

Light Measurement Report

Print date: 02-09-2024

Measurement date and time: 30-08-2024 08:07:27 – Measurement no. VFR-240830-3700-MS

Operator: Jakob Daugaard Jepsen

Laboratory and Equipment

Laboratory Owner and Location
Goniospectrometer System and Type
Sensor Name, Calibr. Date and Serial No.

Ingemann Components, Denmark
Viso Systems LabSpion – Type C, horizontal
LabSensor – 22-08-2023 – 1130826259

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

24 planes – 15°
2,5°
9,00 m
13,9 W – PF 0,51 – DPF 0,96
228 V – 0,119 A
50 Hz
Lamp stabilized in 31 min 17 sec – 2,0%

Tested Light Source

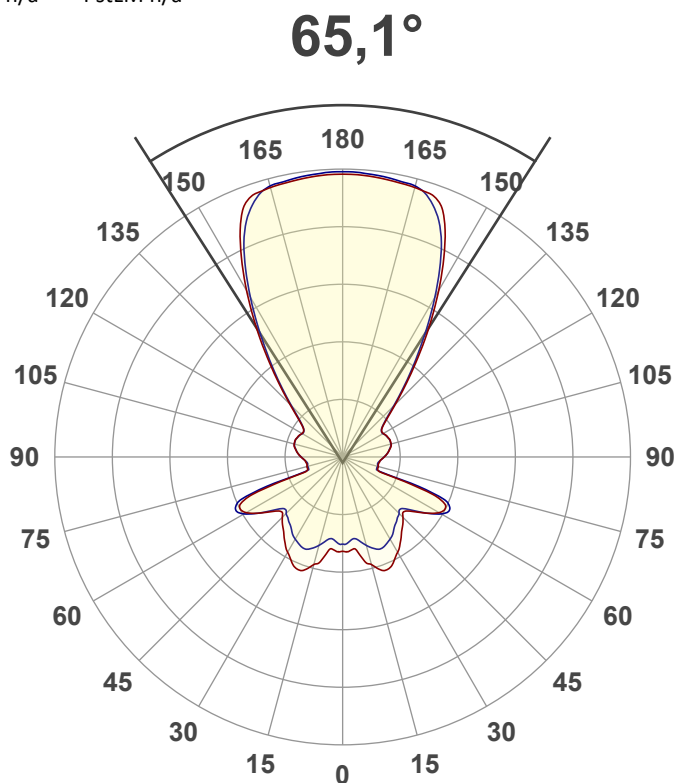
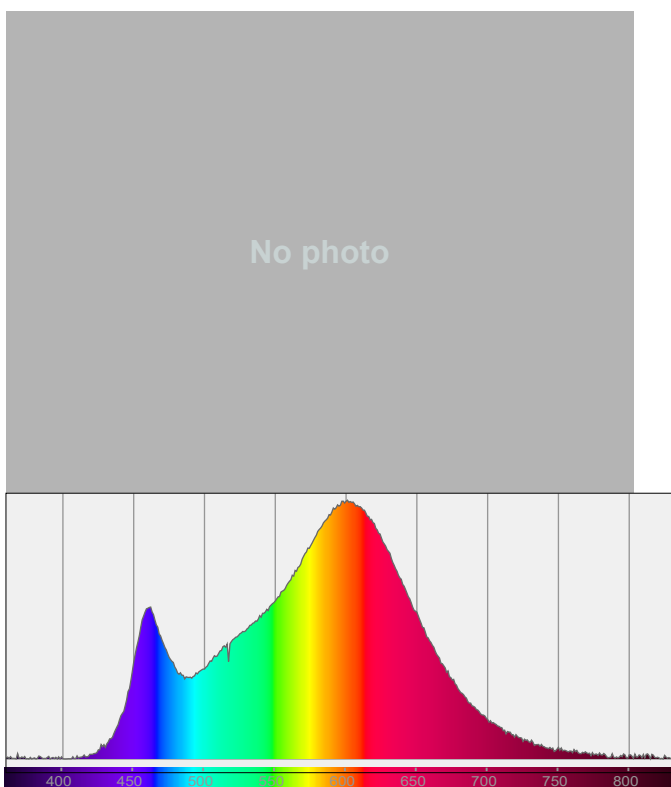
Product Name
Item No. and Manufacturer
Product Description (line 1)

