Light Measurement Report

Print date: 04-09-2024
Measurement date and time: 03-09-2024 09:48:58 – Measurement no. VFR-240903-3744-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

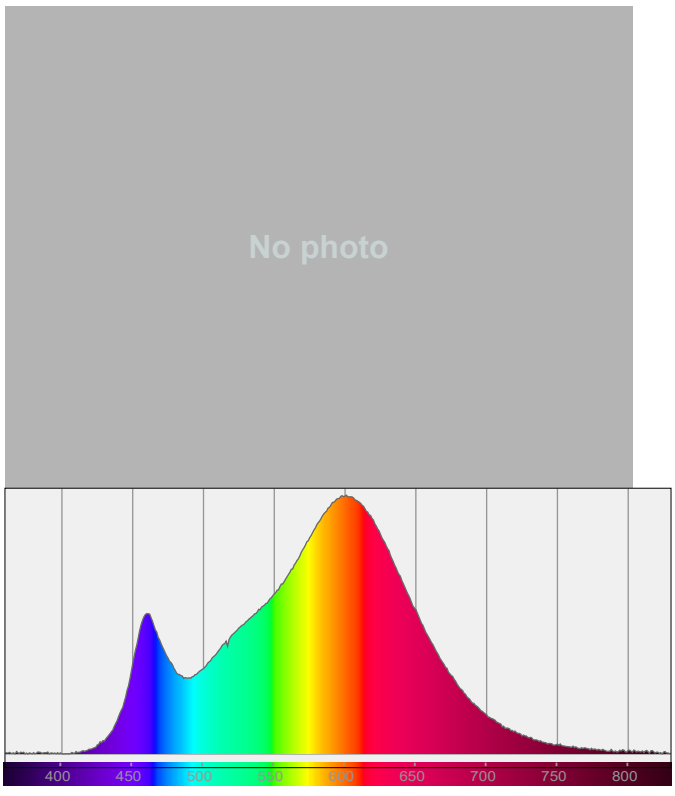
Number of C-planes and Resolution	24 planes – 15°
γ (gamma)-Resolution	5°
Test Distance	8,99 m
Input Power, Power and Displ. Factors	13,9 W – PF 0,53 – DPF 0,96
Input RMS Voltage and Current	227 V – 0,116 A
Frequency of Input Power	50 Hz
Warm-up Time and Variation	Lamp stabilized in 29 min 28 sec – 2,0%

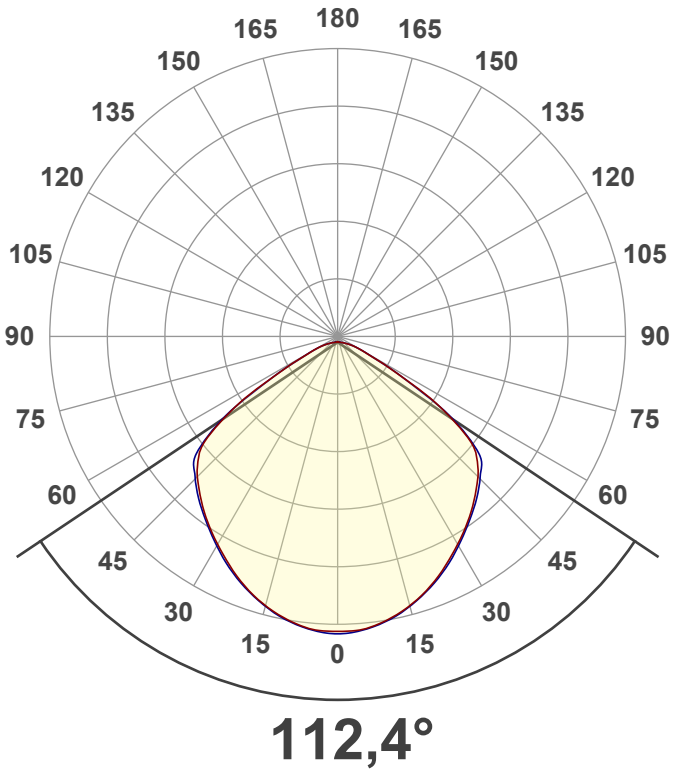
Tested Light Source

Product Name	Compass Pendant 430
Item No. and Manufacturer	Pendant – Hay
Product Description (line 1)	

Main Light Measurement Results

Output – Total Lumen (Up% / Down%)	979 lm – 0,31% / 99,69%
Efficiency	70 lm/W
Peak Intensity and Beam Angle	385 cd – 112,4°
Correlated Color Temperature, Target/Measured	CCT = 3132 K / 3132 K
Color Rendering Index	CRI 82,2
Color Rendering TM30-18	R_f 83,1 – R_g 91,5
Color Shift, CIE duv and MacAdam Steps	Duv 0,0006 – SDCM n/a
Flicker	SVM n/a – PstLM n/a





