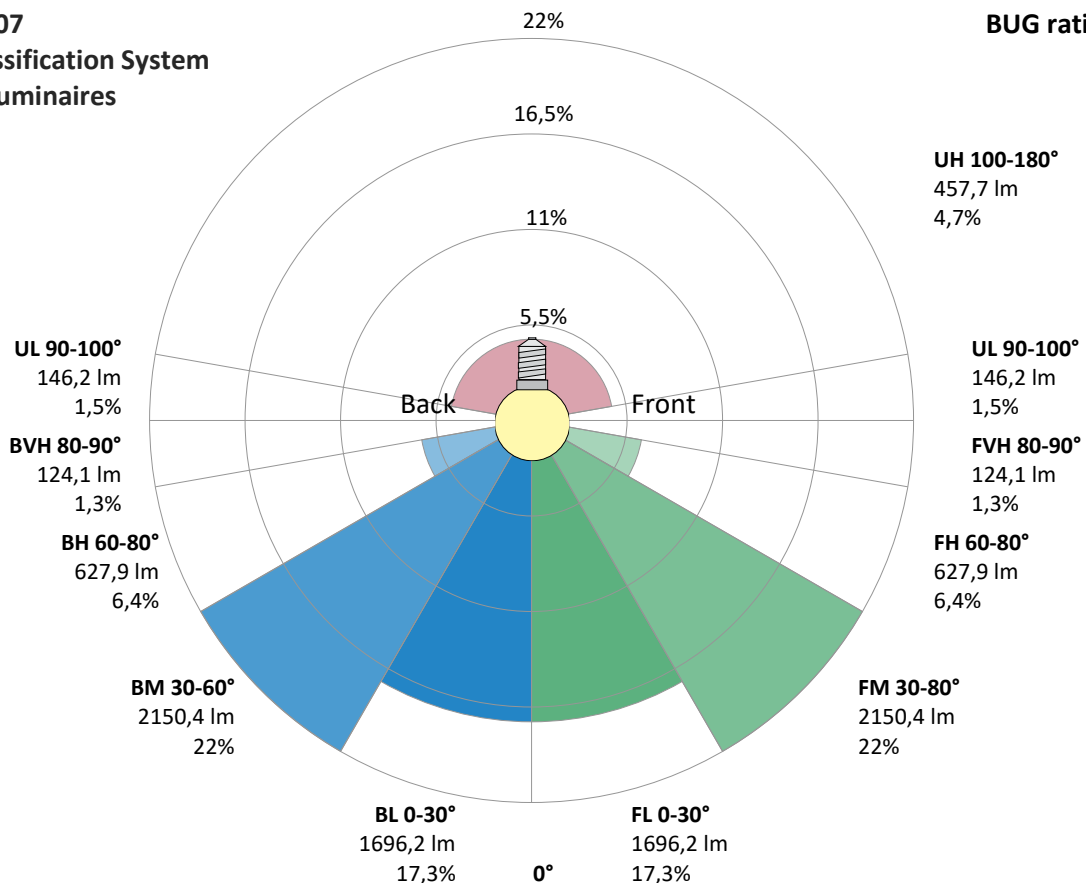
Zone (γ)	Lumen	% Total
0-30°	3401 lm	34,7%
0-40°	5093 lm	52,0%
0-60°	7695 lm	78,6%
60-90°	1497 lm	15,3%
70-100°	868 lm	8,9%
90-120°	411 lm	4,2%
0-90°	9192 lm	93,8%
90-180°	603 lm	6,2%
0-180°	9795 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	1696 lm	17,3%
Medium(30-60°)	2150 lm	22,0%
High(60-80°)	628 lm	6,4%
Very high(80-90°)	124 lm	1,3%
Back light		
Low(0-30°)	1696 lm	17,3%
Medium(30-60°)	2150 lm	22,0%
High(60-80°)	628 lm	6,4%
Very high(80-90°)	124 lm	1,3%
Uplight		
Low(90-100°)	146 lm	1,5%
High(100-180°)	458 lm	4,7%

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

BUG rating B3 U3 G2



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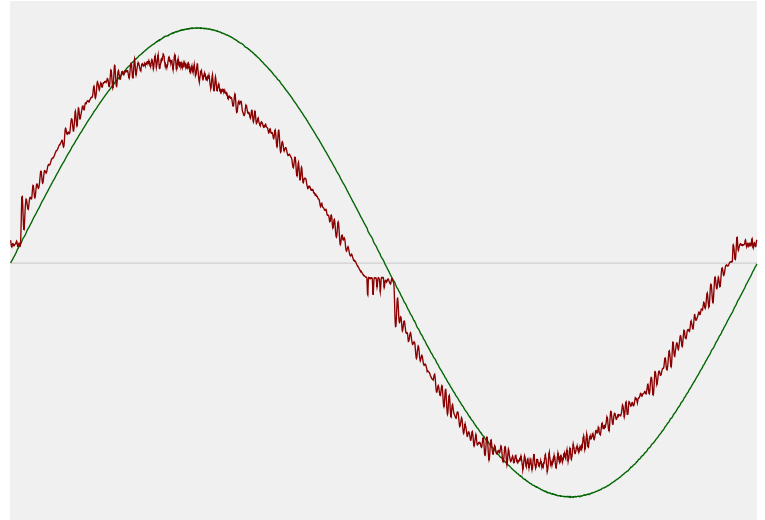


