Light Measurement Report

Print date: 27/05/2025
Measurement date and time: 27/05/2025 12:21:56 – Measurement no. VFR-250527-0802-MS
Measurement tracking No. and Link: VT250527-000050
Operator: JW

Laboratory and Equipment

Laboratory Owner and Location	Viso Systems, Copenhagen V, Denmark
Goniospectrometer System and Type	LabSpion – Type C, horizontal
Sensor Name, Calibr. Date and Serial No.	LabSensor Model2 – 11/12/2024 – 3532797498
Spectrometer Manufacturer and Model	Ibsen Photonics, Denmark – Freedom VIS (Custom Viso)

Measurement Conditions

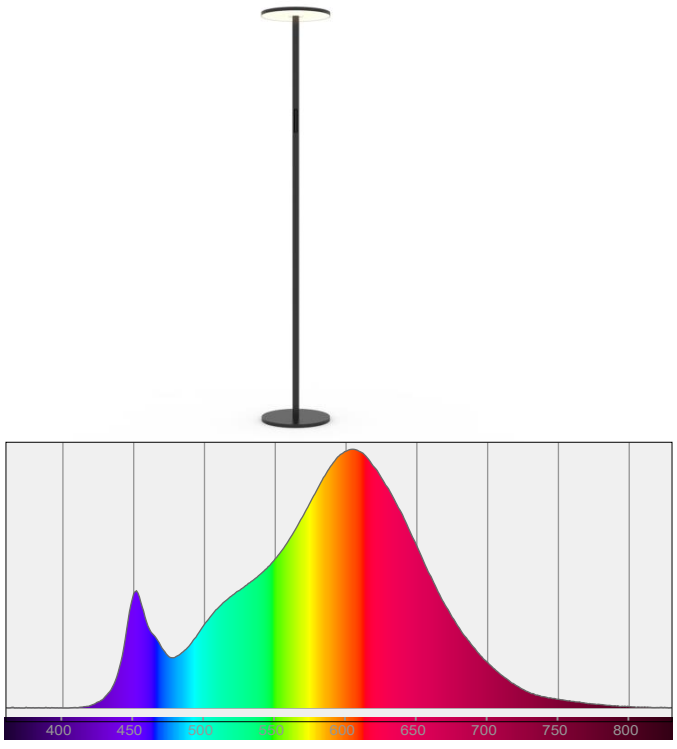
Number of C-planes and Resolution	16 planes – 22,5°
γ (gamma)-Resolution	5°
Test Distance	3,14 m
Input Power, Power and Displ. Factors	29,8 W – PF 0,55 – DPF 0,99
Input RMS Voltage and Current	237 V – 0,229 A
Frequency of Input Power	50,1 Hz
Warm-up Time and Variation	Lamp stabilized in 15 min 4 sec – 2,0%

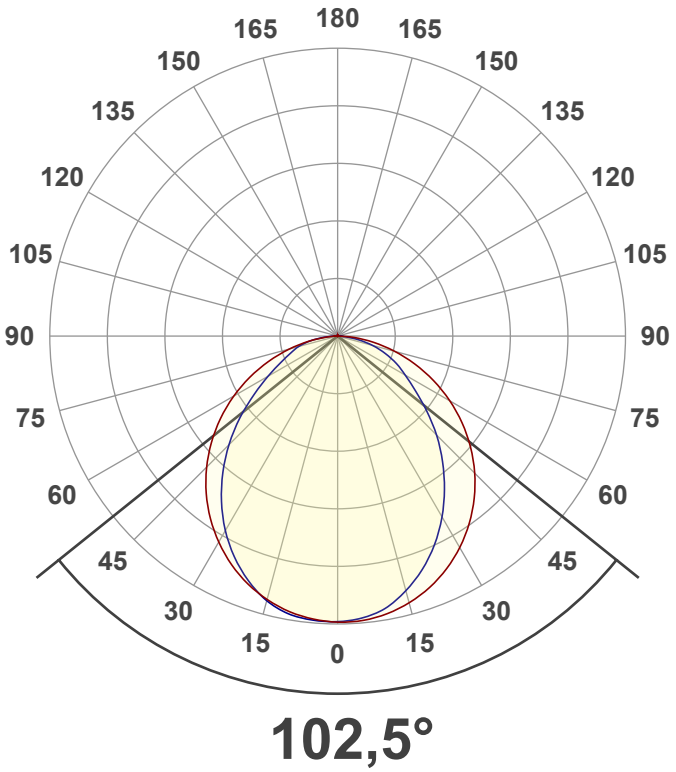
Tested Light Source

Product Name	BALANCE F 28W CRI90 3000K 180D MATTE BLACK
Item No. and Manufacturer	42941497309802 – ELECTRUM
Product Description (line 1)	

Main Light Measurement Results

Output – Total Lumen (Up% / Down%)	1103 lm – 0,42% / 99,58%
Efficiency	37 lm/W
Peak Intensity and Beam Angle	426 cd – 102,5°
Correlated Color Temperature, Target/Measured	CCT = 3000 K / 2886 K
Color Rendering Index	CRI 83,5
Color Rendering TM30-18	R_f 86,0 – R_g 94,7
Color Shift, CIE duv and MacAdam Steps	Duv 0,0008 – SDCM 4,5
Flicker	SVM 0 – PstLM 0,01

