

# Light Measurement Report

Print date: 25-9-2025

Measurement date and time: 25-9-2025 15:15:40 – Measurement no. VFR-250925-3375-MS

Measurement tracking No. and Link: [VT250925-002355](https://www.viso-systems.com/VT250925-002355)

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

36 planes – 10°  
5°  
2,89 m  
144 W – PF 0,99 – DPF 0,99  
230 V – 0,633 A  
50 Hz  
Lamp stabilized in 15 min 2 sec – 2,0%

## Tested Light Source

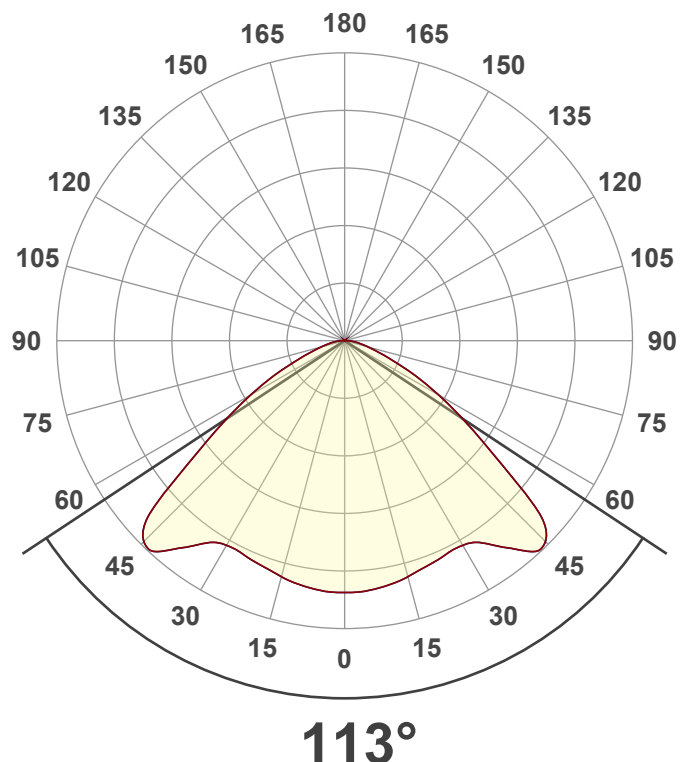
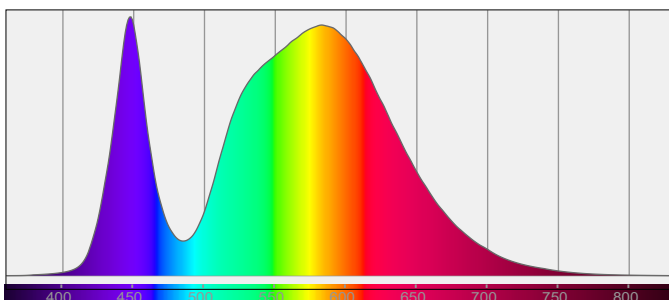
Product Name  
Item No. and Manufacturer  
Product Description (line 1)  
SWITCH

812720-4000K-150W  
812720-4000K-150W – Dutchfulfillment  
LED HIGHBAY ARGOS | 0-10V | 150W/120W/100W | 60°/90°/120° | CCT

## 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

18290 lm – 0,18% / 99,82%  
127 lm/W  
6347 cd – 113°  
CCT = 4000 K / 4151 K  
CRI 72,0  
 $R_f$  73,8 –  $R_g$  94,6  
Duv 0,0014 – SDCM 3,3  
SVM 0 – PstLM 0,07



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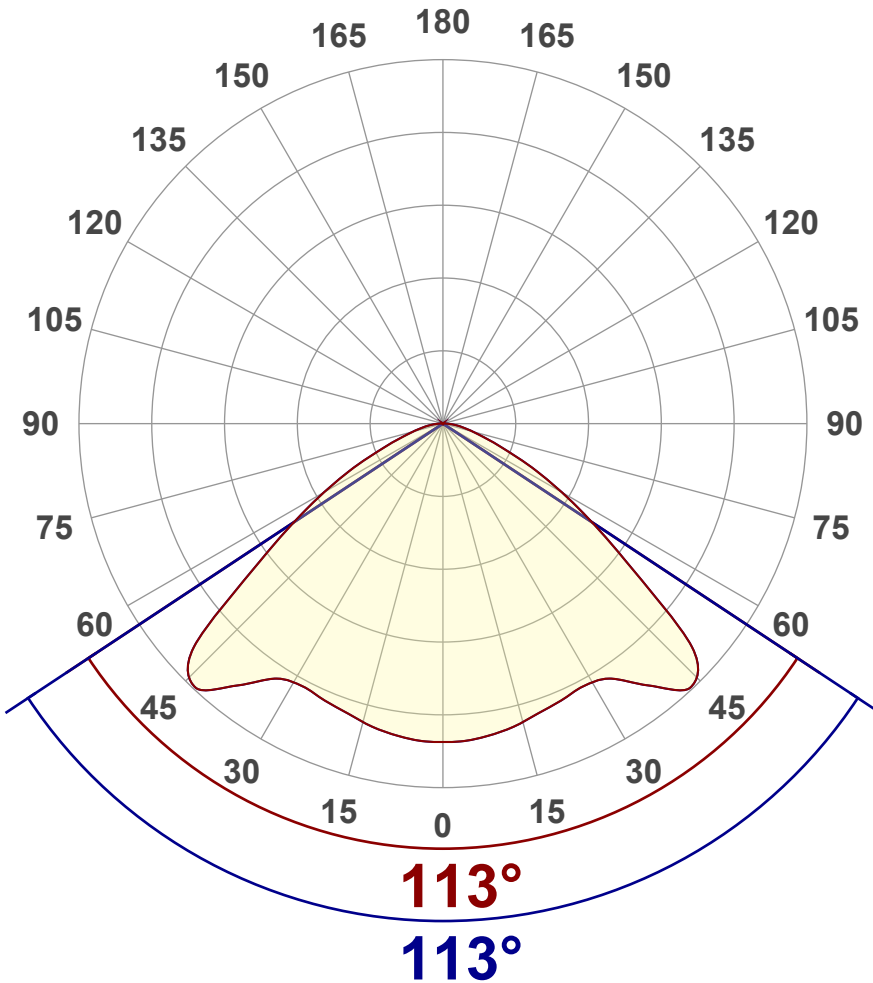
Measurement tracking No. and Link: [VT250925-002355](#)