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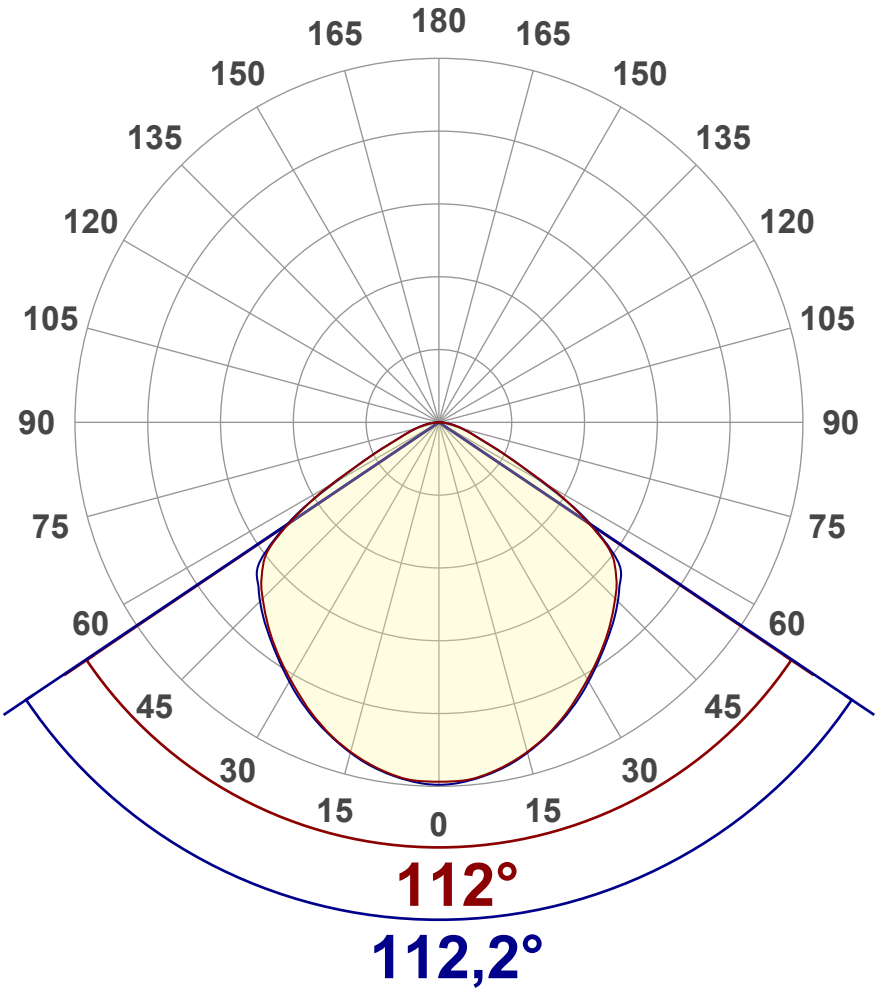
Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	979 lm
Lumen Up% / Down%	0,31% / 99,69%
Peak Intensity	385 cd