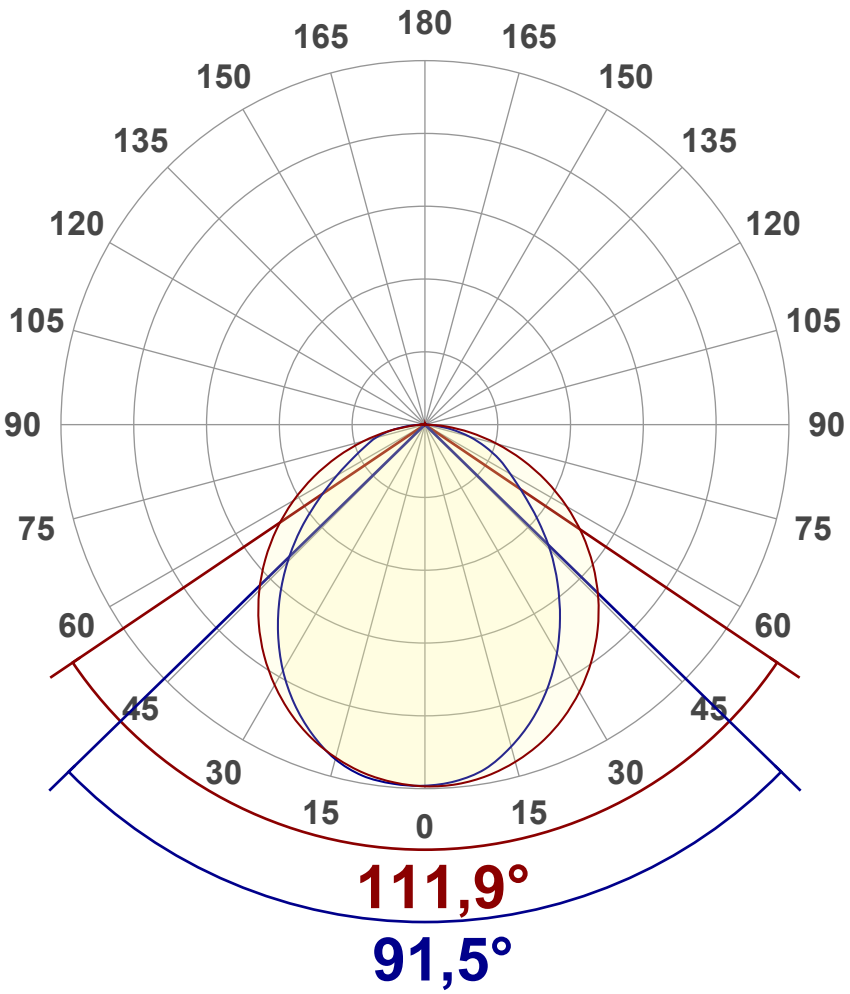




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Luminous Intensity diagram Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	1103 lm
Lumen Up% / Down%	0,42% / 99,58%
Peak Intensity	426 cd
Beam Angle (50%)	102,5°
Beam Angle (90%)	91,5°
Beam Angle (10%)	111,9°

