Light Measurement Report

Print date: 02-09-2024
Measurement date and time: 30-08-2024 12:58:45 – Measurement no. VFR-240830-3716-MS
Operator: Jakob Daugaard Jepsen

Laboratory and Equipment

Laboratory Owner and Location	Ingemann Components, Denmark
Goniospectrometer System and Type	Viso Systems LabSpion – Type C, horizontal
Sensor Name, Calibr. Date and Serial No.	LabSensor – 22-08-2023 – 1130826259

Measurement Conditions

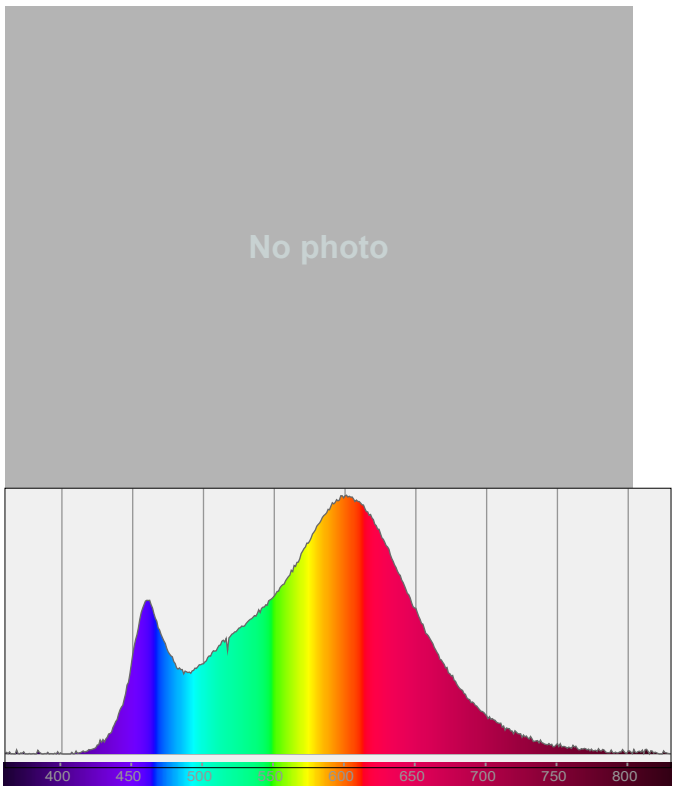
Number of C-planes and Resolution	24 planes – 15°
γ (gamma)-Resolution	5°
Test Distance	9,00 m
Input Power, Power and Displ. Factors	13,9 W – PF 0,51 – DPF 0,96
Input RMS Voltage and Current	229 V – 0,119 A
Frequency of Input Power	50,1 Hz
Warm-up Time and Variation	n/a – n/a%

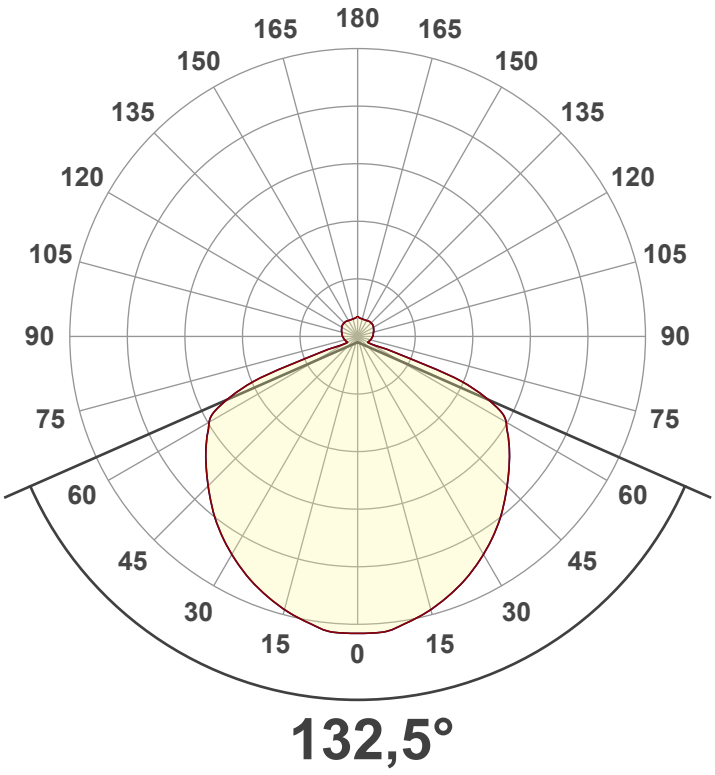
Tested Light Source

Product Name	AVA Cone Pendant 600
Item No. and Manufacturer	Pendant – Hay
Product Description (line 1)	

Main Light Measurement Results

Output – Total Lumen (Up% / Down%)	1025 lm – 11,1% / 88,9%
Efficiency	73 lm/W
Peak Intensity and Beam Angle	287 cd – 132,5°
Correlated Color Temperature, Target/Measured	CCT = 3175 K / 3175 K
Color Rendering Index	CRI 83,1
Color Rendering TM30-18	R_f 83,5 – R_g 92,0
Color Shift, CIE duv and MacAdam Steps	Duv -0,0010 – SDCM n/a
Flicker	SVM 0 – PstLM 0,01