Beam angle

Average (50%)	112,4°

Cut-off Angle

Average 2,5%	166,3°

Field Angle

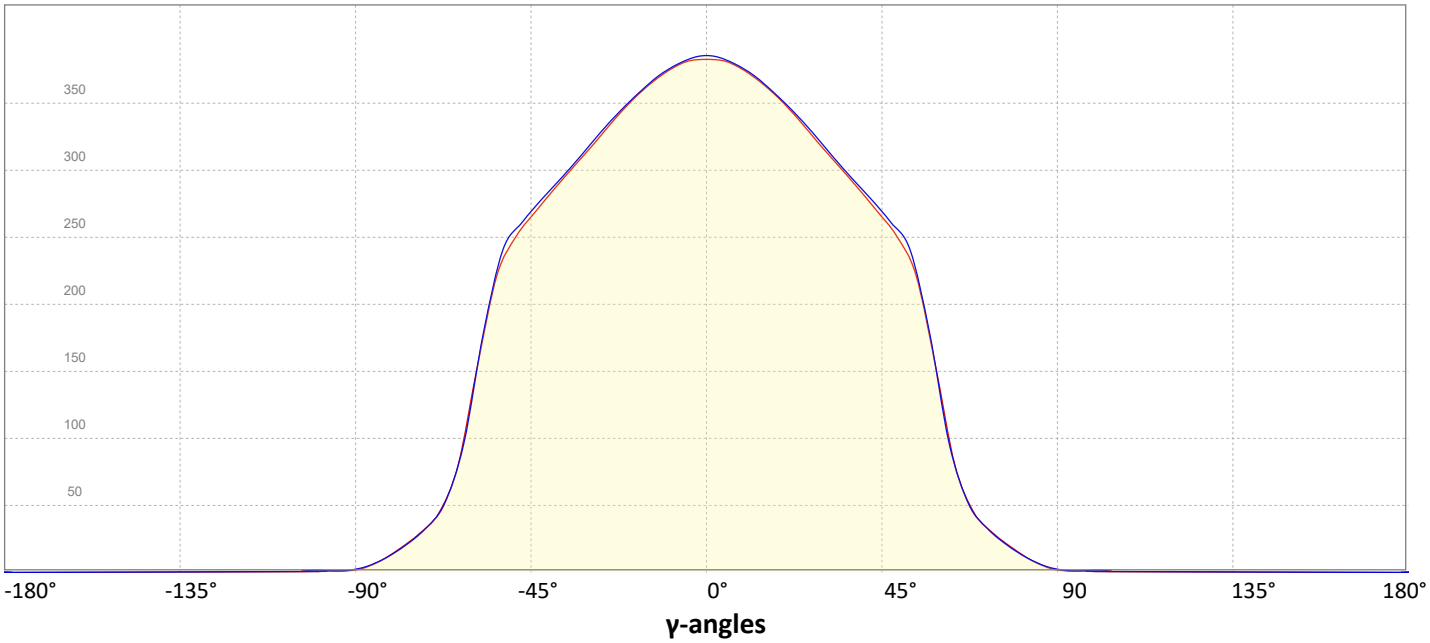
Average 10%	141,1°

Intensity Ratio

In 120° cone	88,7%
In 90° cone	59,5%

C000-C180
C090-C270

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



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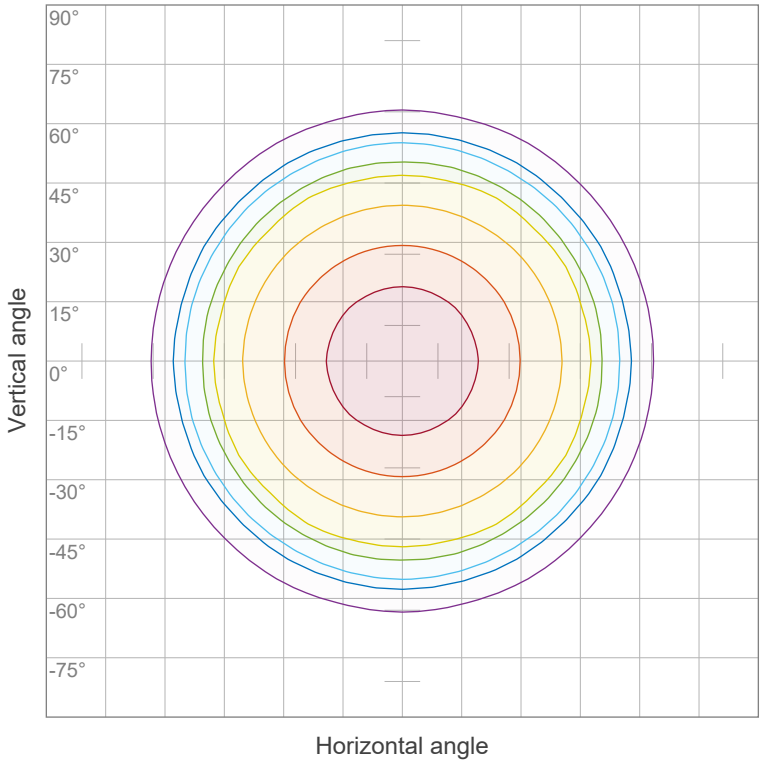
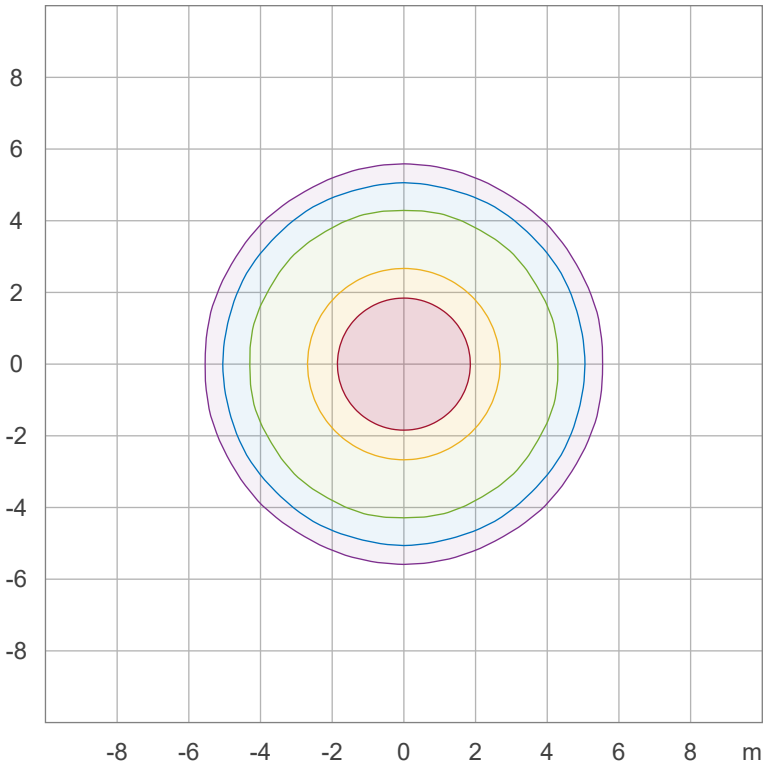
Iso-intensity Diagram (Iso-candela)



90 %	346,4 cd
80 %	307,9 cd
70 %	269,4 cd
60 %	230,9 cd
50 %	192,4 cd
40 %	153,9 cd
30 %	115,5 cd
20 %	77,0 cd
10 %	38,5 cd

Peak intensity: 384,8 cd
Number of c-planes: 24

Iso-illuminance Diagram (Iso-lux)