Power Details

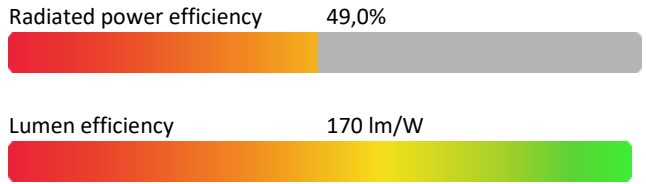
Input Power

Power feed to light source	57,6 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,257 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	59,19 VA
Displacement factor of AC power feed	0,98
Power factor of AC current feed	0,97
Total harmonic distortion of the current	6,02%
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	4003 K
CCT shift	-3 K
CCT end	4000 K

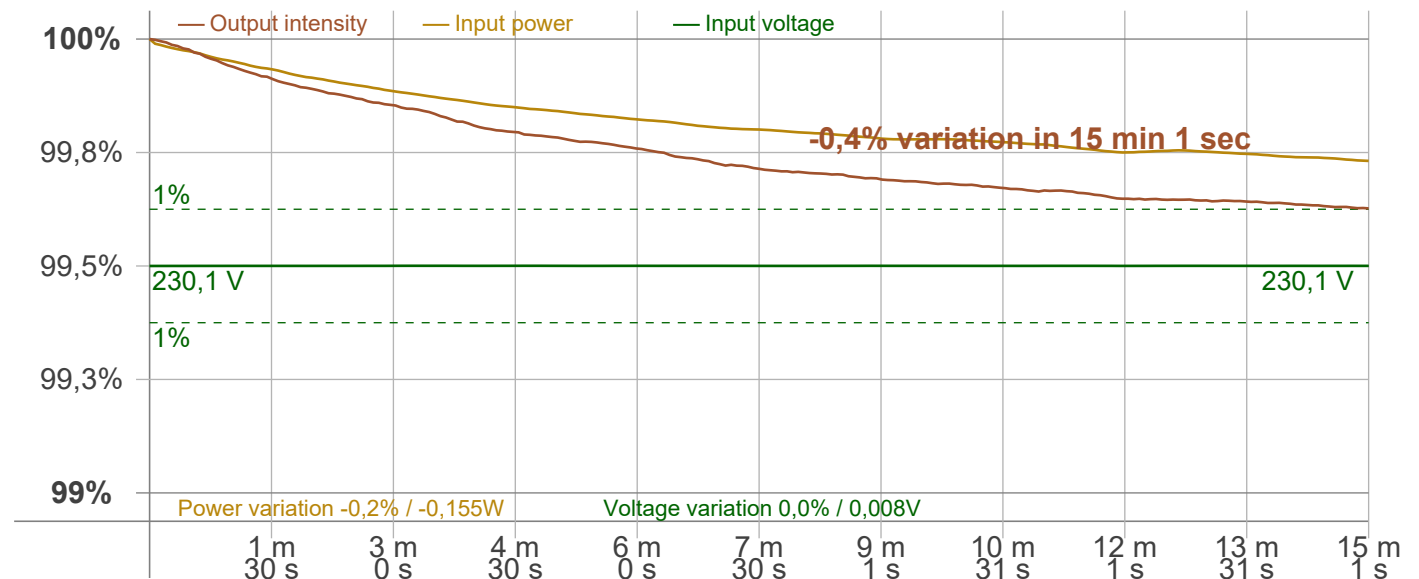
Warmup Result

Total warmup time	Lamp stabilized in 15 min 1 sec
Warmup variation	-0,4%

Output Change

Output start	9832 lm
Output change	-37 lm
Output end	9795 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 100,5 Hz
 Percent Flicker 0,14 %
 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 0,13 %
 JA8/10 400 Hz 0,13 %
 JA8/10 1000 Hz 0,13 %

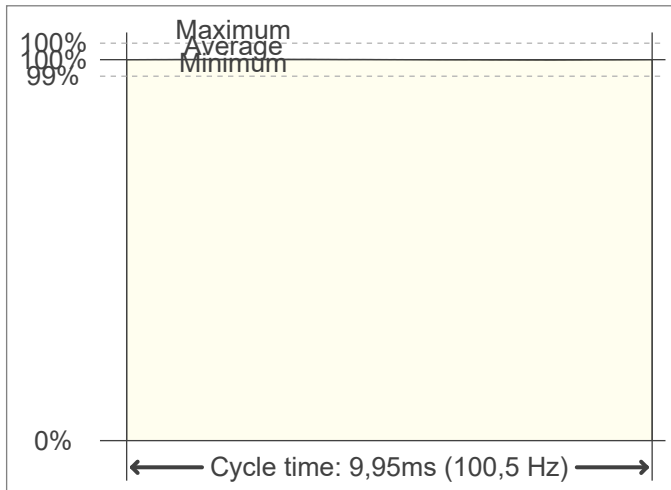
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

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