Cut-off Angle

Average 2,5%	174,1°

Field Angle

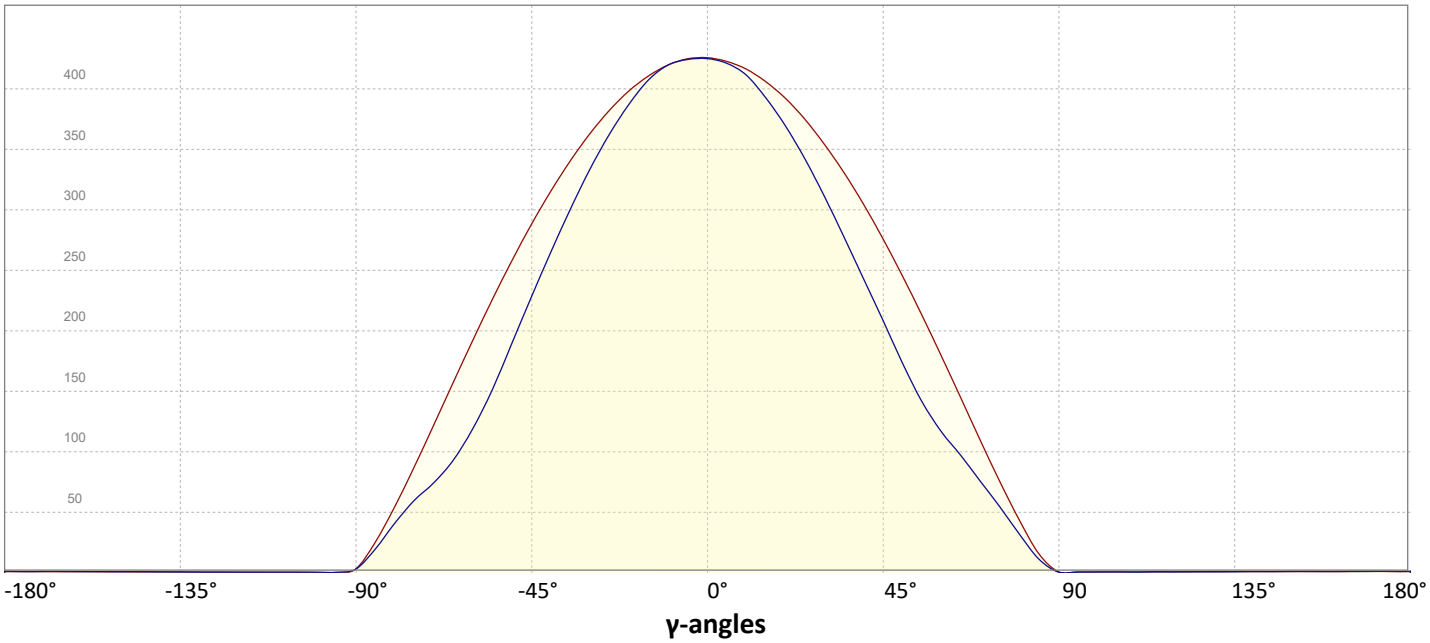
Average 10%	159,7°

Intensity Ratio

In 120° cone	80,0%
In 90° cone	56,2%

C000-C180
C090-C270

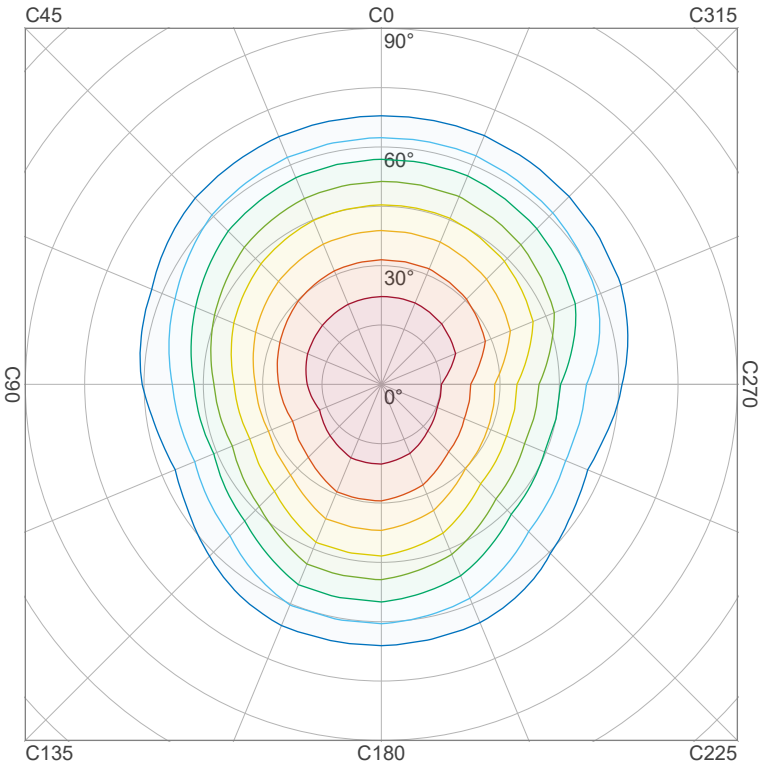
Linear distribution diagram - Intensity (candela) vs γ-angle



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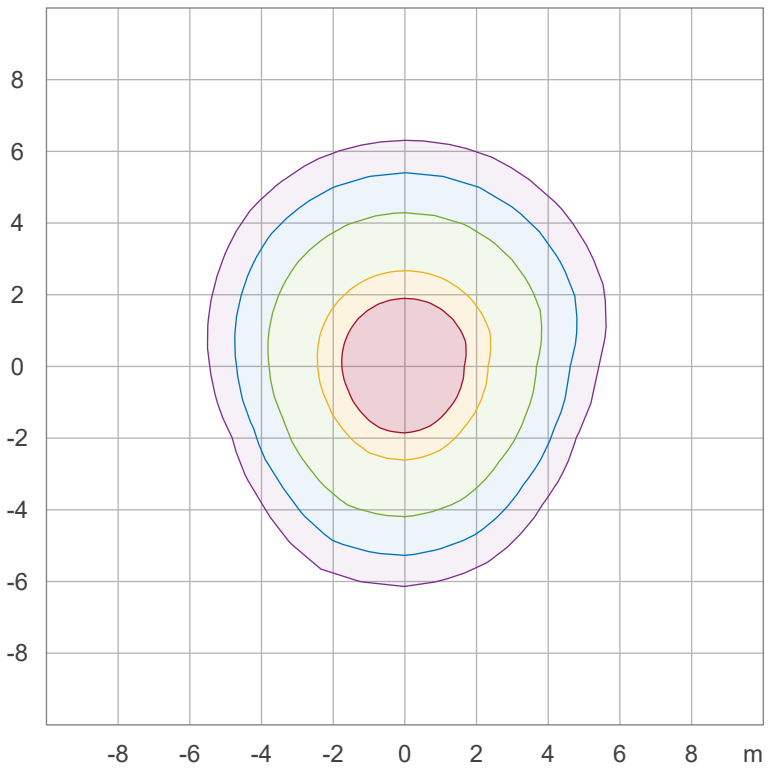
Iso-intensity Diagram (Iso-candela)



90 %	383,7 cd
80 %	341,1 cd
70 %	298,4 cd
60 %	255,8 cd
50 %	213,2 cd
40 %	170,5 cd
30 %	127,9 cd
20 %	85,3 cd
10 %	42,6 cd

Peak intensity: 426,3 cd
Number of c-planes: 16

Iso-illuminance Diagram (Iso-lux)