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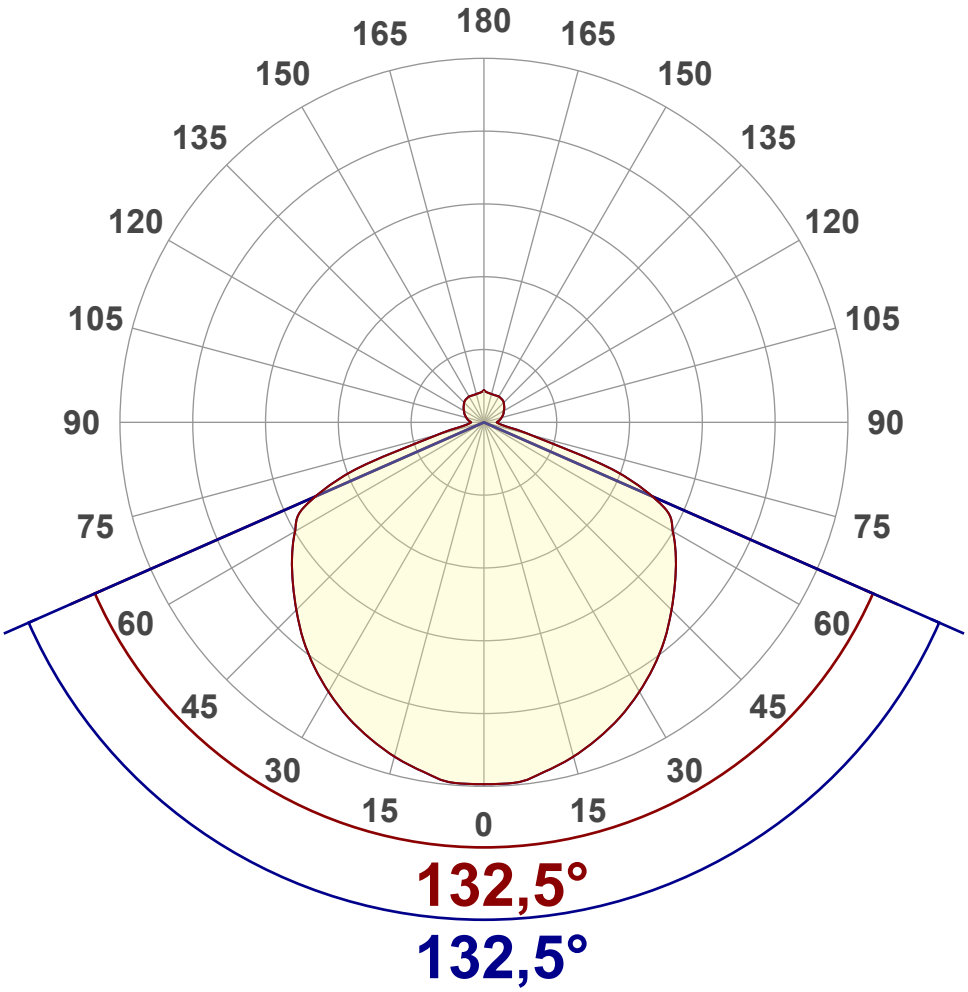
Luminous Intensity diagram Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	1025 lm
Lumen Up% / Down%	11,1% / 88,9%
Peak Intensity	287 cd