50,0 %	21,4 lx
30,0 %	12,8 lx
10,0 %	4,3 lx
5,0 %	2,1 lx
3,0 %	1,3 lx

Peak illuminance: 42,7 lx
Mounting height: 3,0 m
Number of c-planes: 24

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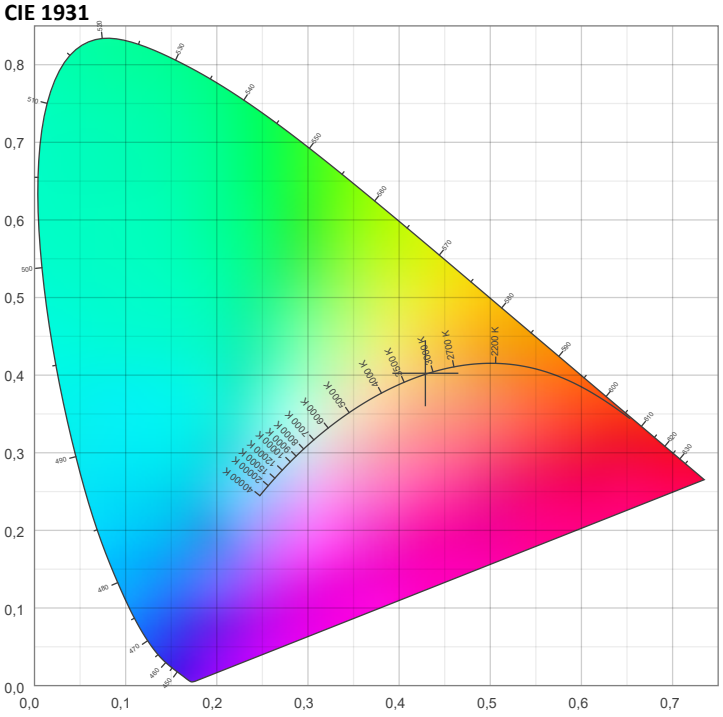
Color details

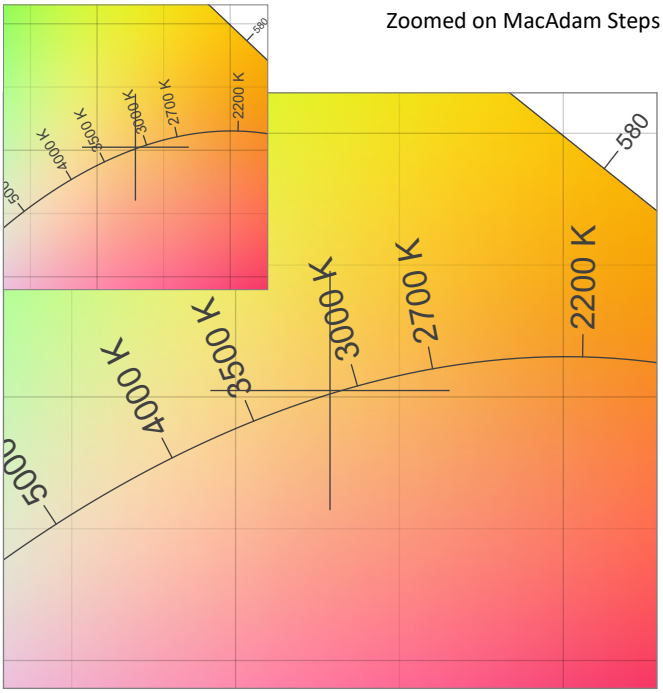
Correlated Color Temperature, Target	CCT = 3132 K
Correlated Color Temperature, Measured	CCT = 3132 K
Color Rendering Index	CRI 82,2
Color Rendering Index, R9 (red component)	R9 = 5,5
Color Rendering TM30-18	R_f 83,1 – R_g 91,5
Color Quality Scale	CQS = 81,6
MacAdam Steps	SDCM = n/a
Color coordinates CIE 1931	(x;y) = (0,429;0,402)
Color coordinate CIEs 1960	(u;v) = (0,246;0,346)
Color deviation from BBL	Duv = 0,0006
Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0,246;0,520)

CIE 1931

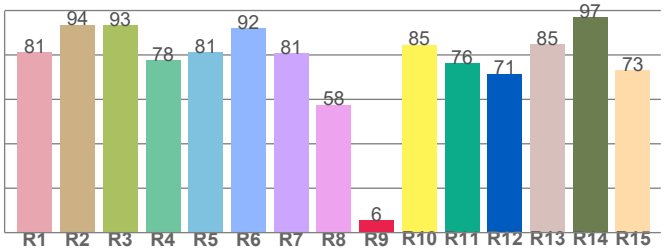


CIE 1931 – zoomed on Planckian locus

Zoomed on MacAdam Steps



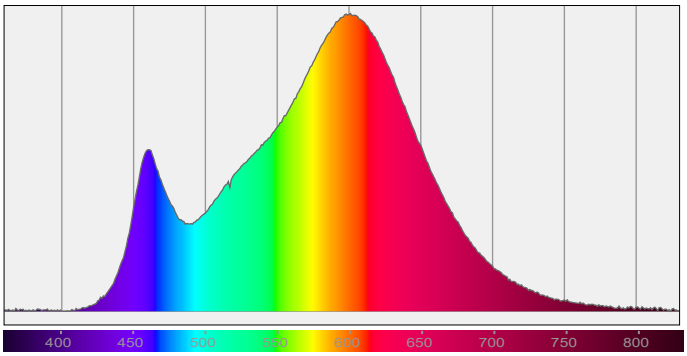
Color Rendering Index per reference color (CIE 1995)



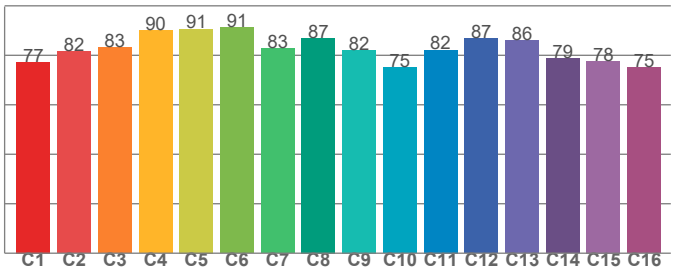
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
81,4	93,6	93,3	77,7	81,2	92,0	80,6	57,5	5,5	84,6	76,2	71,5	84,8	97,0	73,1