50,0 %	23,7 lx
30,0 %	14,2 lx
10,0 %	4,7 lx
5,0 %	2,4 lx
3,0 %	1,4 lx

Peak illuminance: 47,3 lx
Mounting height: 3,0 m
Number of c-planes: 16

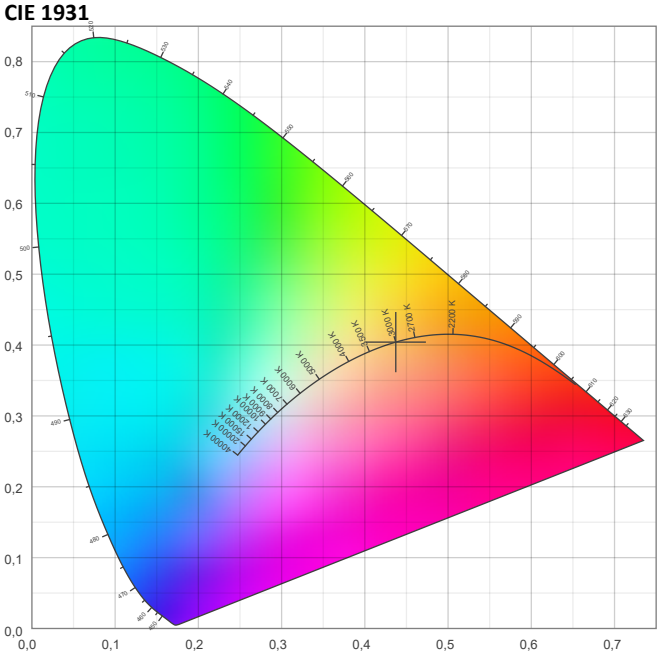
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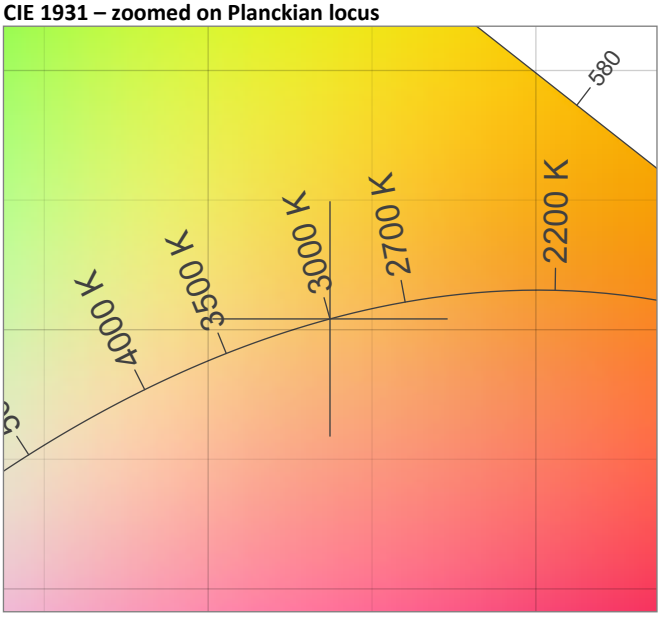
Color details

Correlated Color Temperature, Target	CCT = 3000 K
Correlated Color Temperature, Measured	CCT = 2886 K
Color Rendering Index	CRI 83,5
Color Rendering Index, R9 (red component)	R9 = 11,5
Color Rendering TM30-18	R_f 86,0 – R_g 94,7
Color Quality Scale	CQS = 83,4
MacAdam Steps	SDCM = 4,5
Color coordinates CIE 1931	(x;y) = (0,437;0,404)
Color coordinate CIEs 1960	(u;v) = (0,251;0,348)
Color deviation from BBL	Duv = 0,0008
Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0,251;0,521)

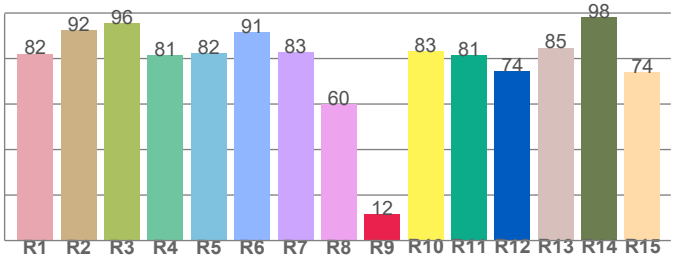
CIE 1931



CIE 1931 – zoomed on Planckian locus



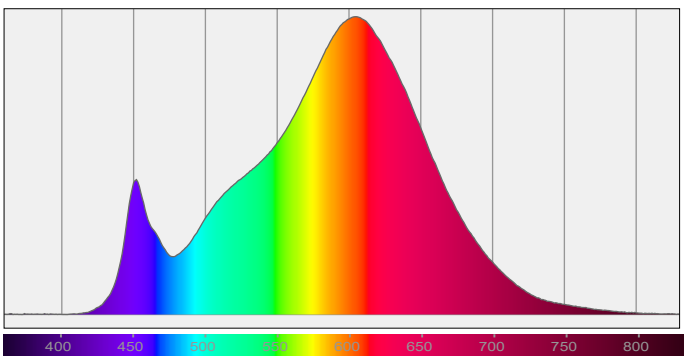
Color Rendering Index per reference color (CIE 1995)



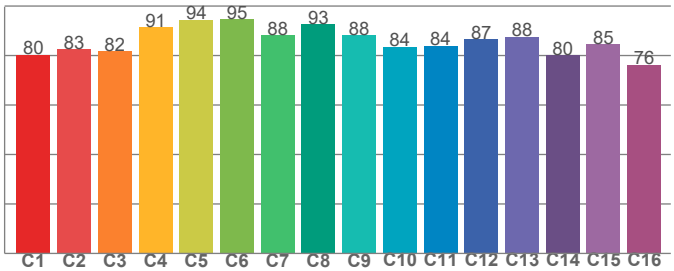
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
82,1	92,4	95,6	81,5	82,4	91,5	82,8	60,0	11,5	83,1	81,4	74,4	84,7	98,2	73,9

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



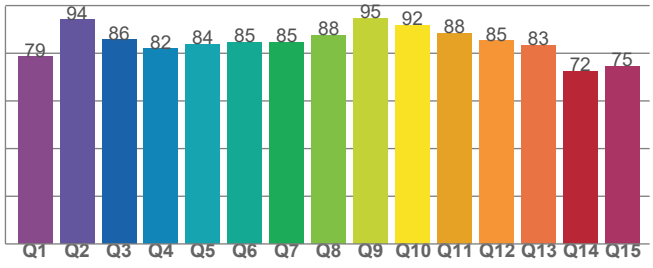
TM30-18 Rf-values per hue bin



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
80,3	82,6	81,7	91,5	94,4	94,6	88,1	92,7	88,1	83,5	84,0	86,7	87,6	80,2	84,7	76,3