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## Luminous Intensity diagram

Unit: 0-100% of peak intensity



## Main Values

Output (total Lumen)	18290 lm
Lumen Up% / Down%	0,18% / 99,82%
Peak Intensity	6347 cd
Beam Angle (50%)	113°
Beam Angle (90%)	113°
Beam Angle (10%)	113°

## Cut-off Angle

Average 2,5%	171,7°
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## Field Angle

Average 10%	146,8°
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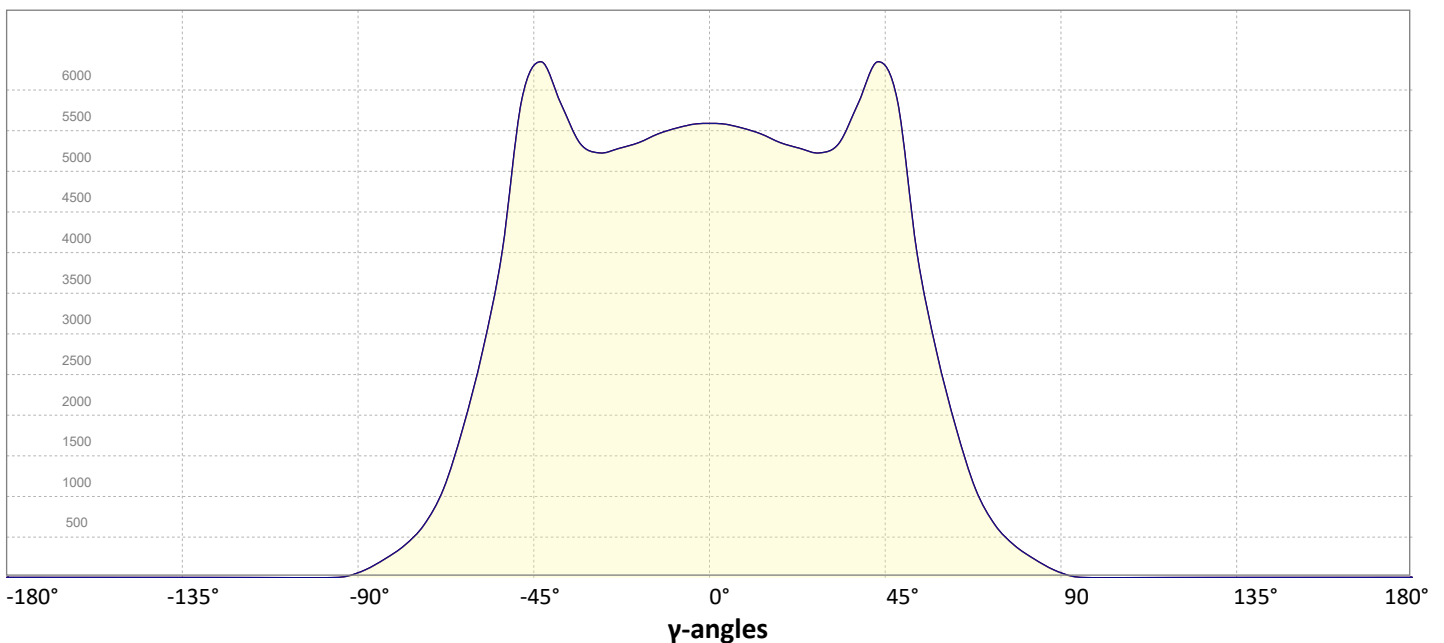
## Intensity Ratio