Beam angle

Average (50%)	132,5°

Cut-off Angle

Average 2,5%	360°

Field Angle

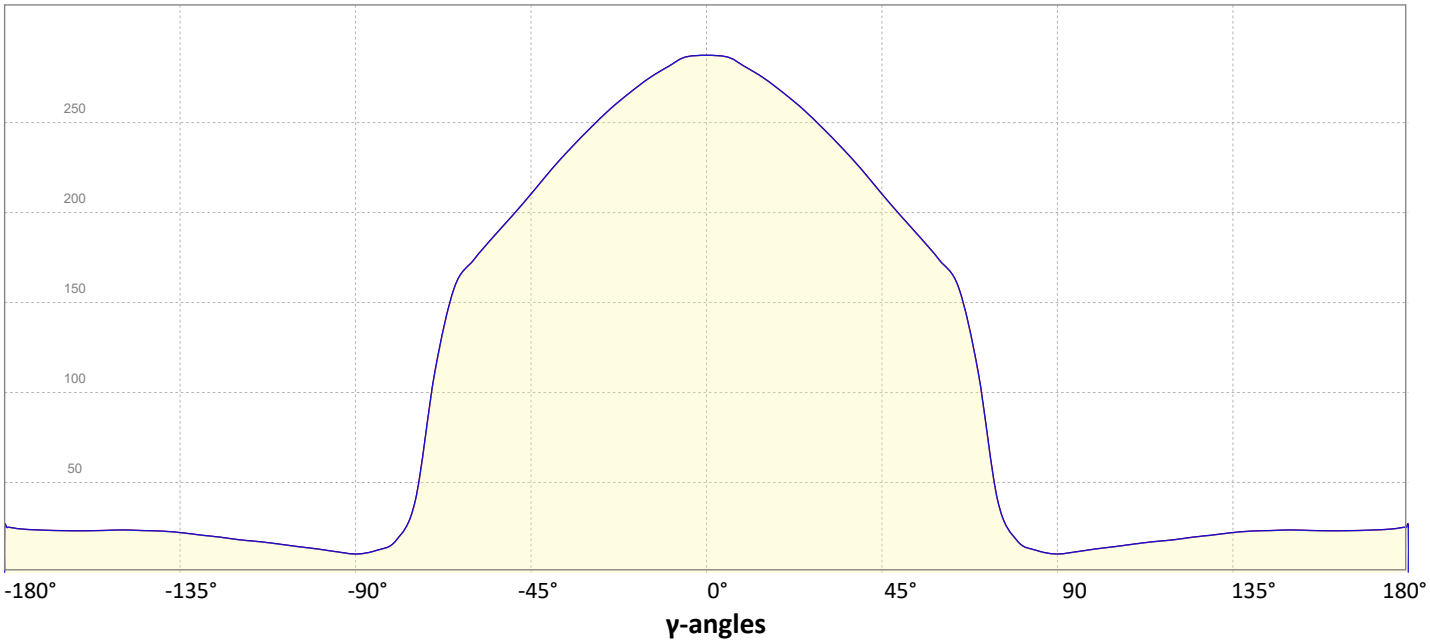
Average 10%	154,4°

Intensity Ratio

In 120° cone	68,2%
In 90° cone	44,0%

C000-C180
C090-C270

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



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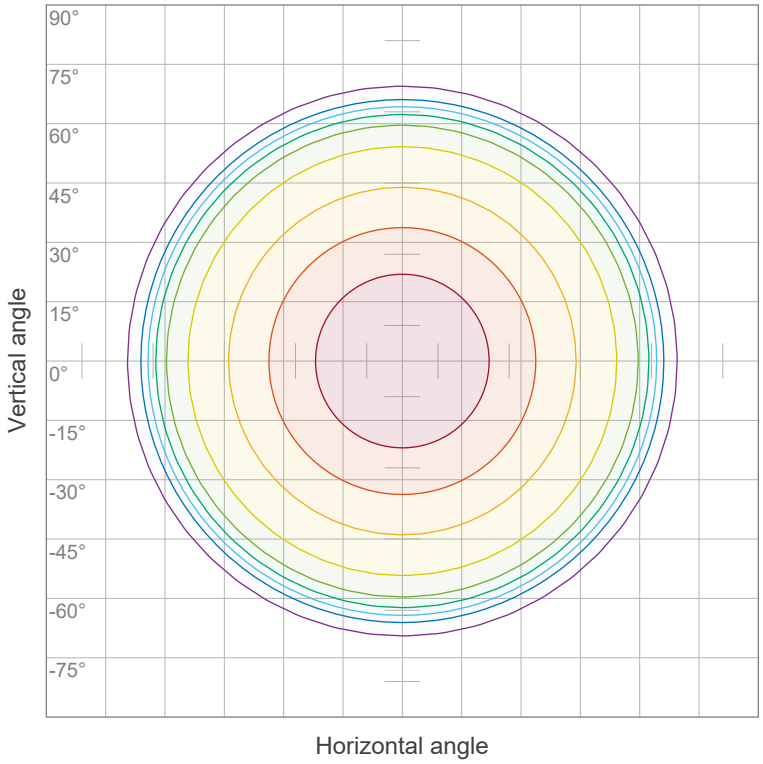
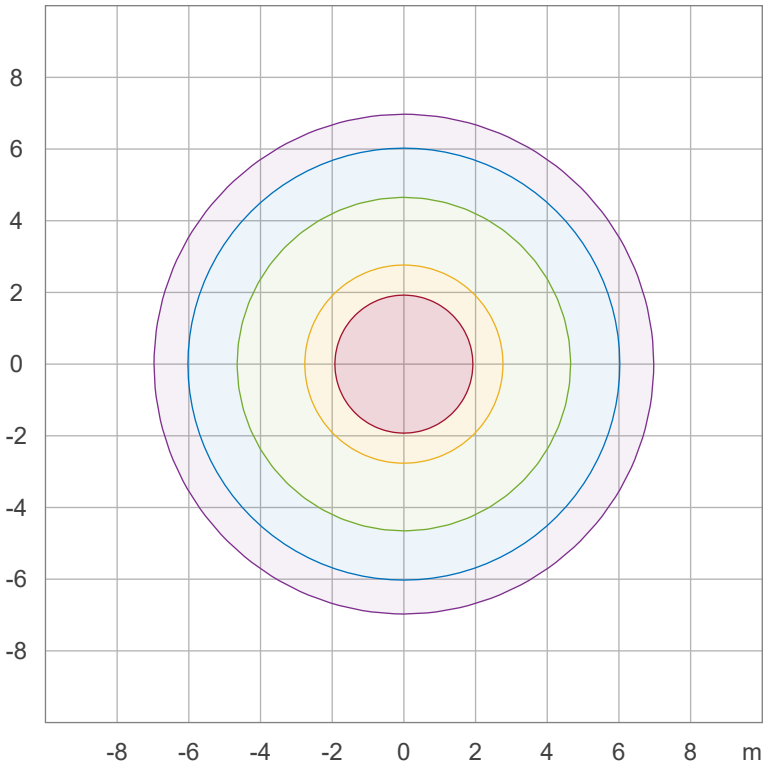
Iso-intensity Diagram (Iso-candela)



90 %	258,1 cd
80 %	229,4 cd
70 %	200,7 cd
60 %	172,0 cd
50 %	143,4 cd
40 %	114,7 cd
30 %	86,0 cd
20 %	57,3 cd
10 %	28,7 cd

Peak intensity: 286,7 cd
Number of c-planes: 24

Iso-illuminance Diagram (Iso-lux)