AVA Pyramid Table Lamp 450
Table Lamp – Hay

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

796 lm – 53,25% / 46,75%
57 lm/W
233 cd – 65,1°
CCT = 3162 K / 3162 K
CRI 83,2
 R_f 83,6 – R_g 91,9
Duv -0,0009 – SDCM n/a
SVM n/a – PstLM n/a



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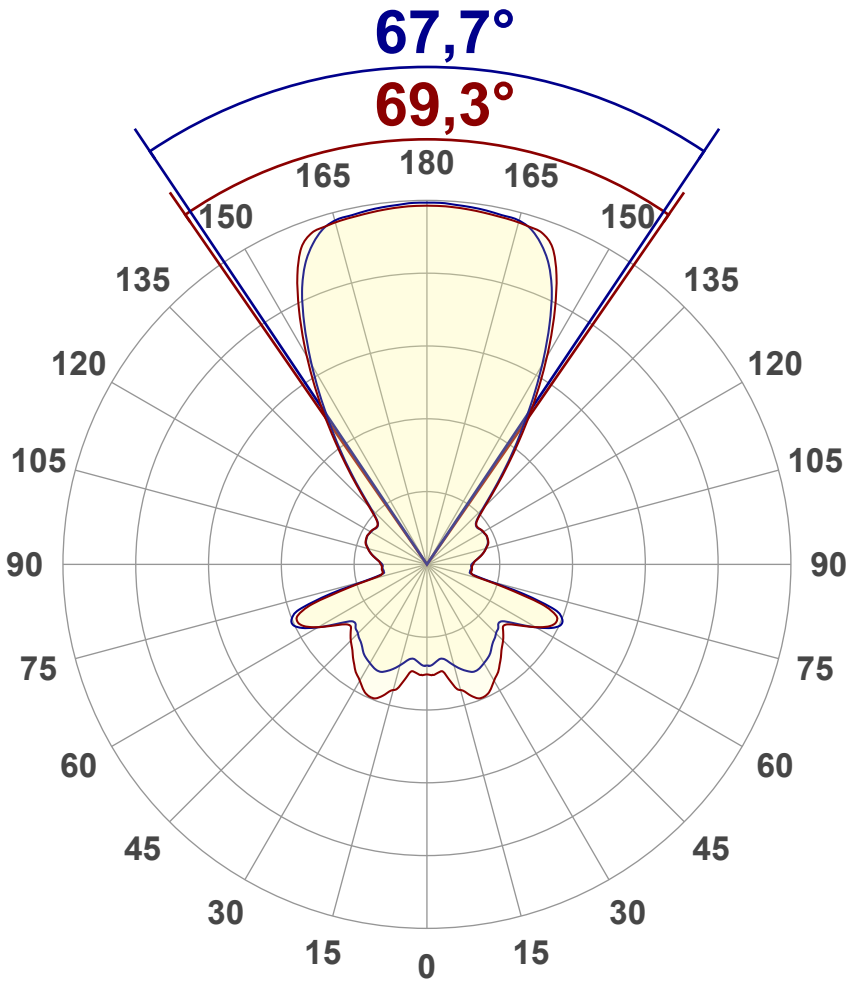
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	796 lm
Lumen Up% / Down%	53,25% / 46,75%
Peak Intensity	233 cd

Beam angle

Average (50%)	65,1°
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Cut-off Angle

Average 2,5%	360°
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Field Angle