In 120° cone	87,0%
In 90° cone	56,4%

**C000-C180**

**C090-C270**

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



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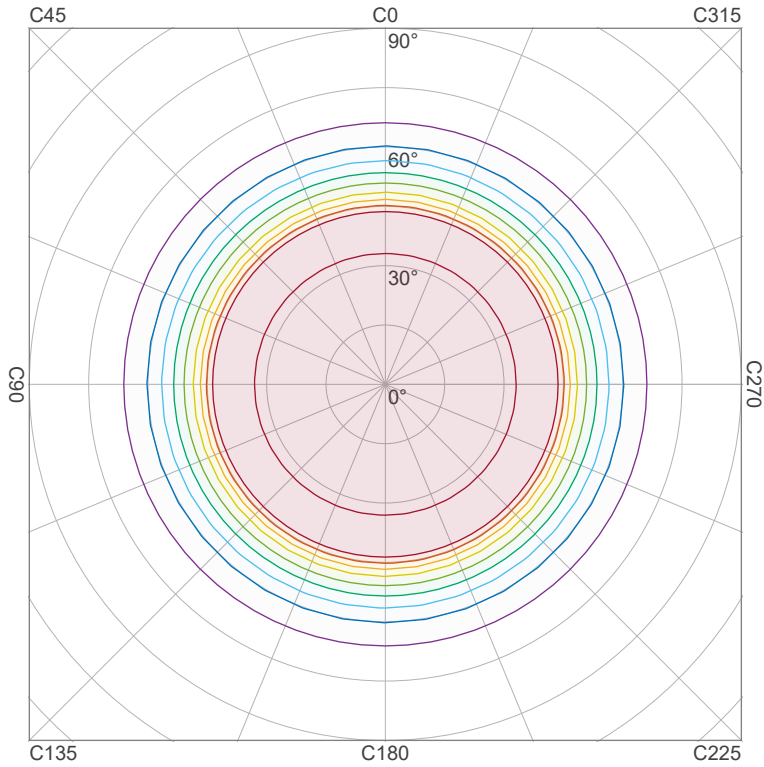
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## Iso-intensity Diagram (Iso-candela)

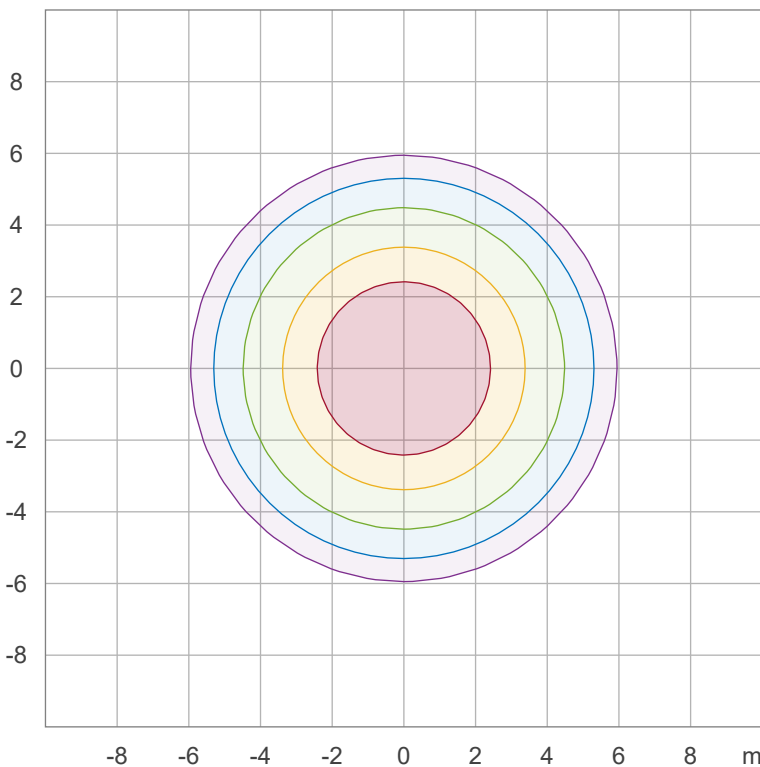


90 %	5701,9 cd
80 %	5068,4 cd
70 %	4434,8 cd
60 %	3801,3 cd
50 %	3167,7 cd
40 %	2534,2 cd
30 %	1900,6 cd
20 %	1267,1 cd
10 %	633,5 cd

Peak intensity: 6335,5 cd

Number of c-planes: 36

## Iso-illuminance Diagram (Iso-lux)



50,0 %	310,2 lx
30,0 %	186,1 lx
10,0 %	62,0 lx
5,0 %	31,0 lx
3,0 %	18,6 lx

Peak illuminance: 620,4 lx

Mounting height: 3,0 m

Number of c-planes: 36

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## Color details

Correlated Color Temperature, Target CCT = 4000 K  
 Correlated Color Temperature, Measured CCT = 4151 K  
 Color Rendering Index CRI 72,0  
 Color Rendering Index, R9 (red component) R9 = -26,5  
 Color Rendering TM30-18 R<sub>f</sub> 73,8 – R<sub>g</sub> 94,6  
 Color Quality Scale CQS = 71,7

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 = 0,0014  
 Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,225;0,502)

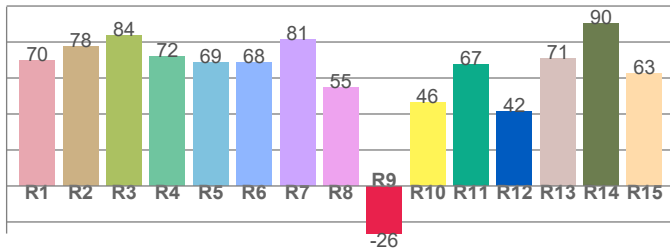
### CIE 1931



### CIE 1931 – zoomed on Planckian locus



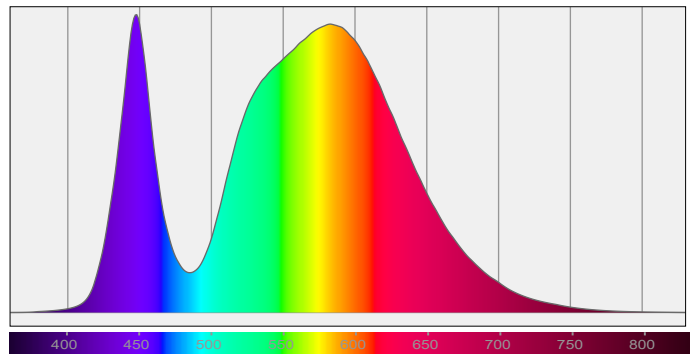
### Color Rendering Index per reference color (CIE 1995)