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



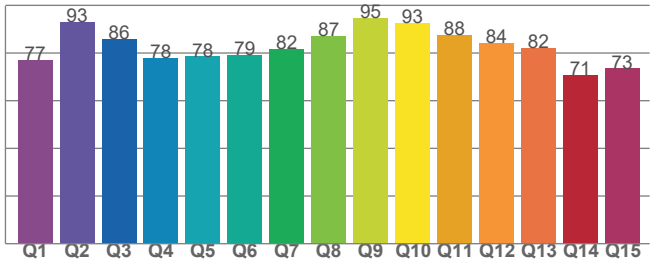
TM30-18 Rf-values per hue bin



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
77,3	81,6	83,2	90,0	90,7	91,2	82,7	87,0	82,2	75,0	82,2	86,9	86,0	78,7	77,6	75,1

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
77,0	93,1	86,0	77,8	78,5	79,1	81,6	87,1	94,5	92,6	87,5	84,2	82,2	70,9	73,4

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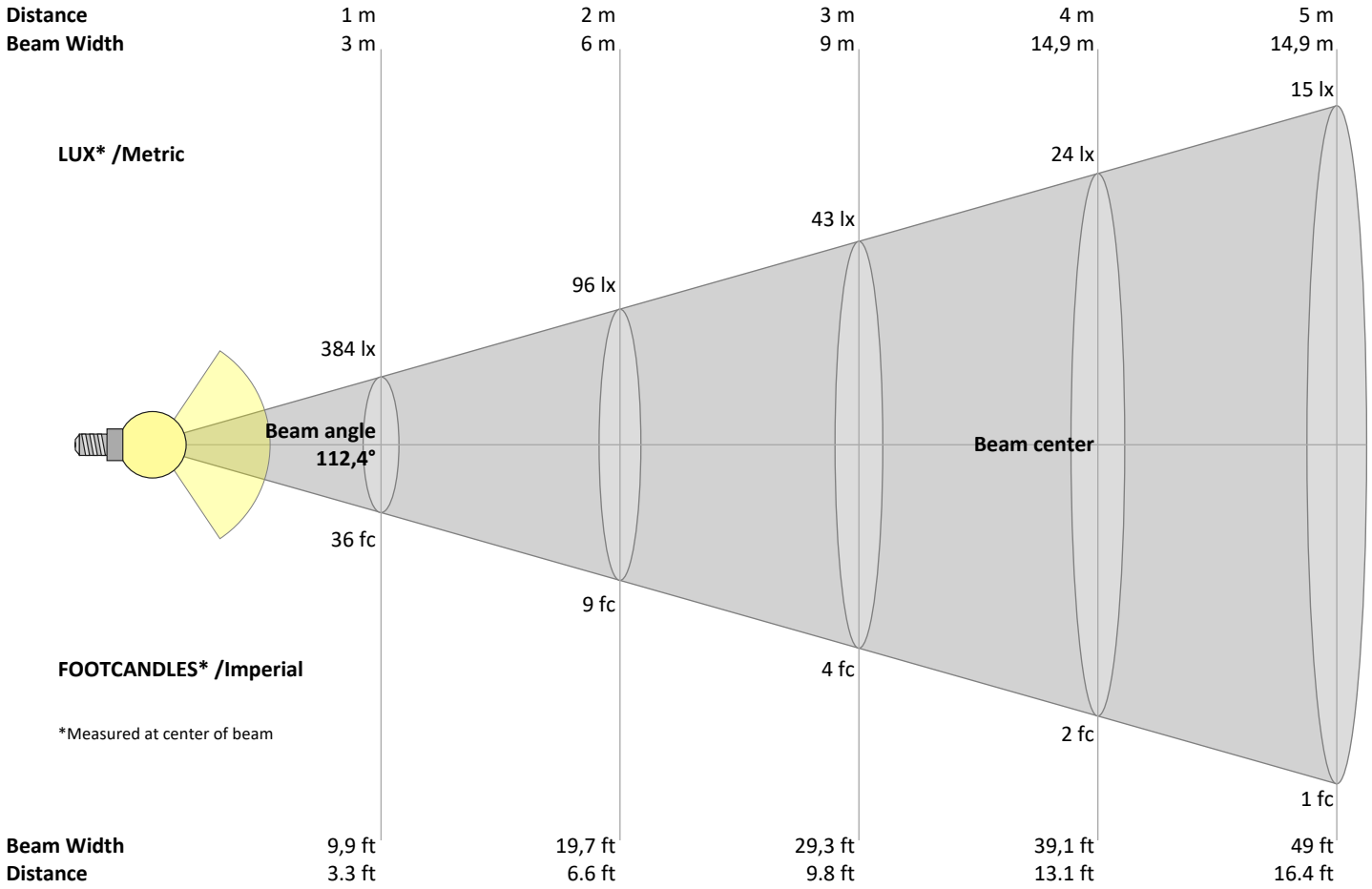
Beam Details