50,0 %	15,9 lx
30,0 %	9,6 lx
10,0 %	3,2 lx
5,0 %	1,6 lx
3,0 %	1,0 lx

Peak illuminance: 31,9 lx
Mounting height: 3,0 m
Number of c-planes: 24

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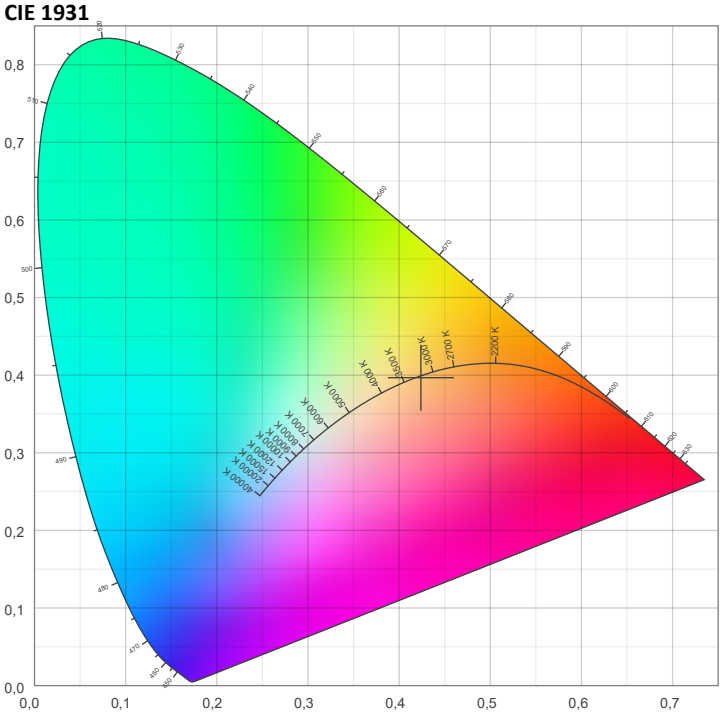
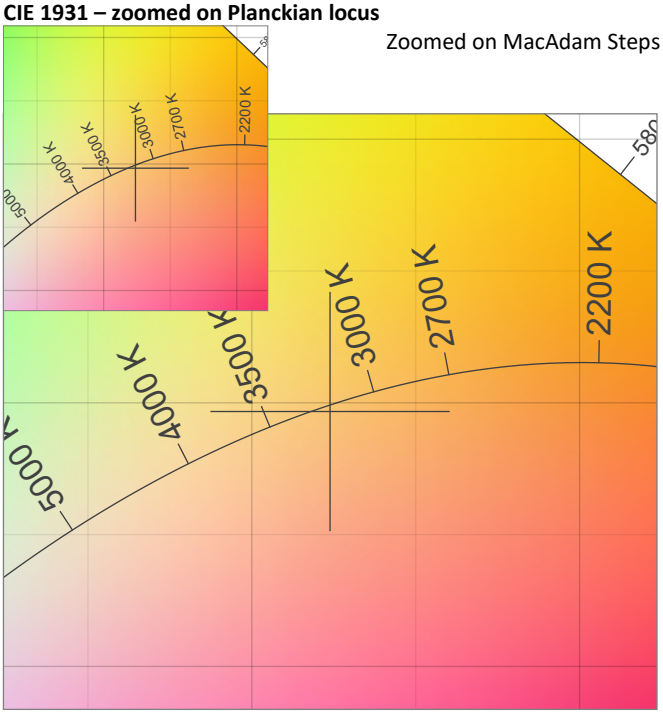
Color details

Correlated Color Temperature, Target	CCT = 3175 K
Correlated Color Temperature, Measured	CCT = 3175 K
Color Rendering Index	CRI 83,1
Color Rendering Index, R9 (red component)	R9 = 10,1
Color Rendering TM30-18	R_f 83,5 – R_g 92,0
Color Quality Scale	CQS = 82,3
MacAdam Steps	SDCM = n/a
Color coordinates CIE 1931	(x;y) = (0,424;0,397)
Color coordinate CIEs 1960	(u;v) = (0,245;0,344)
Color deviation from BBL	Duv = -0,0010
Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0,245;0,516)

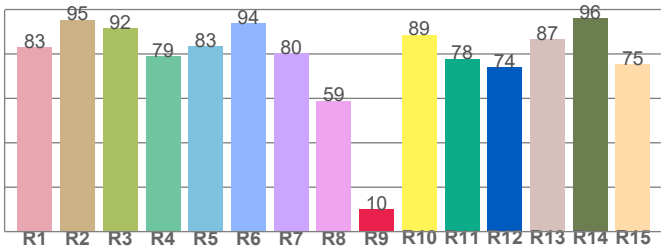
CIE 1931



CIE 1931 – zoomed on Planckian locus



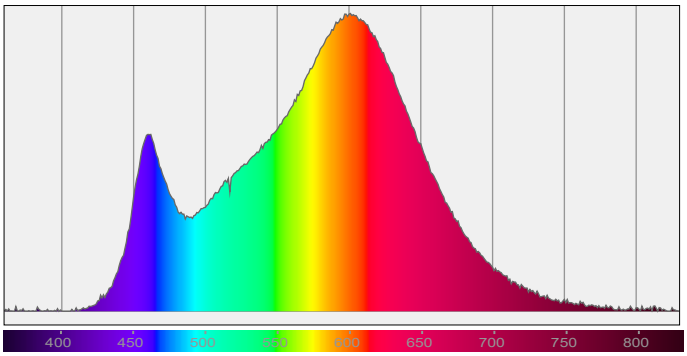
Color Rendering Index per reference color (CIE 1995)



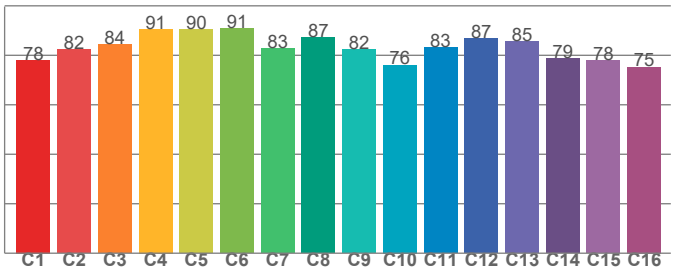
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
83,2	95,4	91,7	78,8	83,3	93,7	80,2	58,9	10,1	88,7	77,9	74,1	86,8	96,1	75,3