Color Quality Scale by reference color



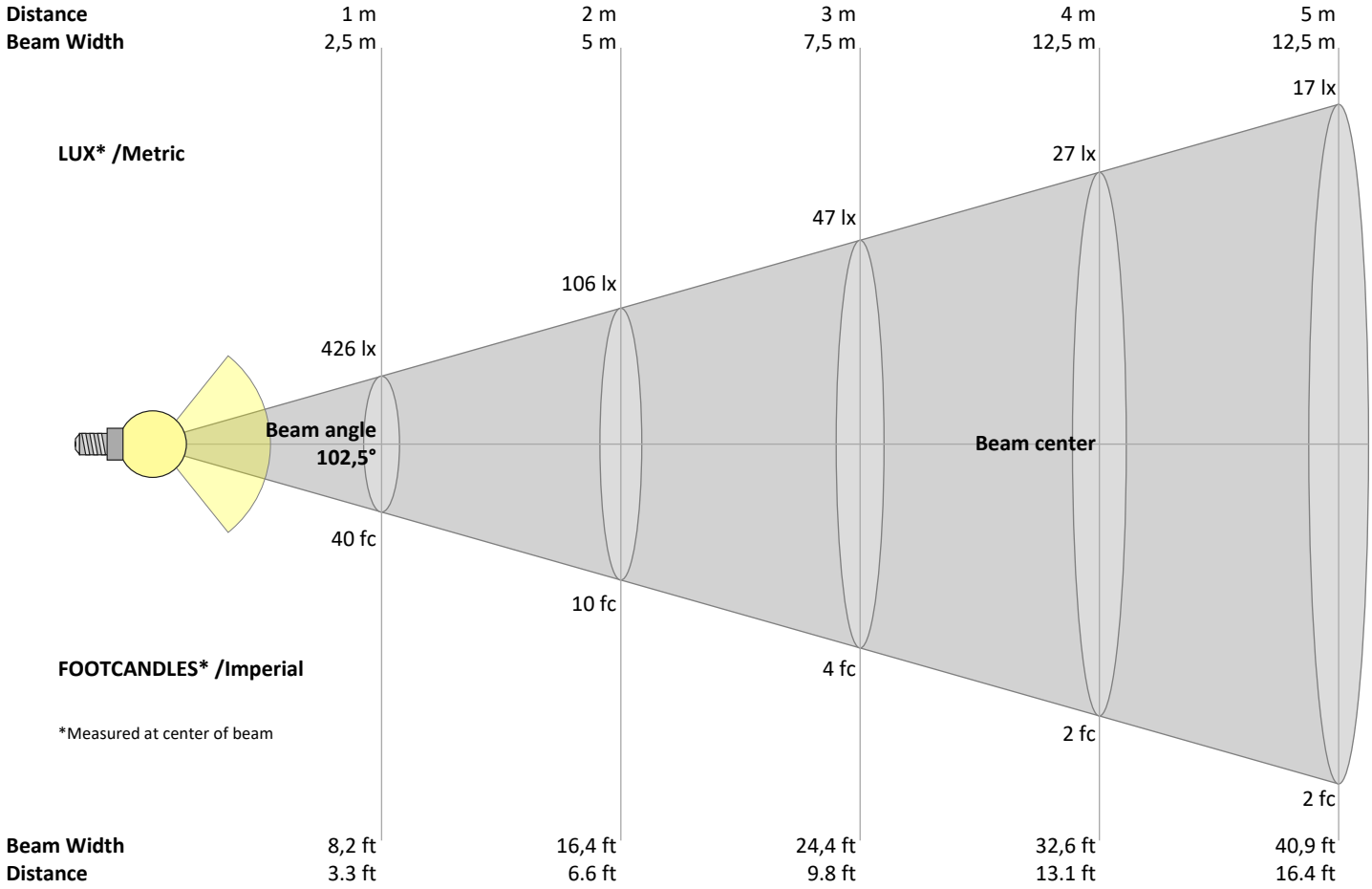
CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
78,5	94,0	85,7	81,8	83,9	84,5	84,6	87,6	94,6	91,8	88,4	85,3	83,4	72,4	74,6

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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
426	106	47	27	17	12	9	7	5	4	4	3	3	2	2	2	1	1	1	1	lux
39,5	9,9	4,4	2,5	1,6	1,1	0,8	0,6	0,5	0,4	0,3	0,3	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1	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
426	425	420	411	399	383	363	341	316	288	258	226	193	158	123	88	55	26	3	0	cd
100%	100%	99%	97%	94%	90%	85%	80%	74%	68%	61%	53%	45%	37%	29%	21%	13%	6%	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
426	421	411	392	369	342	311	277	243	208	173	141	116	96	75	54	31	11	1	1	cd
100%	99%	97%	92%	87%	80%	73%	65%	57%	49%	41%	33%	27%	23%	18%	13%	7%	3%	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
426	423	416	406	392	375	354	330	304	276	245	212	178	144	108	74	43	15	1	1	cd
100%	99%	98%	95%	92%	88%	83%	78%	72%	65%	58%	50%	42%	34%	25%	17%	10%	4%	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
426	424	420	408	388	363	334	301	266	229	190	152	120	94	75	60	41	20	3	0	cd
100%	100%	99%	96%	91%	85%	79%	71%	62%	54%	45%	36%	28%	22%	18%	14%	10%	5%	1%	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		**Viewed Crosswise**					**Viewed Endwise**				
X **Y**		(Viewing direction orthogonal to lamp length axis)					(Viewing direction parallel to lamp length axis)				
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