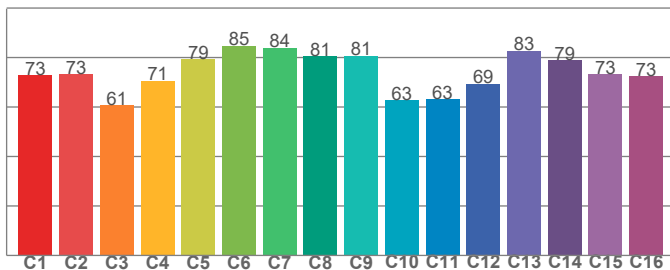
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
69,5	77,8	83,5	72,1	68,8	68,5	81,4	54,9	-26,5	46,4	67,4	41,6	70,7	90,4	62,7

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



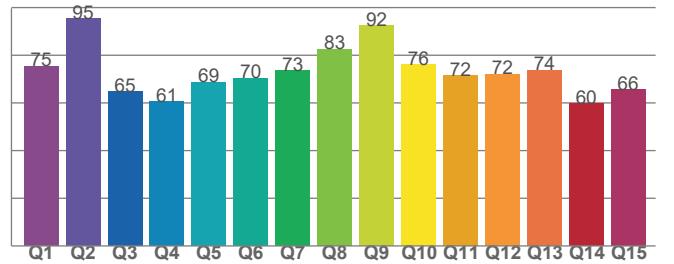
### TM30-18 R<sub>f</sub>-values per hue bin



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
72,7	73,1	60,6	70,7	79,3	84,8	83,9	80,6	80,7	62,7	63,1	69,4	82,7	78,9	73,2	72,5

### Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
75,5	95,4	64,7	60,6	68,8	70,5	73,5	82,6	92,4	76,1	71,5	72,1	73,6	59,7	65,6

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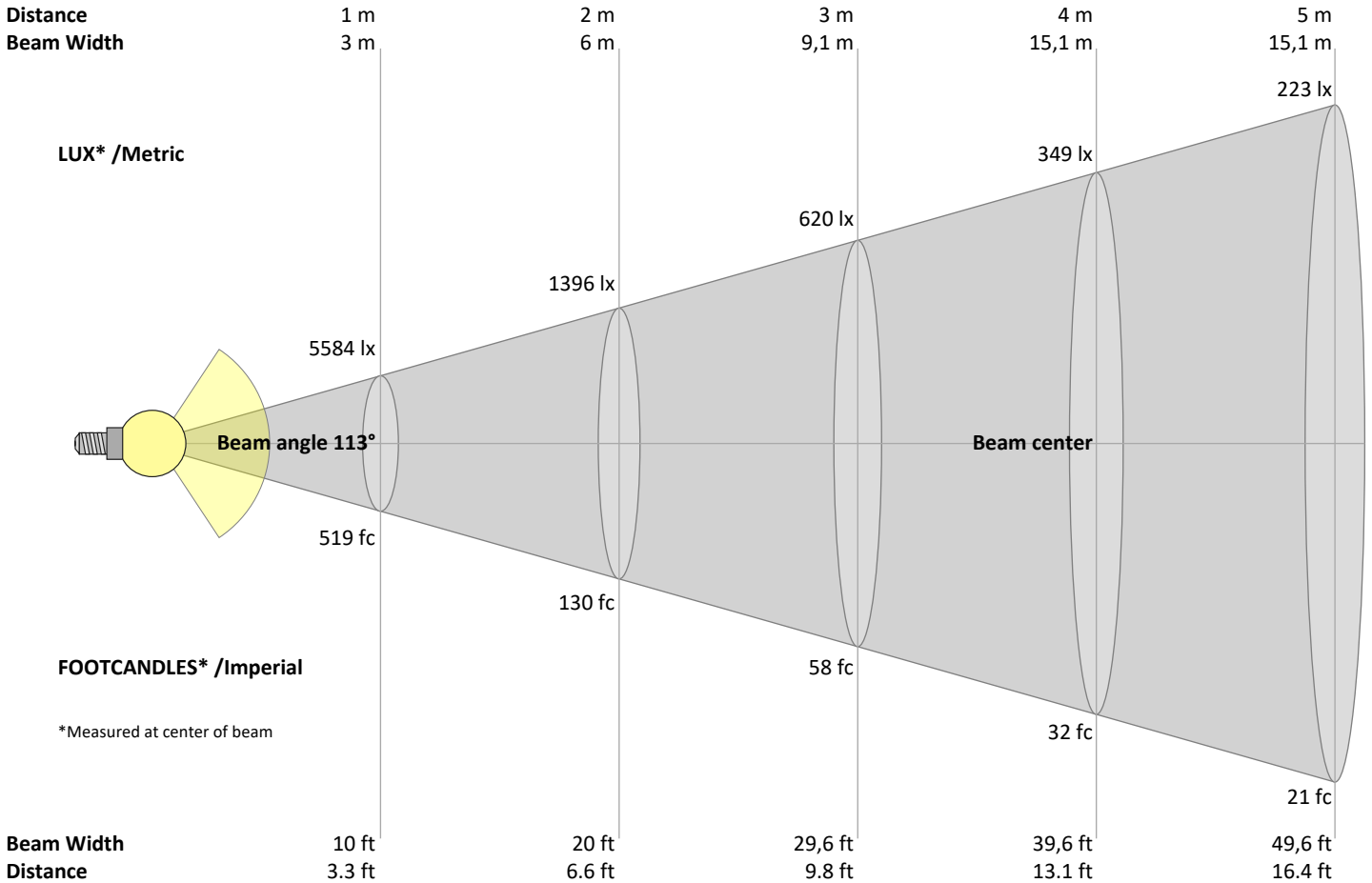
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## Beam Details