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



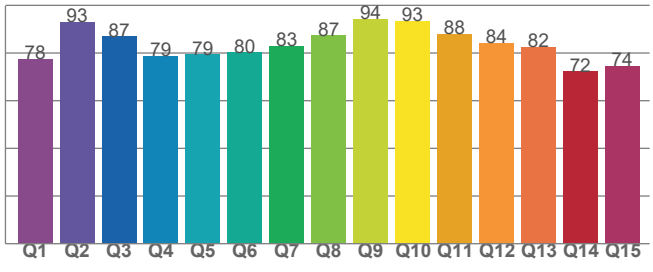
TM30-18 Rf-values per hue bin



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
78,1	82,4	84,3	90,6	90,5	90,9	82,8	87,2	82,4	76,1	83,3	86,7	85,5	78,7	77,8	75,3

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
77,5	93,0	86,9	78,7	79,3	80,2	82,7	87,3	94,2	93,3	87,9	84,2	82,4	72,2	74,4

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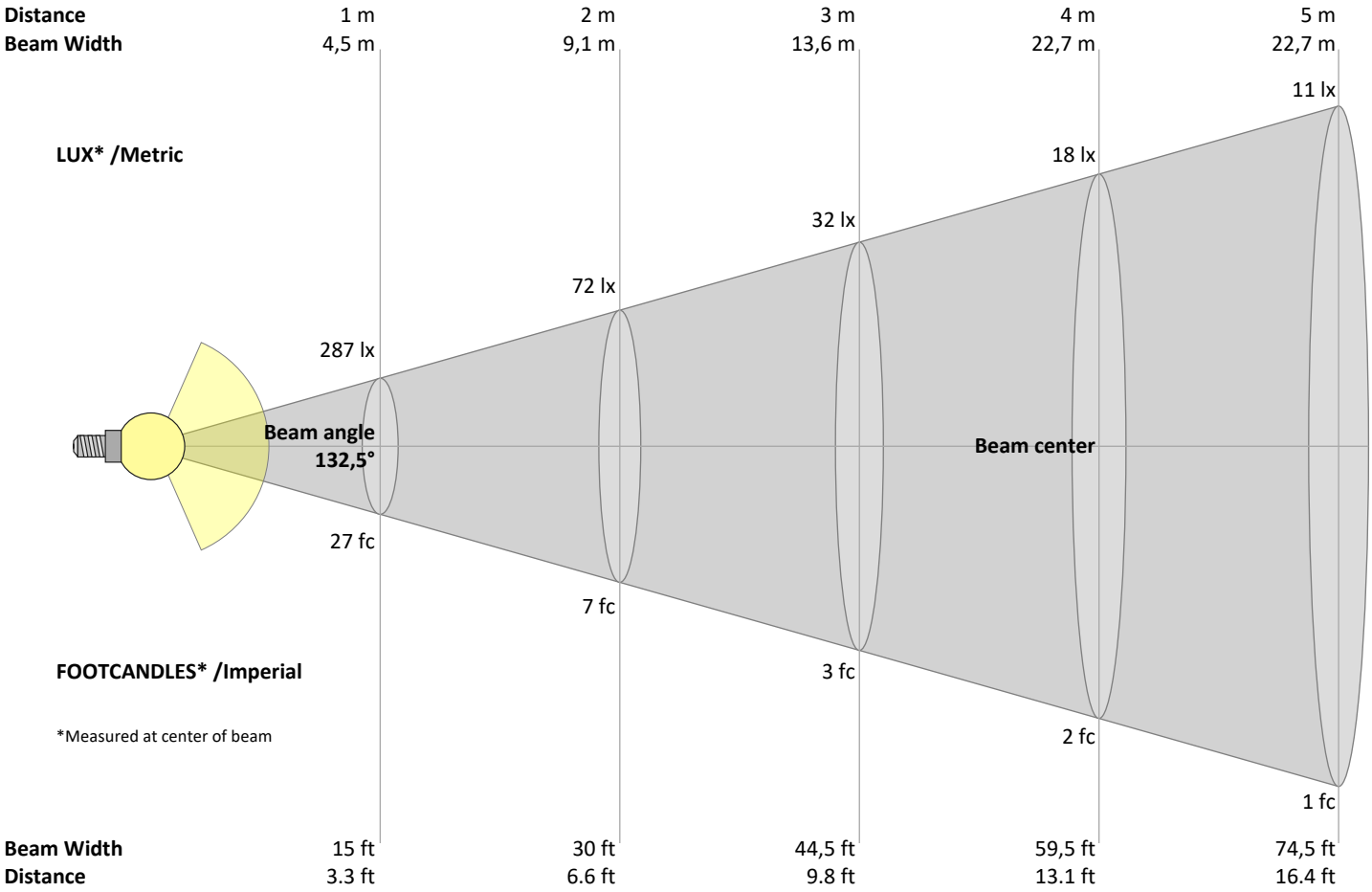
Beam Details