Average 10%	360°
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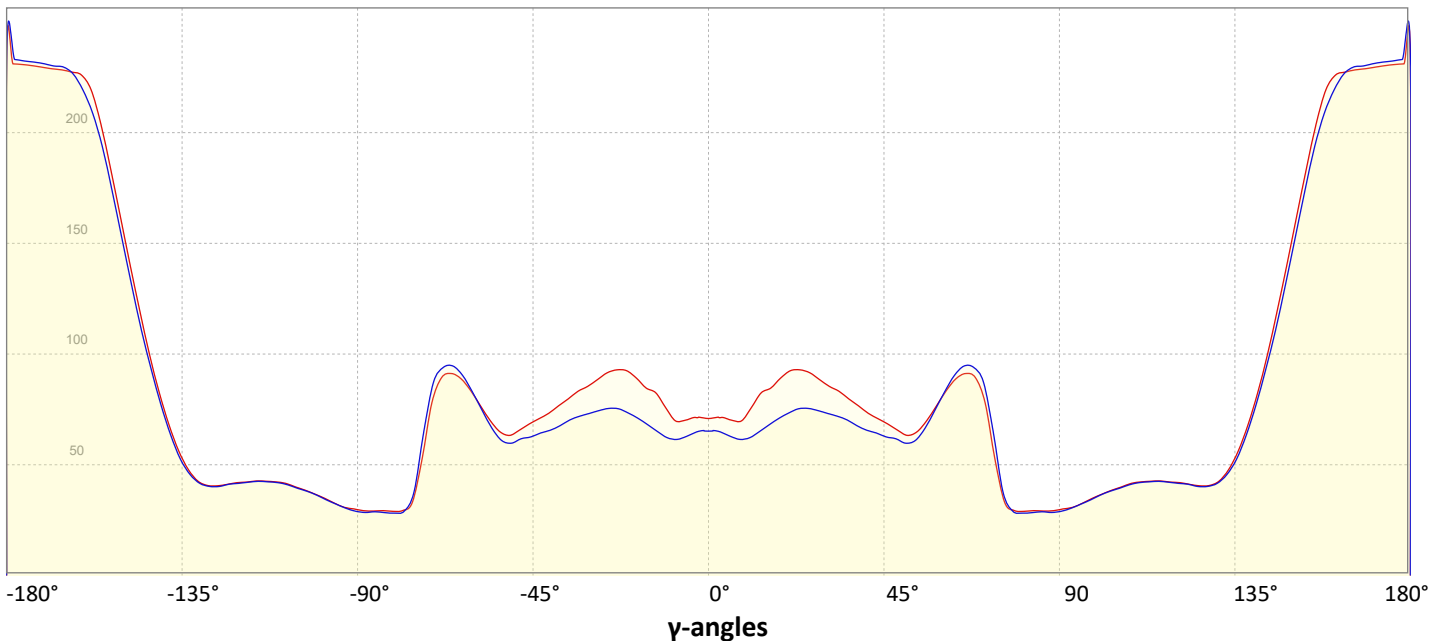
Intensity Ratio