### 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
5584	1396	620	349	223	155	114	87	69	56	46	39	33	28	25	22	19	17	15	14	lux
518,8	129,7	57,6	32,4	20,8	14,4	10,6	8,1	6,4	5,2	4,3	3,6	3,1	2,6	2,3	2	1,8	1,6	1,4	1,3	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
5584	5566	5507	5420	5326	5261	5269	5528	6030	6167	5164	3542	2431	1561	925	554	335	181	67	11	cd
100%	100%	99%	97%	95%	94%	94%	99%	108%	110%	92%	63%	44%	28%	17%	10%	6%	3%	1%	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
5584	5566	5507	5420	5326	5261	5269	5528	6030	6167	5164	3542	2431	1561	925	554	335	181	67	11	cd
100%	100%	99%	97%	95%	94%	94%	99%	108%	110%	92%	63%	44%	28%	17%	10%	6%	3%	1%	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
5584	5566	5507	5420	5326	5261	5269	5528	6030	6167	5164	3542	2431	1561	925	554	335	181	67	11	cd
100%	100%	99%	97%	95%	94%	94%	99%	108%	110%	92%	63%	44%	28%	17%	10%	6%	3%	1%	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
5584	5566	5507	5420	5326	5261	5269	5528	6030	6167	5164	3542	2431	1561	925	554	335	181	67	11	cd
100%	100%	99%	97%	95%	94%	94%	99%	108%	110%	92%	63%	44%	28%	17%	10%	6%	3%	1%	0%	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	32,8	34,0	33,0	34,3	34,5	32,8	34,0	33,0	34,3	34,5
	3H	33,2	34,4	33,6	34,7	34,9	33,2	34,4	33,6	34,7	34,9
	4H	33,3	34,5	33,7	34,7	35,0	33,3	34,5	33,7	34,7	35,0
	6H	33,5	34,5	33,8	34,7	35,1	33,5	34,5	33,8	34,7	35,1
	8H	33,5	34,4	33,8	34,8	35,2	33,5	34,4	33,8	34,8	35,2
	12H	33,5	34,4	33,9	34,8	35,2	33,5	34,4	33,9	34,8	35,2
4H	2H	33,0	34,1	33,4	34,4	34,7	33,0	34,1	33,4	34,4	34,7
	3H	33,6	34,6	34,0	34,9	35,4	33,6	34,6	34,0	34,9	35,4
	4H	33,7	34,6	34,2	35,0	35,6	33,7	34,6	34,2	35,0	35,6
	6H	33,9	34,7	34,4	35,1	35,5	33,9	34,7	34,4	35,1	35,5
	8H	34,0	34,7	34,5	35,1	35,5	34,0	34,7	34,5	35,1	35,5
	12H	34,0	34,6	34,5	35,1	35,5	34,0	34,6	34,5	35,1	35,5
8H	4H	33,8	34,5	34,3	34,9	35,3	33,8	34,5	34,3	34,9	35,3
	6H	34,0	34,6	34,6	35,1	35,6	34,0	34,6	34,6	35,1	35,6
	8H	34,2	34,7	34,7	35,2	35,8	34,2	34,7	34,7	35,2	35,8
	12H	34,3	34,7	34,9	35,2	35,8	34,3	34,7	34,9	35,2	35,8
12H	4H	33,8	34,4	34,3	34,8	35,3	33,8	34,4	34,3	34,8	35,3
	6H	34,1	34,6	34,6	35,1	35,7	34,1	34,6	34,6	35,1	35,7
	8H	34,2	34,6	34,8	35,1	35,7	34,2	34,6	34,8	35,1	35,7

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

S = 1.0H	0,4 / -0,3	0,4 / -0,3
S = 1.5H	1,1 / -1,1	1,1 / -1,1
S = 2.0H	2,1 / -2,2	2,1 / -2,2

## 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	110	105	101	98	107	103	100	96	99	96	93	95	93	90	91	89	88	86
2	100	93	86	81	98	91	85	80	87	82	78	84	80	76	81	78	75	72
3	92	82	74	68	89	80	73	67	77	71	66	74	69	65	72	67	64	61
4	84	72	64	57	82	71	63	57	68	62	56	66	60	55	64	59	55	52
5	77	64	56	49	75	63	55	49	61	54	48	59	53	48	57	52	47	45
6	71	58	49	42	69	57	48	42	55	47	42	53	47	42	52	46	41	39
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	46	38	33	45	38	32	44	37	32	43	37	32	30
9	56	43	35	29	55	42	35	29	41	34	29	40	34	29	39	33	29	27
10	53	39	32	26	51	39	31	26	38	31	26	37	30	26	36	30	26	24