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
384	96	43	24	15	11	8	6	5	4	3	3	2	2	2	1	1	1	1	1	lux
35,7	8,9	4	2,2	1,4	1	0,7	0,6	0,4	0,4	0,3	0,2	0,2	0,2	0,2	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
384	380	373	363	349	333	316	299	283	265	244	204	135	71	40	26	15	7	2	1	cd
100%	99%	97%	94%	91%	87%	82%	78%	74%	69%	63%	53%	35%	18%	10%	7%	4%	2%	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
384	382	374	364	350	335	318	302	285	269	250	206	133	71	41	26	15	7	3	1	cd
100%	99%	98%	95%	91%	87%	83%	79%	74%	70%	65%	54%	35%	19%	11%	7%	4%	2%	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
384	380	373	363	349	333	316	299	283	265	244	204	135	71	40	26	15	7	2	1	cd
100%	99%	97%	94%	91%	87%	82%	78%	74%	69%	63%	53%	35%	18%	10%	7%	4%	2%	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
384	382	374	364	350	335	318	302	285	269	250	206	133	71	41	26	15	7	3	1	cd
100%	99%	98%	95%	91%	87%	83%	79%	74%	70%	65%	54%	35%	19%	11%	7%	4%	2%	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** (Viewing direction orthogonal to lamp length axis)					**Viewed Endwise** (Viewing direction parallel to lamp length axis)				
X	**Y**										
2H	2H	15,5	16,6	15,7	16,9	17,1	15,5	16,6	15,7	16,9	17,2
	3H	15,7	16,8	16,1	17,1	17,3	15,7	16,9	16,1	17,2	17,4
	4H	15,8	16,9	16,2	17,2	17,4	15,8	16,9	16,2	17,2	17,4
	6H	15,9	16,9	16,2	17,1	17,5	15,9	16,9	16,3	17,2	17,6
	8H	15,9	16,8	16,2	17,1	17,6	15,9	16,9	16,3	17,2	17,6
	12H	15,9	16,8	16,3	17,1	17,6	15,9	16,8	16,3	17,2	17,6
4H	2H	15,7	16,8	16,1	17,0	17,3	15,7	16,8	16,1	17,1	17,3
	3H	16,1	17,0	16,5	17,3	17,8	16,1	17,0	16,5	17,4	17,8
	4H	16,2	17,0	16,6	17,4	18,0	16,2	17,0	16,7	17,5	18,0
	6H	16,3	17,1	16,8	17,5	17,8	16,3	17,1	16,8	17,5	17,9
	8H	16,3	17,1	16,8	17,4	17,8	16,4	17,1	16,9	17,5	17,8
	12H	16,4	17,0	16,9	17,4	17,9	16,4	17,0	16,9	17,4	17,9
8H	4H	16,2	16,9	16,7	17,3	17,7	16,2	17,0	16,7	17,3	17,7
	6H	16,4	16,9	16,9	17,4	17,9	16,4	17,0	16,9	17,4	18,0
	8H	16,5	17,0	17,0	17,5	18,1	16,5	17,0	17,1	17,5	18,2
	12H	16,6	16,9	17,1	17,5	18,1	16,6	17,0	17,2	17,5	18,1
12H	4H	16,2	16,8	16,7	17,2	17,7	16,2	16,8	16,7	17,2	17,7
	6H	16,4	16,9	16,9	17,4	18,0	16,5	16,9	17,0	17,4	18,1
	8H	16,5	16,9	17,1	17,4	18,0	16,5	16,9	17,1	17,4	18,0

Variations with the observer position for the luminaire spacings, S:		
S = 1.0H	0,3 / -0,1	0,3 / -0,2
S = 1.5H	1,0 / -1,5	1,1 / -1,5
S = 2.0H	2,2 / -2,9	2,2 / -2,9

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	106	102	99	107	104	100	97	99	97	94	96	93	91	92	90	88	86
2	101	94	88	82	99	92	86	81	88	84	79	85	81	78	82	79	76	74
3	93	83	76	70	90	81	75	69	79	73	68	76	71	66	73	69	65	63
4	85	74	66	59	83	73	65	59	70	63	58	68	62	57	66	61	57	55
5	78	66	58	51	76	65	57	51	63	56	51	61	55	50	59	54	49	47
6	72	60	51	45	71	59	51	45	57	50	44	55	49	44	54	48	44	42
7	67	54	46	40	65	53	45	40	52	45	39	50	44	39	49	43	39	37
8	63	49	41	35	61	49	41	35	47	40	35	46	40	35	45	39	35	33
9	58	45	37	32	57	45	37	32	44	37	32	42	36	31	41	36	31	29
10	55	42	34	29	53	41	34	29	40	33	29	39	33	29	38	33	28	27