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
287	72	32	18	11	8	6	4	4	3	2	2	2	1	1	1	1	1	1	1	lux
26,6	6,7	3	1,7	1,1	0,7	0,5	0,4	0,3	0,3	0,2	0,2	0,2	0,1	0,1	0,1	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
287	286	281	274	266	257	246	235	223	210	198	186	173	155	107	38	17	12	10	12	cd
100%	100%	98%	96%	93%	90%	86%	82%	78%	73%	69%	65%	60%	54%	37%	13%	6%	4%	4%	4%	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
287	286	281	274	266	257	246	235	223	210	198	186	173	155	107	38	17	12	10	12	cd
100%	100%	98%	96%	93%	90%	86%	82%	78%	73%	69%	65%	60%	54%	37%	13%	6%	4%	4%	4%	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
287	286	281	274	266	257	246	235	223	210	198	186	173	155	107	38	17	12	10	12	cd
100%	100%	98%	96%	93%	90%	86%	82%	78%	73%	69%	65%	60%	54%	37%	13%	6%	4%	4%	4%	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
287	286	281	274	266	257	246	235	223	210	198	186	173	155	107	38	17	12	10	12	cd
100%	100%	98%	96%	93%	90%	86%	82%	78%	73%	69%	65%	60%	54%	37%	13%	6%	4%	4%	4%	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** (Viewing direction orthogonal to lamp length axis)					**Viewed Endwise** (Viewing direction parallel to lamp length axis)				
X	**Y**										
2H	2H	11,0	12,1	11,4	12,6	13,0	11,0	12,1	11,4	12,6	13,0
	3H	12,2	13,3	12,7	13,8	14,2	12,2	13,3	12,7	13,8	14,2
	4H	12,3	13,4	12,8	13,8	14,3	12,3	13,4	12,8	13,8	14,3
	6H	12,3	13,2	12,8	13,7	14,3	12,3	13,2	12,8	13,7	14,3
	8H	12,3	13,2	12,8	13,7	14,3	12,3	13,2	12,8	13,7	14,3
	12H	12,2	13,2	12,7	13,6	14,3	12,2	13,2	12,7	13,6	14,3
4H	2H	11,5	12,6	12,1	13,1	13,6	11,5	12,6	12,1	13,1	13,6
	3H	12,9	13,9	13,4	14,3	14,9	12,9	13,9	13,4	14,3	14,9
	4H	13,0	13,9	13,6	14,4	15,1	13,0	13,9	13,6	14,4	15,1
	6H	13,0	13,7	13,6	14,3	14,8	13,0	13,7	13,6	14,3	14,8
	8H	12,9	13,6	13,6	14,2	14,7	12,9	13,6	13,6	14,2	14,7
	12H	12,9	13,5	13,5	14,1	14,7	12,9	13,5	13,5	14,1	14,7
8H	4H	13,0	13,7	13,6	14,2	14,8	13,0	13,7	13,6	14,2	14,8
	6H	13,0	13,5	13,6	14,1	14,9	13,0	13,5	13,6	14,1	14,9
	8H	13,0	13,4	13,6	14,1	14,9	13,0	13,4	13,6	14,1	14,9
	12H	13,0	13,3	13,7	14,0	14,8	13,0	13,3	13,7	14,0	14,8
12H	4H	12,9	13,5	13,5	14,1	14,7	12,9	13,5	13,5	14,1	14,7
	6H	13,0	13,4	13,6	14,1	14,9	13,0	13,4	13,6	14,1	14,9
	8H	12,9	13,3	13,7	14,0	14,8	12,9	13,3	13,7	14,0	14,8

Variations with the observer position for the luminaire spacings, S:		
S = 1.0H	0,2 / -0,2	0,2 / -0,2
S = 1.5H	0,2 / -0,5	0,2 / -0,5
S = 2.0H	0,7 / -1,0	0,7 / -1,0

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	116	116	116	116	112	112	112	112	105	105	105	98	98	98	92	92	92	89
1	106	101	97	93	102	98	94	91	92	89	86	86	84	81	81	79	77	74
2	96	88	81	75	93	85	79	74	80	75	70	75	71	67	70	67	64	61
3	87	77	68	62	84	74	67	61	70	63	58	65	60	56	62	57	53	51
4	80	67	59	52	76	65	57	51	61	54	49	58	52	47	54	49	45	43
5	73	60	51	44	70	58	50	43	55	47	42	52	45	40	49	43	39	36
6	67	54	45	38	64	52	44	37	49	42	36	46	40	35	44	38	34	32
7	62	48	39	33	59	47	39	33	44	37	32	42	36	31	40	34	30	28
8	57	44	35	29	55	43	35	29	40	33	28	38	32	27	36	31	27	24
9	54	40	32	26	52	39	31	26	37	30	25	35	29	24	33	28	24	22
10	50	37	29	24	48	36	28	23	34	27	23	33	26	22	31	25	22	20