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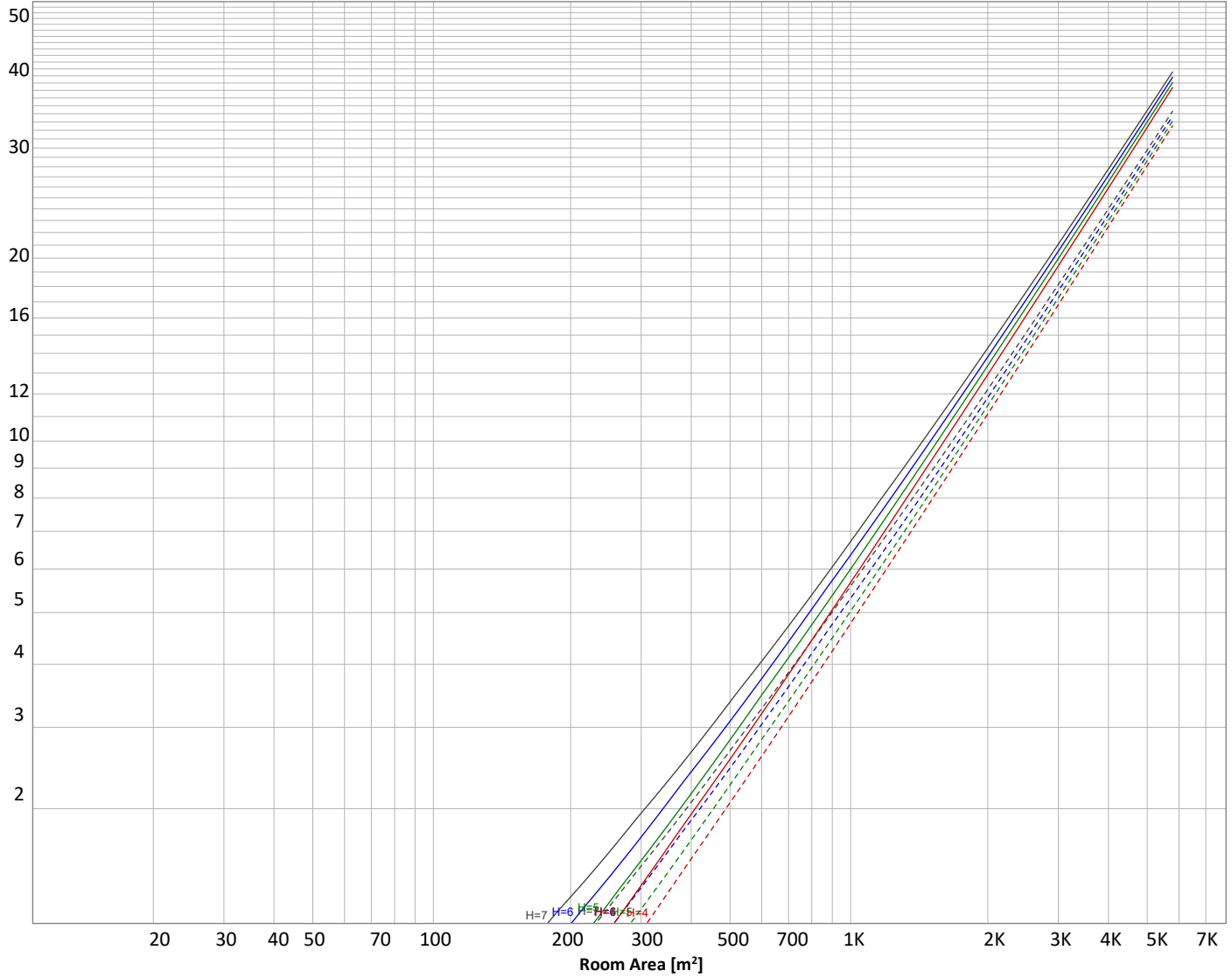
Operator:



## Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



### Conditions

H = Room height	Flux = 18290 lm				
H <sub>down</sub> = Lamp distance from ceiling =	0.00 m	Line type	Ceiling reflectance	ρ(%) 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°
530 lm	1533 lm	2434 lm	3498 lm	4723 lm	3192 lm	1551 lm	597 lm	199 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
15,8 lm	1,38 lm	2,69 lm	3,38 lm	3,34 lm	2,86 lm	2,19 lm	1,37 lm	0,480 lm

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## Outdoor Light Planning

### Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	530 lm	2,9%
10-20°	1533 lm	8,4%
20-30°	2434 lm	13,3%
30-40°	3498 lm	19,1%
40-50°	4723 lm	25,8%
50-60°	3192 lm	17,5%
60-70°	1551 lm	8,5%
70-80°	597 lm	3,3%
80-90°	199 lm	1,1%
90-100°	16 lm	0,1%
100-110°	1 lm	0,0%
110-120°	3 lm	0,0%
120-130°	3 lm	0,0%
130-140°	3 lm	0,0%
140-150°	3 lm	0,0%
150-160°	2 lm	0,0%
160-170°	1 lm	0,0%
170-180°	0 lm	0,0%
<b>Total</b>	<b>18290 lm</b>	<b>100,0%</b>