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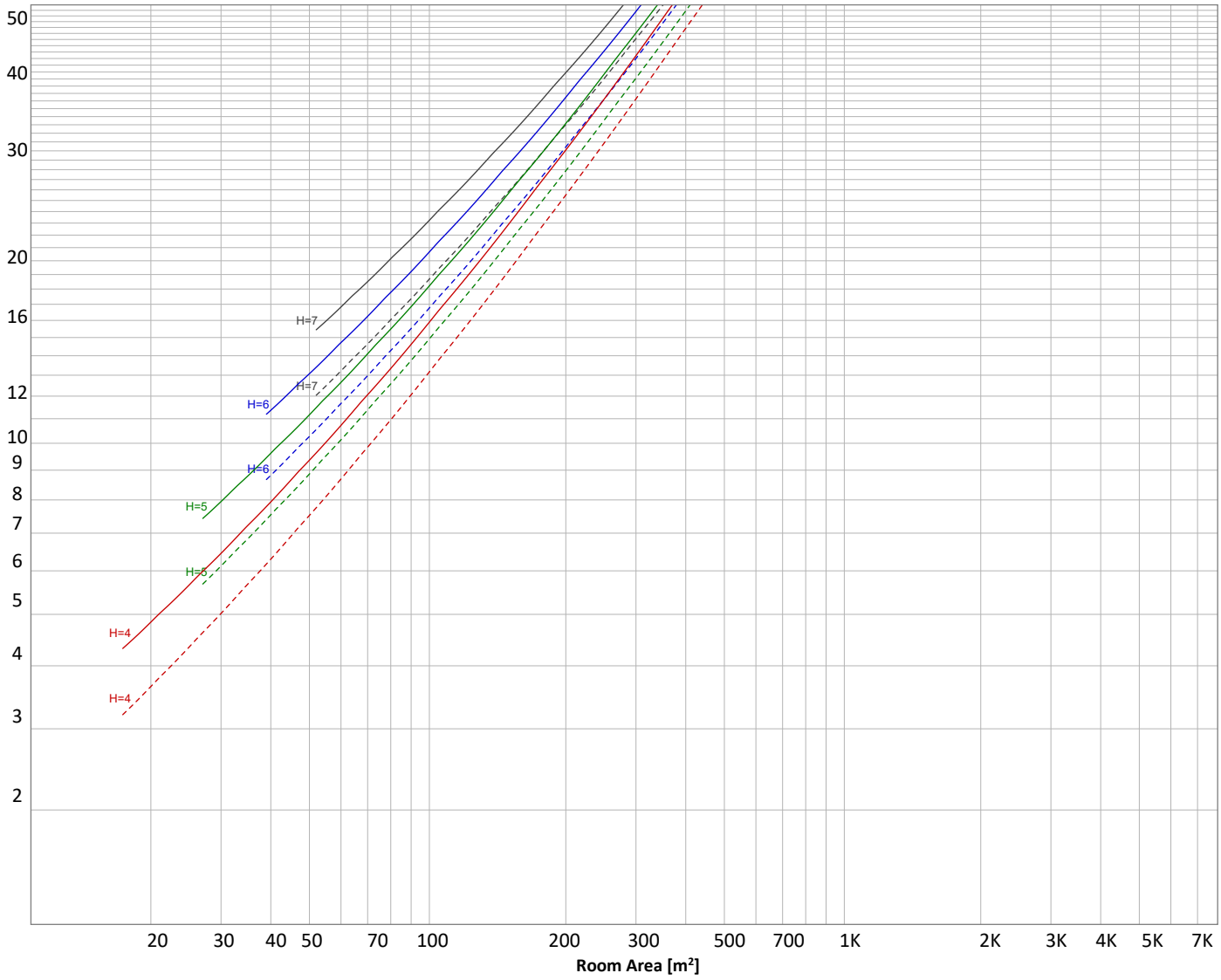
Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 979 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°
36,2 lm	102 lm	154 lm	188 lm	206 lm	181 lm	72,4 lm	27,5 lm	7,95 lm

90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
1,37 lm	0,827 lm	0,373 lm	0,207 lm	0,160 lm	0,068 lm	0,046 lm	0,028 lm	0,009 lm

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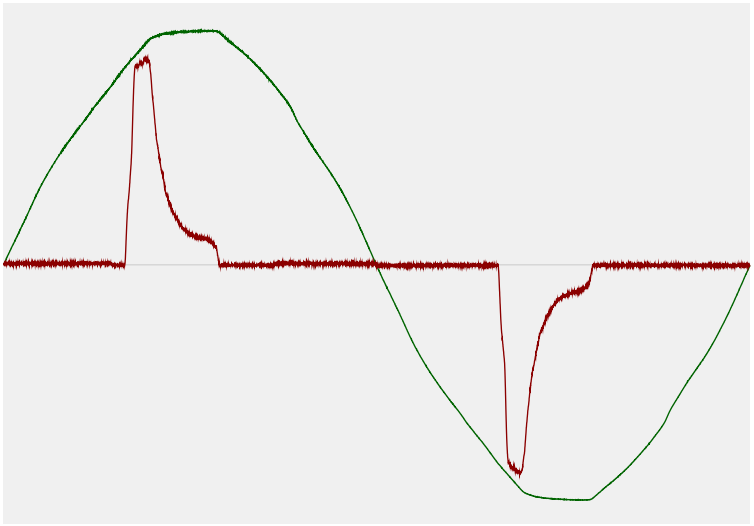
Power Details

Input Power

Power feed to light source	13,9 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	227 V
RMS Input current feed, I_{RMS}	0,116 A
Volt-Ampere or apparent power = V_{RMS}*I_{RMS}	26,43 VA
Displacement factor of AC power feed	0,96
Power factor of AC current feed	0,53
Total harmonic distortion of the current	152,08%
Total harmonic distortion of the voltage	1,92%