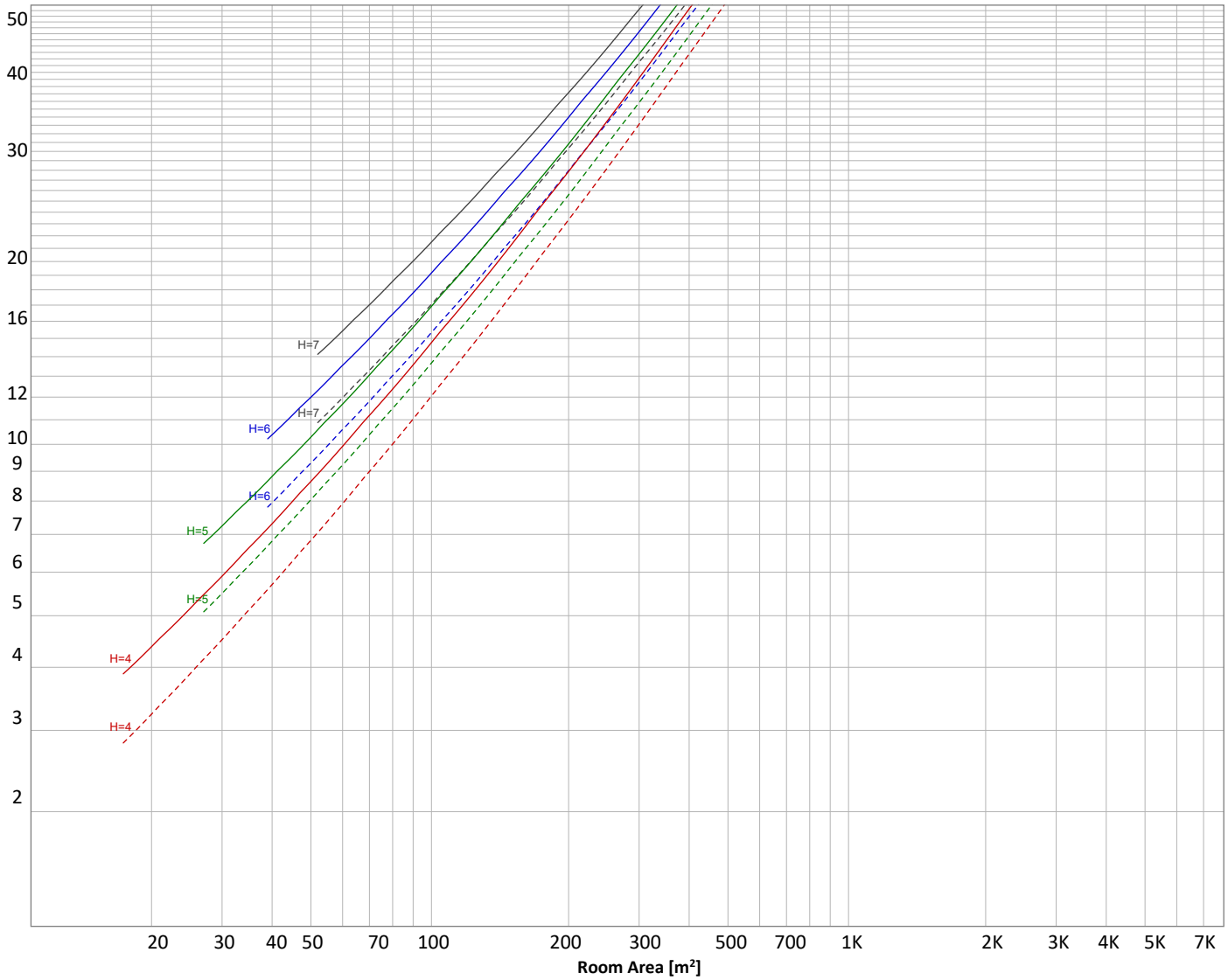
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 1103 lm		ρ(%)		
H_{down} = Lamp distance from ceiling =	0.00 m	Line type	Ceiling reflectance	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°
40,2 lm	114 lm	169 lm	197 lm	195 lm	166 lm	121 lm	72,8 lm	22,1 lm

90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
1,03 lm	0,587 lm	0,562 lm	0,566 lm	0,572 lm	0,534 lm	0,435 lm	0,283 lm	0,099 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	40 lm	3,6%
10-20°	114 lm	10,3%
20-30°	169 lm	15,3%
30-40°	197 lm	17,9%
40-50°	195 lm	17,7%
50-60°	166 lm	15,1%
60-70°	121 lm	11,0%
70-80°	73 lm	6,6%
80-90°	22 lm	2,0%
90-100°	1 lm	0,1%
100-110°	1 lm	0,1%
110-120°	1 lm	0,1%
120-130°	1 lm	0,1%
130-140°	1 lm	0,1%
140-150°	1 lm	0,0%
150-160°	0 lm	0,0%
160-170°	0 lm	0,0%
170-180°	0 lm	0,0%
Total	1103 lm	100,0%

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	323 lm	29,3%
0-40°	520 lm	47,2%
0-60°	882 lm	80,0%
60-90°	216 lm	19,6%
70-100°	96 lm	8,7%
90-120°	2 lm	0,2%
0-90°	1098 lm	99,6%
90-180°	5 lm	0,4%
0-180°	1103 lm	100,0%