In 120° cone	38,3%
In 90° cone	31,1%

C000-C180

C090-C270

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



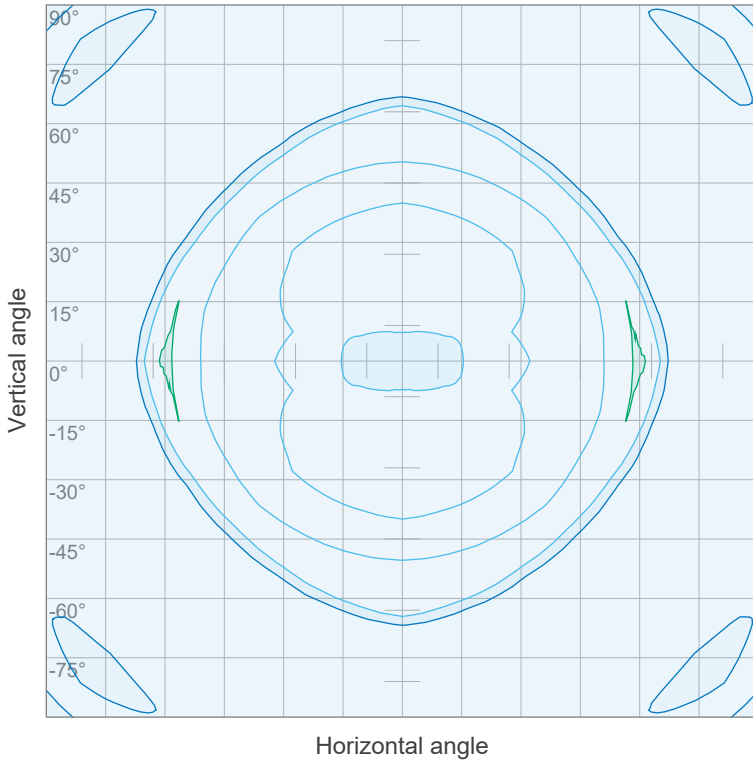
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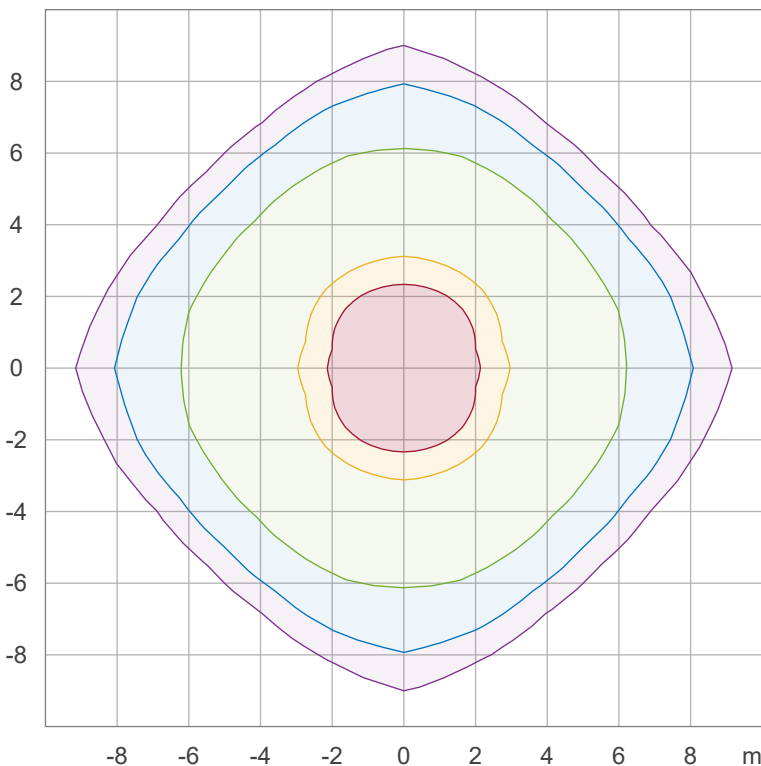
Iso-intensity Diagram (Iso-candela)



Percentage	Intensity (cd)
90 %	209,7
80 %	186,4
70 %	163,1
60 %	139,8
50 %	116,5
40 %	93,2
30 %	69,9
20 %	46,6
10 %	23,3

Peak intensity: 233,0 cd
Number of c-planes: 24

Iso-illuminance Diagram (Iso-lux)