### Intensity peaks

Max intensity	6347 cd
Intensity, 90°	67 cd
Intensity, 0°	5584 cd

### Zonal Lumen summary

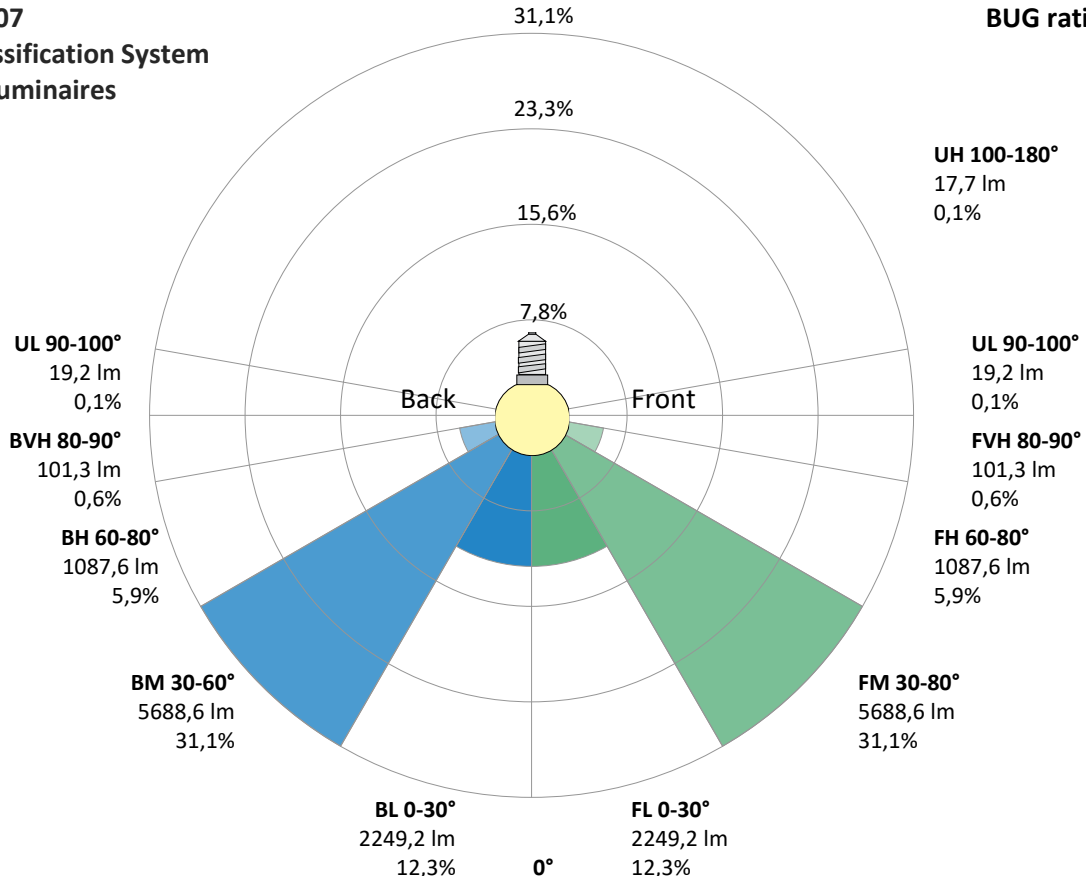
Zone (γ)	Lumen	% Total
0-30°	4497 lm	24,6%
0-40°	7994 lm	43,7%
0-60°	15910 lm	87,0%
60-90°	2347 lm	12,8%
70-100°	812 lm	4,4%
90-120°	20 lm	0,1%
0-90°	18257 lm	99,8%
90-180°	34 lm	0,2%
0-180°	18290 lm	100,0%

### BUG rating

	Lumen	% Total
<b>Forward light</b>		
Low(0-30°)	2249 lm	12,3%
Medium(30-60°)	5689 lm	31,1%
High(60-80°)	1088 lm	5,9%
Very high(80-90°)	101 lm	0,6%
<b>Back light</b>		
Low(0-30°)	2249 lm	12,3%
Medium(30-60°)	5689 lm	31,1%
High(60-80°)	1088 lm	5,9%
Very high(80-90°)	101 lm	0,6%
<b>Uplight</b>		
Low(90-100°)	19 lm	0,1%
High(100-180°)	18 lm	0,1%

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

**BUG rating B4 U2 G2**



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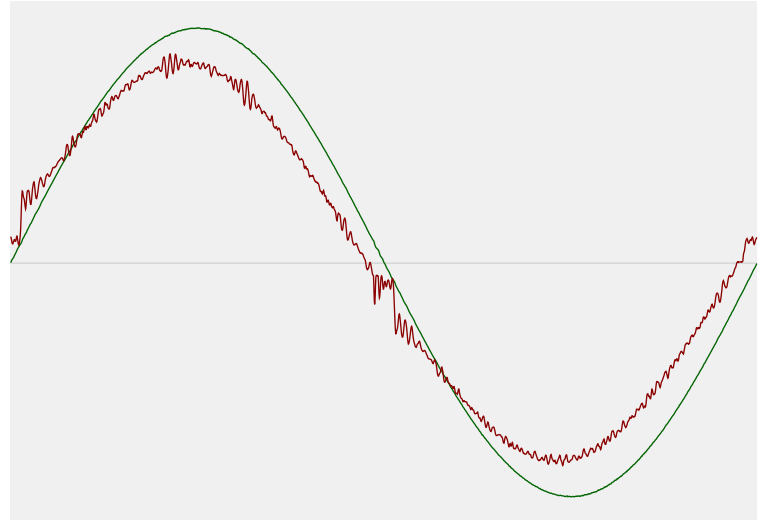