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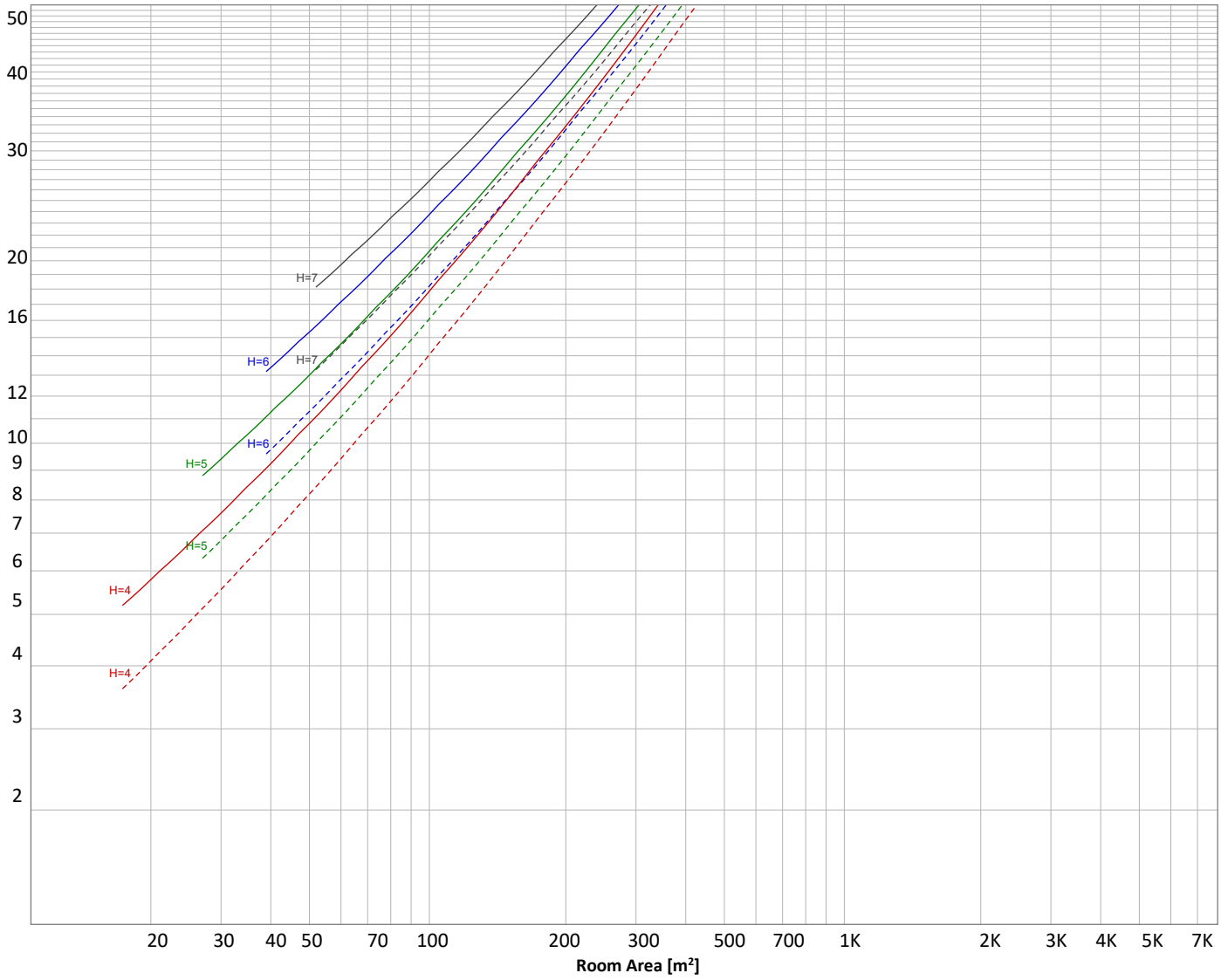
Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 1025 lm
H_{down} = Lamp distance from ceiling =	0.00 m
H_{work} = Work area height from floor =	0.00 m
E_{work} = Average lux on work area =	100 lx

	ρ(%)		
Line type	Ceiling reflectance	Wall reflectance	Floor reflectance
----------	70	50	30
————	50	30	20

Zonal Lumen Summary

0°-10°	10°-20°	20°-30°	30°-40°	40°-50°	50°-60°	60°-70°	70°-80°	80°-90°
27,1 lm	77,4 lm	118 lm	147 lm	163 lm	166 lm	147 lm	51,5 lm	14,0 lm

90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
12,7 lm	15,3 lm	17,0 lm	17,6 lm	17,0 lm	14,6 lm	10,8 lm	6,59 lm	2,28 lm

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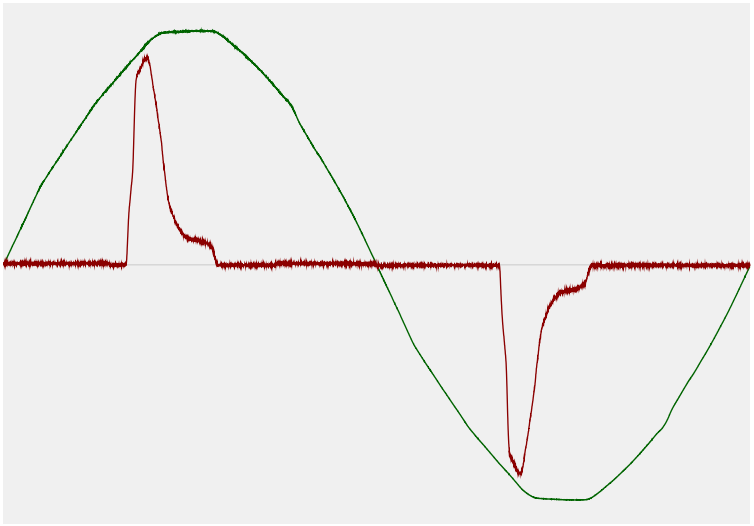
Power Details

Input Power

Power feed to light source	13,9 W
Frequency of input power	50,1 Hz
RMS Input voltage feed, V_{RMS}	229 V
RMS Input current feed, I_{RMS}	0,119 A
Volt-Ampere or apparent power = V_{RMS}*I_{RMS}	27,38 VA
Displacement factor of AC power feed	0,96
Power factor of AC current feed	0,51
Total harmonic distortion of the current	158,65%
Total harmonic distortion of the voltage	1,57%

Input Power Curve



Efficiency

Radiated power efficiency 22,6%

Lumen efficiency 73 lm/W

Stabilization Details

Warmup Conditions

Stable period	n/a
Stable change max	n/a%
Minimum time	n/a

Color Temperature Change

CCT start	n/a K
CCT shift	n/a K
CCT end	3175 K

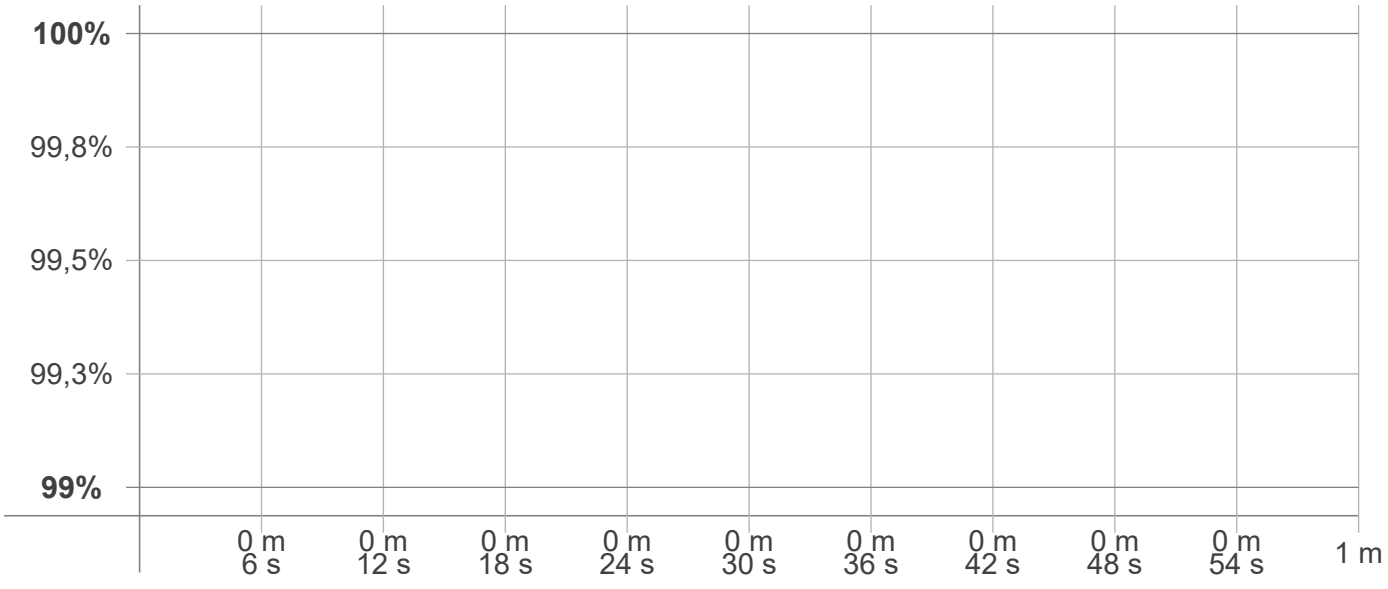
Warmup Result

Total warmup time	n/a
Warmup variation	n/a%

Output Change

Output start	n/a lm
Output change	n/a lm
Output end	1025 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

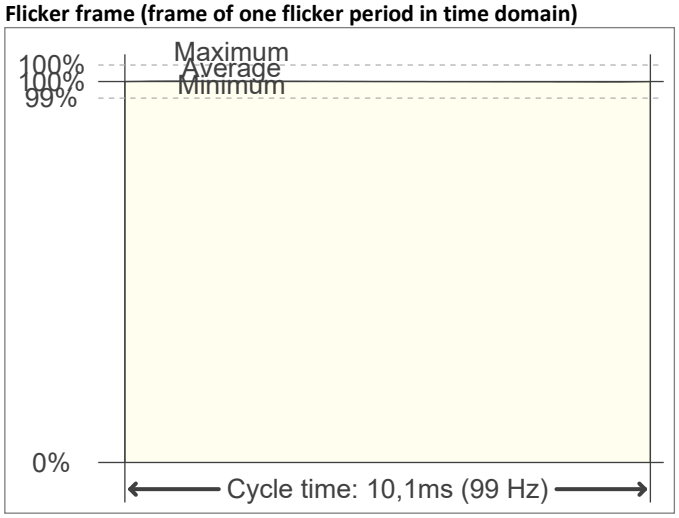
Measurement time

PstLM	180 sec
All other indices	1,2 sec

Flicker indices according to Illuminating Engineering Society (IES)

Flicker frequency	99,01 Hz
Percent Flicker	0,16 %
Flicker index	0

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



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	0,15 %
JA8/10 1000 Hz	0,15 %

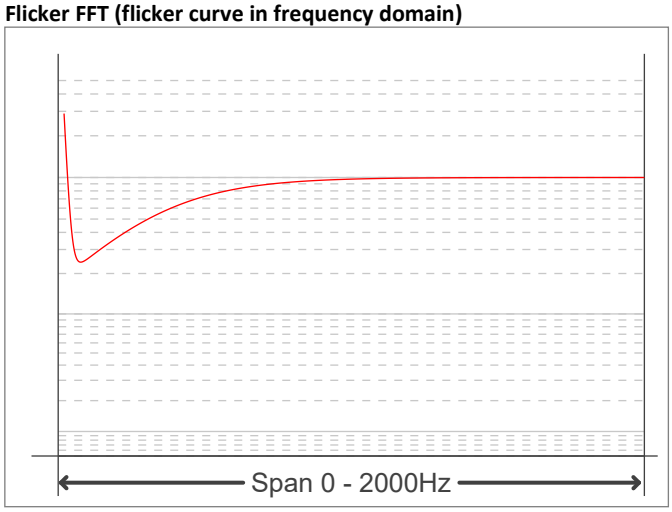
Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp	0

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 FFT (flicker curve in frequency domain)



Compliance with EU Ecodesign directive

Regulation EU 2019/2020 on Directive 2009/125/EC (Ecodesign Directive) defines two evaluation variables for Temporal Light Artefacts (TLA): The PstLM for the evaluation of visible flicker in the frequency range 0.3Hz to 80Hz. "st" stands for "short term", and "LM" stands for "light flicker meter method". The "stroboscopic visibility measure" SVM for evaluating the stroboscopic effect on moving objects in the frequency range 80Hz to 2000Hz. For both parameters, a value of 1 means that an average observer recognises the flicker with a probability of 50%. The permissible limits are 1 for PstLM and 0.4 for SVM.

PstLM value	{FLPSTLM}	Not compliant
SVM value	{FLS}	Not compliant
Product total		**Not compliant**