Intensity peaks

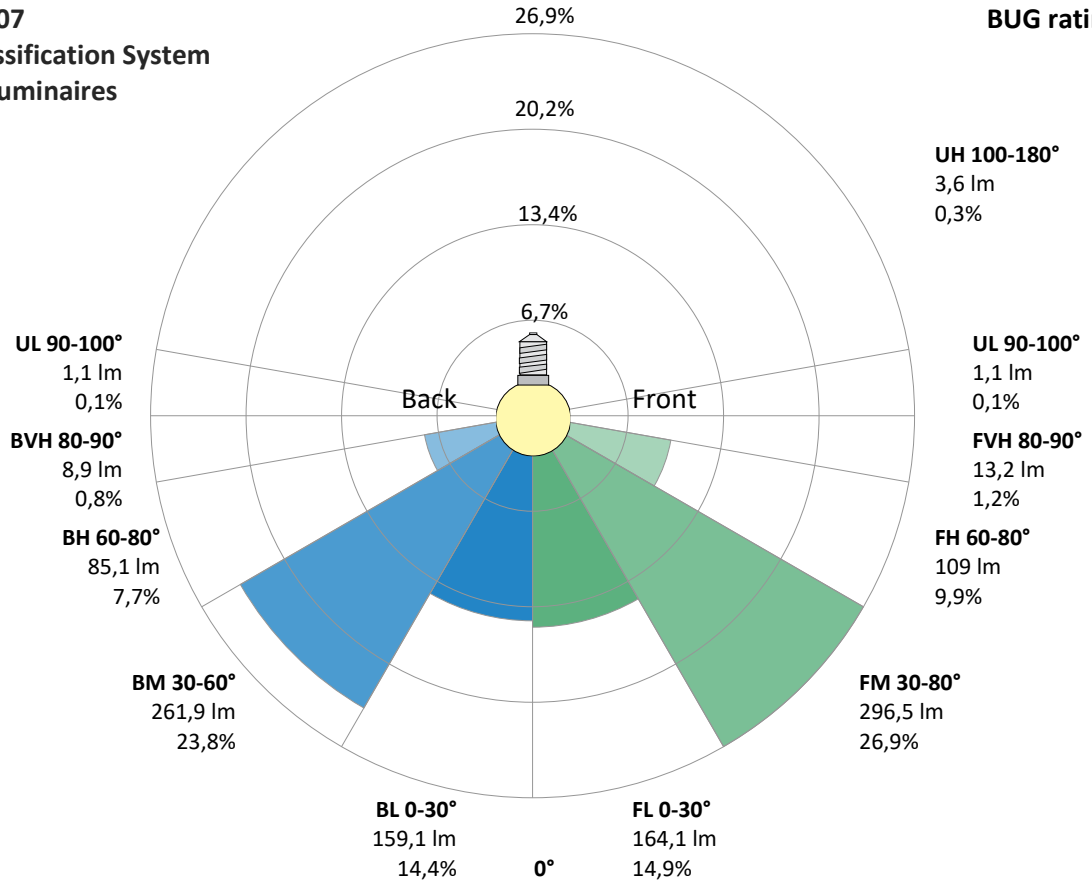
Max intensity	426 cd
Intensity, 90°	3 cd
Intensity, 0°	426 cd

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	164 lm	14,9%
Medium(30-60°)	296 lm	26,9%
High(60-80°)	109 lm	9,9%
Very high(80-90°)	13 lm	1,2%
Back light		
Low(0-30°)	159 lm	14,4%
Medium(30-60°)	262 lm	23,8%
High(60-80°)	85 lm	7,7%
Very high(80-90°)	9 lm	0,8%
Uplight		
Low(90-100°)	1 lm	0,1%
High(100-180°)	4 lm	0,3%

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

BUG rating B1 U1 G1



Light Measurement Report

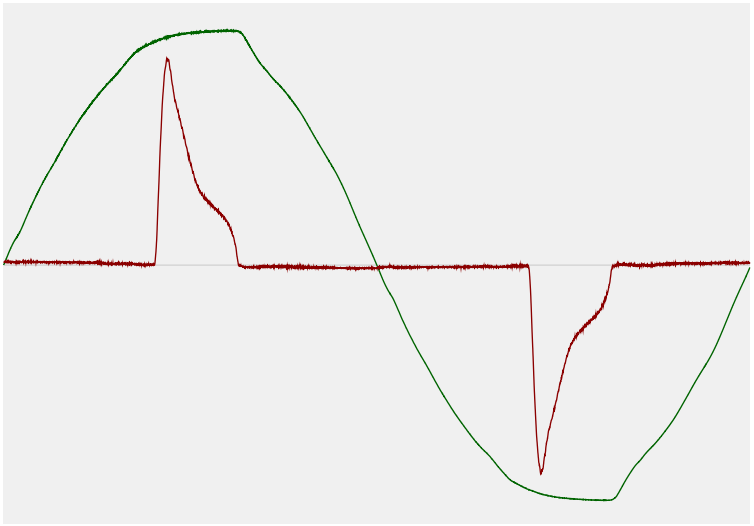
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Power Details

Input Power

Power feed to light source	29,8 W
Frequency of input power	50,1 Hz
RMS Input voltage feed, V_{RMS}	237 V
RMS Input current feed, I_{RMS}	0,229 A
Volt-Ampere or apparent power = V_{RMS}*I_{RMS}	54,12 VA
Displacement factor of AC power feed	0,99
Power factor of AC current feed	0,55
Total harmonic distortion of the current	142,95%
Total harmonic distortion of the voltage	3,2%