## Power Details

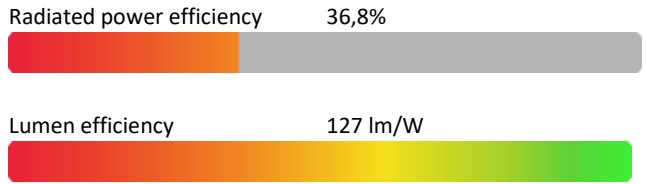
### Input Power

Power feed to light source	144 W
Frequency of input power	50 Hz
RMS Input voltage feed, $V_{RMS}$	230 V
RMS Input current feed, $I_{RMS}$	0,633 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	145,64 VA
Displacement factor of AC power feed	0,99
Power factor of AC current feed	0,99
Total harmonic distortion of the current	2,58%
Total harmonic distortion of the voltage	0,07%

### 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	4002 K
CCT shift	-2 K
CCT end	4000 K

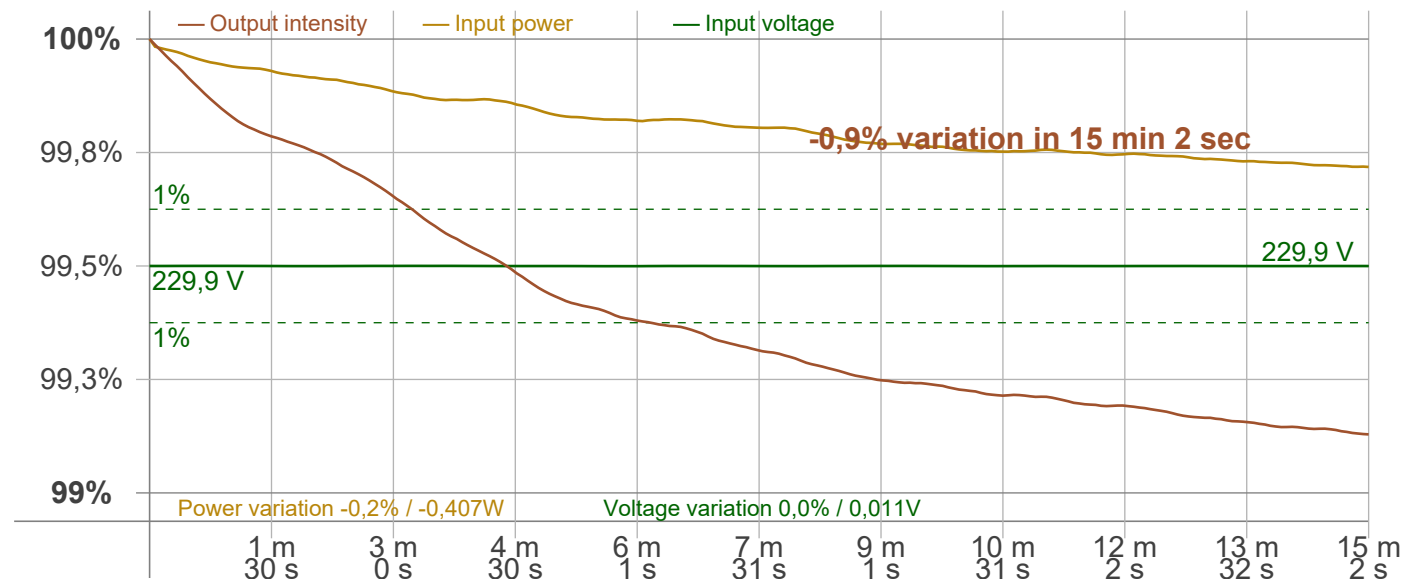
### Warmup Result

Total warmup time	Lamp stabilized in 15 min 2 sec
Warmup variation	-0,9%

### Output Change

Output start	18456 lm
Output change	-166 lm
Output end	18290 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 540,54 Hz  
 Percent Flicker 0,32 %  
 Flicker index 0

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

JA8/10 40 Hz 0,15 %  
 JA8/10 90 Hz 0,16 %  
 JA8/10 200 Hz 0,18 %  
 JA8/10 400 Hz 0,19 %  
 JA8/10 1000 Hz 0,31 %

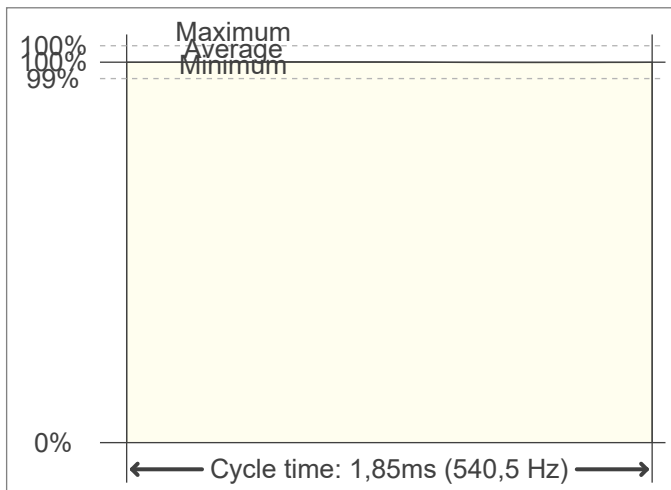
### TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

PstLM value (F < 80 Hz) 0,07  
 SVM value (80 < F < 2000 Hz) 0

### 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