Percentage	Illuminance (lx)
50,0 %	4,2
30,0 %	2,5
10,0 %	0,8
5,0 %	0,4
3,0 %	0,3

Peak illuminance: 8,4 lx
Mounting height: 3,0 m
Number of c-planes: 24

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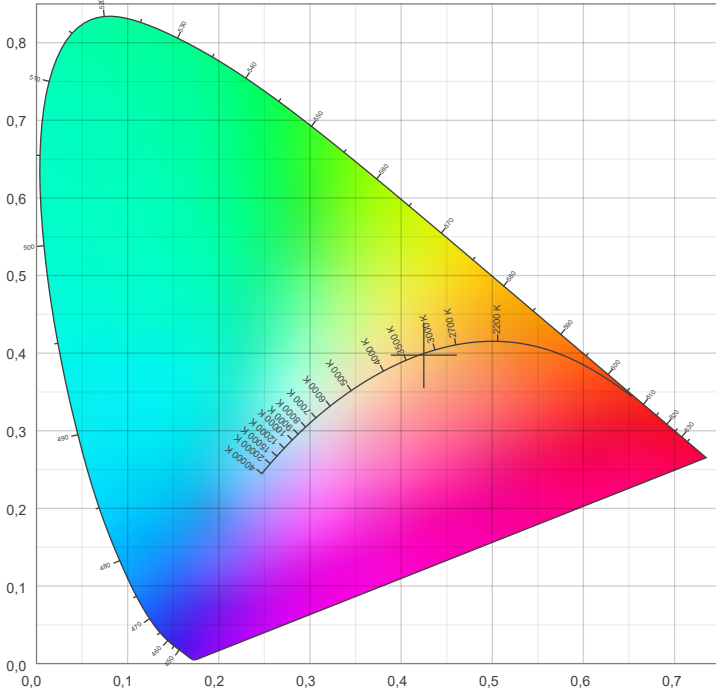


Color details

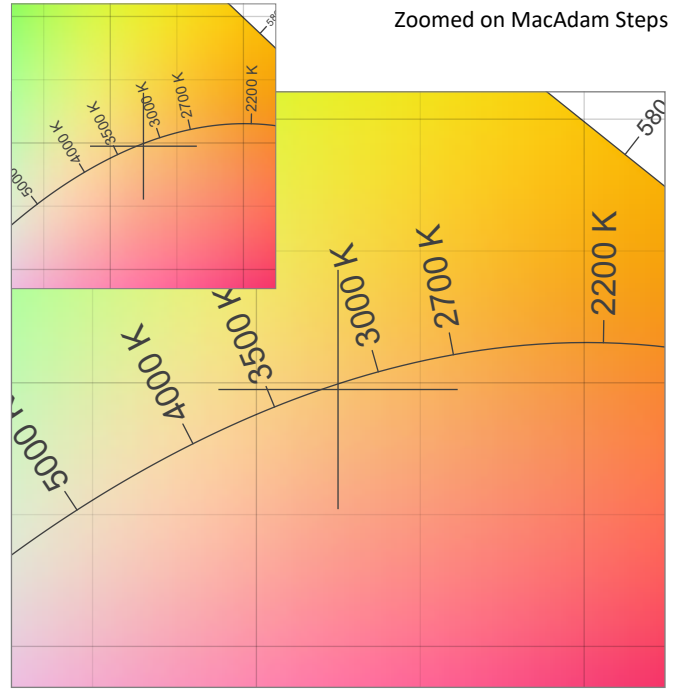
Correlated Color Temperature, Target CCT = 3162 K
 Correlated Color Temperature, Measured CCT = 3162 K
 Color Rendering Index CRI 83,2
 Color Rendering Index, R9 (red component) R9 = 10,5
 Color Rendering TM30-18 R_f 83,6 – R_g 91,9
 Color Quality Scale CQS = 82,3

MacAdam Steps
 Color coordinates CIE 1931 (x;y) = (0,425;0,397)
 Color coordinate CIEs 1960 (u;v) = (0,246;0,345)
 Color deviation from BBL Duv = -0,0009
 Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,246;0,517)
 SDCM = n/a