Input Power Curve



Efficiency

Radiated power efficiency 11,4%

Lumen efficiency 37 lm/W

Stabilization Details

Warmup Conditions

Stable period	15 min
Stable change max	2,0%
Minimum time	15 min

Color Temperature Change

CCT start	2996 K
CCT shift	+4 K
CCT end	3000 K

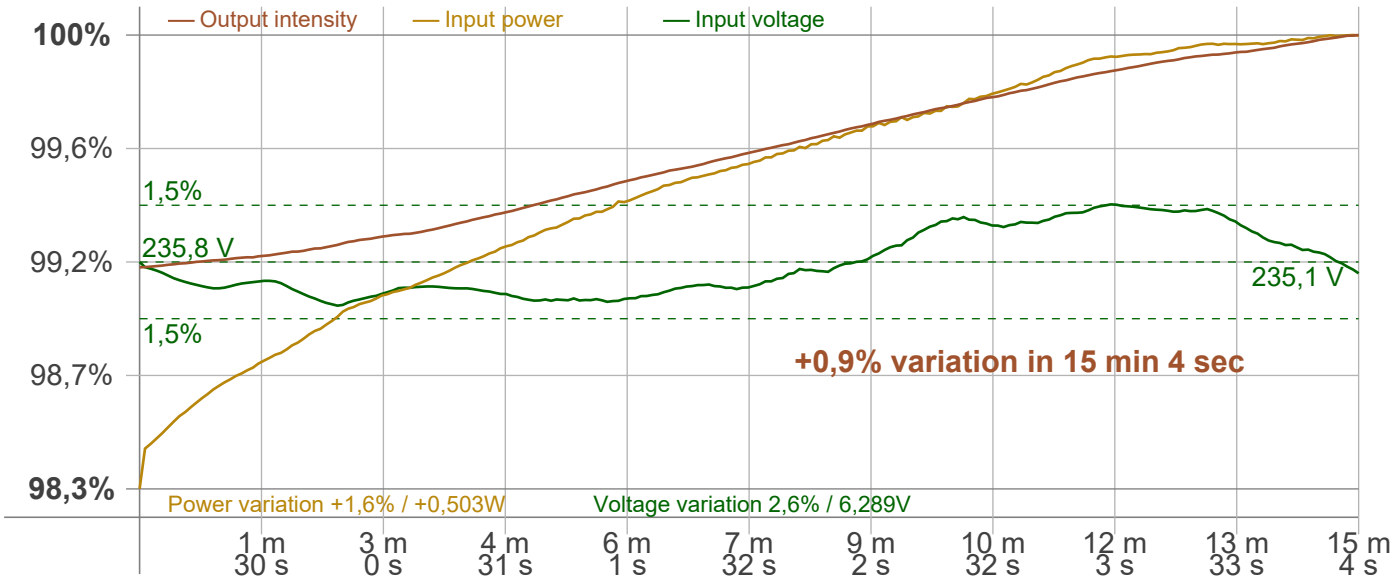
Warmup Result

Total warmup time	Lamp stabilized in 15 min 4 sec
Warmup variation	+0,9%

Output Change

Output start	1093 lm
Output change	+9 lm
Output end	1103 lm

Stabilization Curve



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Flicker /TLA details

Flicker Meter Type	Viso Systems LabFlicker
Frequency of input power	50,1 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	10,24 Hz
Percent Flicker	0,02 %
Flicker index	0

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

JA8/10 40 Hz	0,01 %
JA8/10 90 Hz	0,01 %
JA8/10 200 Hz	0,01 %
JA8/10 400 Hz	0,02 %
JA8/10 1000 Hz	0,02 %

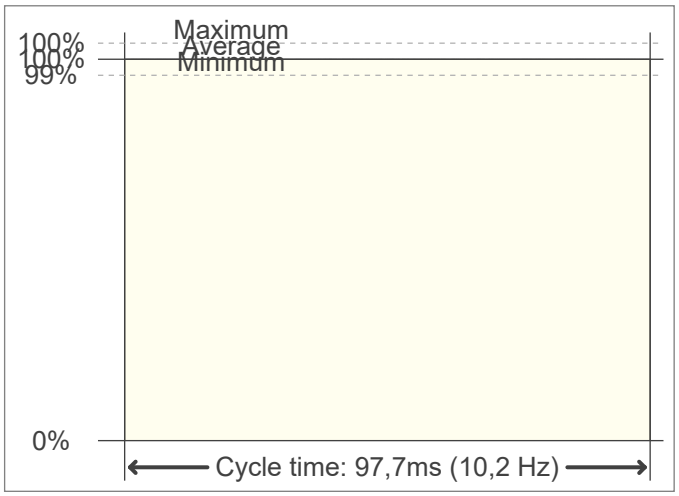
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

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

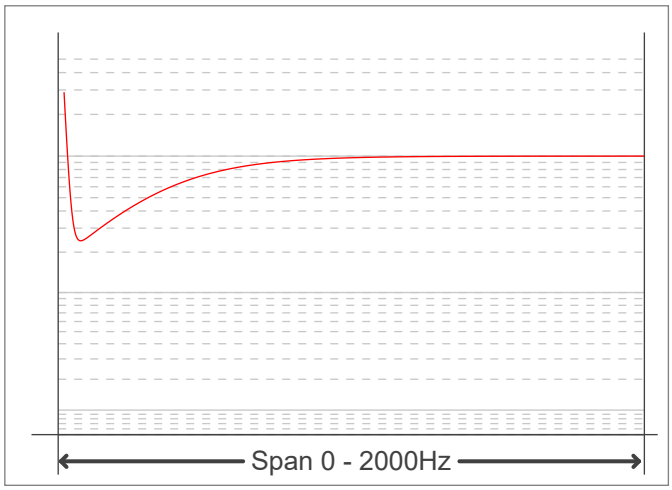
Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp	0

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot