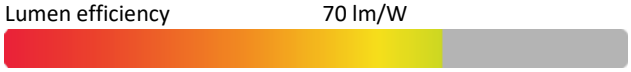
Input Power Curve



Efficiency

Radiated power efficiency 21,5%

Lumen efficiency 70 lm/W



Stabilization Details

Warmup Conditions

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

Color Temperature Change

CCT start	3083 K
CCT shift	+49 K
CCT end	3132 K

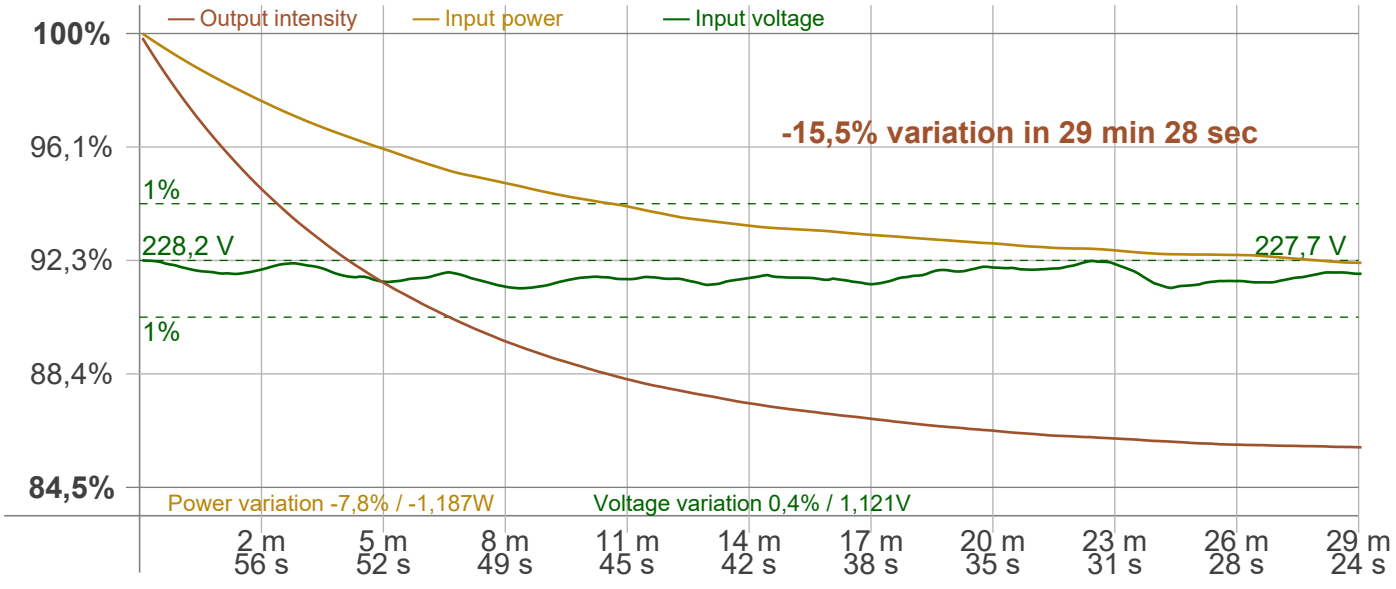
Warmup Result

Total warmup time	Lamp stabilized in 29 min 28 sec
Warmup variation	-15,5%

Output Change

Output start	1155 lm
Output change	-176 lm
Output end	979 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	n/a samples/s

Measurement time

PstLM	180 sec
All other indices	1,2 sec

Flicker indices according to Illuminating Engineering Society (IES)

Flicker frequency	n/a Hz
Percent Flicker	n/a %
Flicker index	n/a

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

JA8/10 40 Hz	n/a %
JA8/10 90 Hz	n/a %
JA8/10 200 Hz	n/a %
JA8/10 400 Hz	n/a %
JA8/10 1000 Hz	n/a %

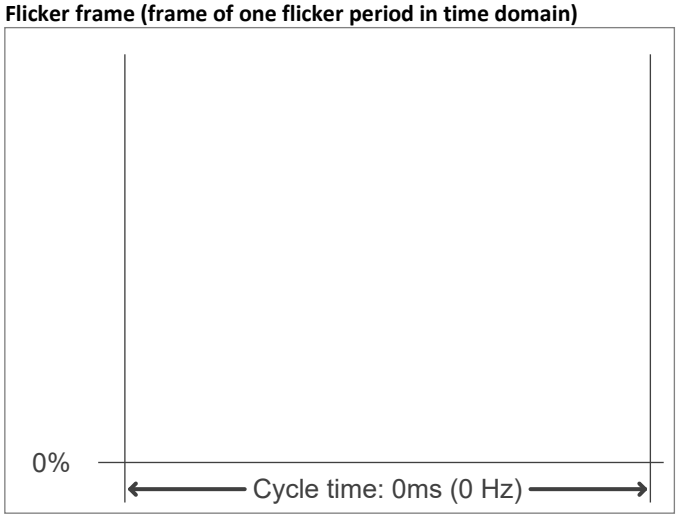
Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp	n/a

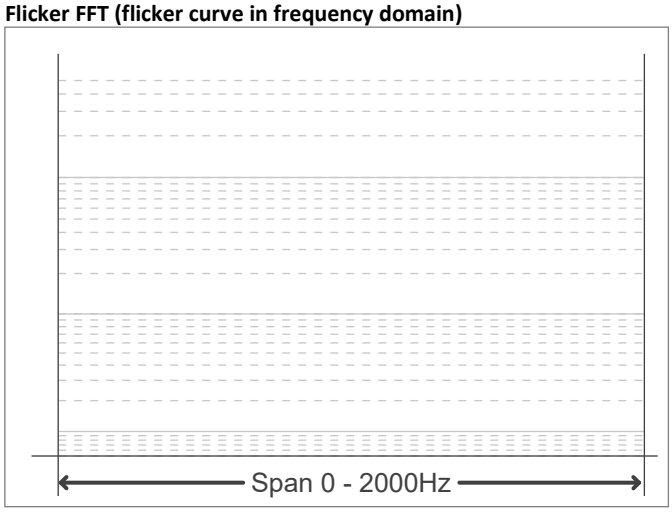
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

PstLM value (F < 80 Hz)	n/a
SVM value (80 < F < 2000 Hz)	n/a

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



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	65535,00	Not compliant
SVM value	65535,00	Not compliant
Product total		**Not compliant**