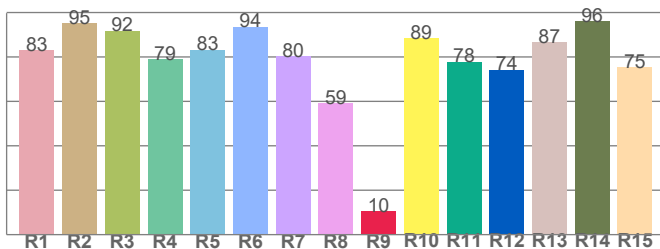
CIE 1931



CIE 1931 – zoomed on Planckian locus



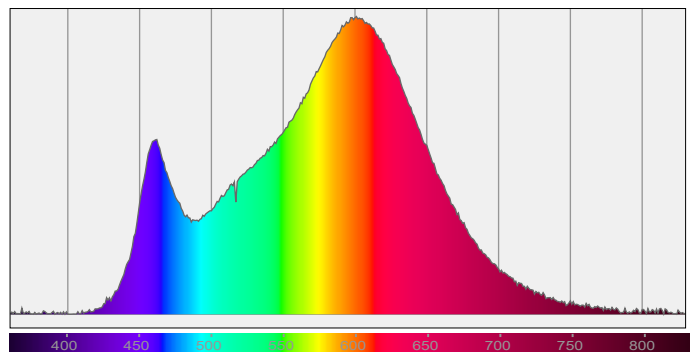
Color Rendering Index per reference color (CIE 1995)



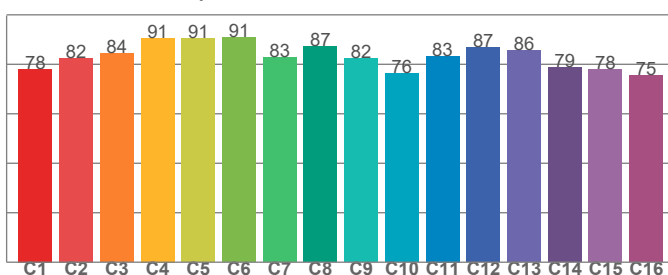
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
83,1	95,3	91,8	78,8	83,2	93,6	80,3	59,0	10,5	88,5	77,8	74,2	86,7	96,2	75,3

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



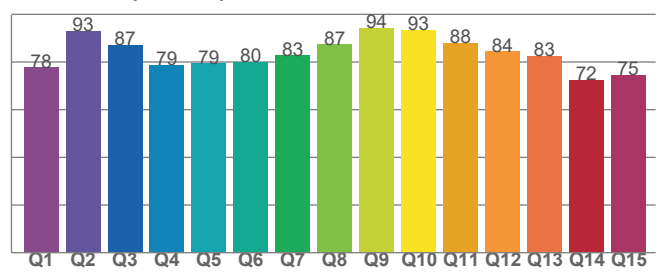
TM30-18 Rf-values per hue bin



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

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
77,6	93,0	87,0	78,8	79,3	80,1	82,7	87,3	94,2	93,3	88,0	84,3	82,5	72,4	74,5

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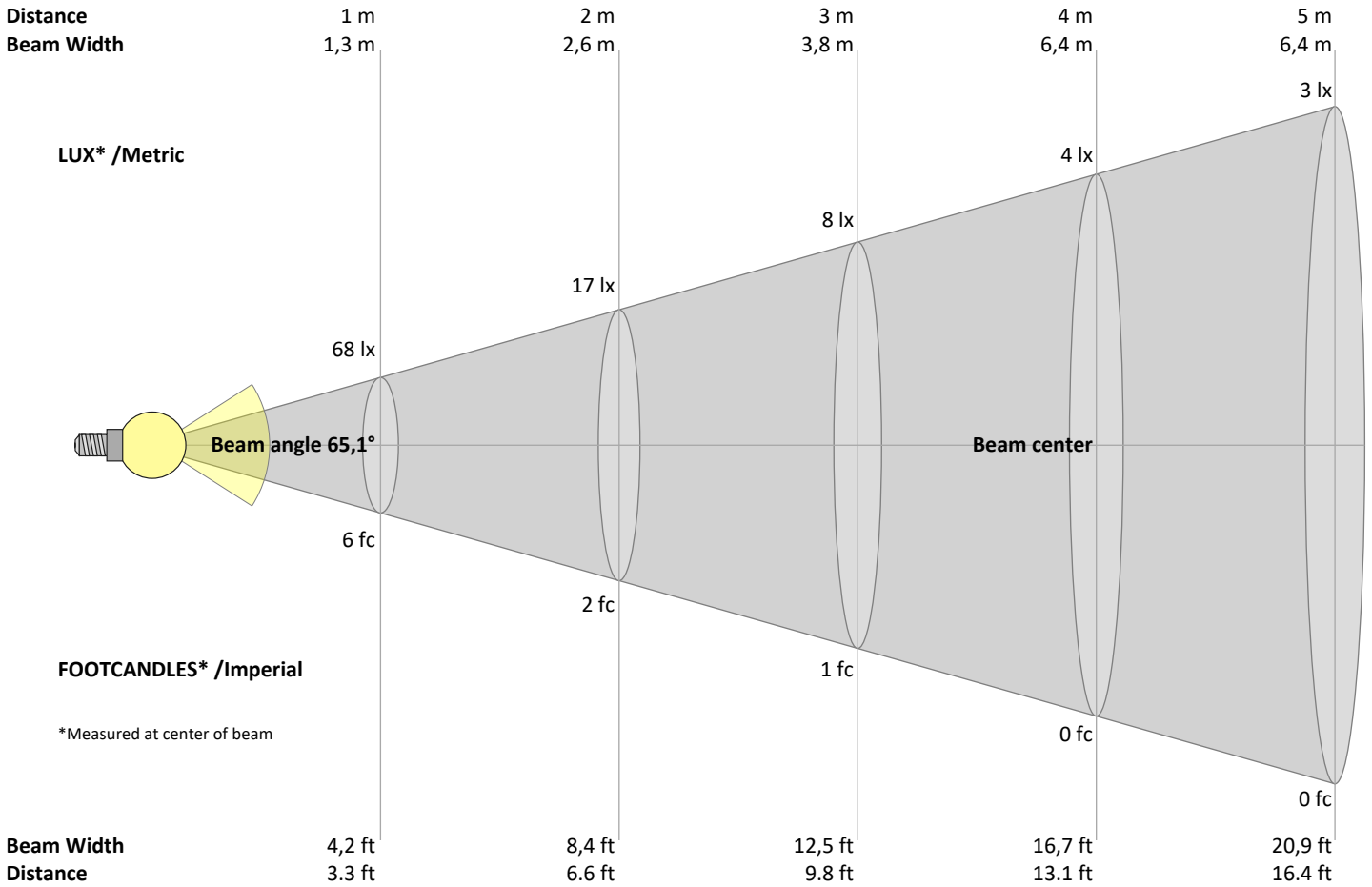
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Beam Details



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
68	17	8	4	3	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	lux
6,3	1,6	0,7	0,4	0,3	0,2	0,1	0,1	0,1	0,1	0,1	0	0	0	0	0	0	0	0	0	fc

Intensities in 0° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
68	71	88	90	80	69	66	88	67	29	30	35	41	42	40	53	105	181	227	230	cd
100%	104%	129%	132%	117%	102%	97%	129%	98%	42%	44%	52%	61%	62%	59%	78%	154%	265%	332%	336%	of 0°val

Intensities in 90° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
68	62	71	75	70	63	63	90	74	28	29	35	41	42	40	51	101	174	224	231	cd
100%	90%	104%	110%	102%	92%	92%	132%	108%	41%	42%	51%	60%	62%	59%	75%	147%	255%	328%	339%	of 0°val

Intensities in 180° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
68	71	88	90	80	69	66	88	67	29	30	35	41	42	40	53	105	181	227	230	cd
100%	104%	129%	132%	117%	102%	97%	129%	98%	42%	44%	52%	61%	62%	59%	78%	154%	265%	332%	336%	of 0°val

Intensities in 270° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
68	62	71	75	70	63	63	90	74	28	29	35	41	42	40	51	101	174	224	231	cd
100%	90%	104%	110%	102%	92%	92%	132%	108%	41%	42%	51%	60%	62%	59%	75%	147%	255%	328%	339%	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	7,0	7,9	8,0	8,8	10,0	6,9	7,7	7,8	8,6	9,9
	3H	9,4	10,2	10,4	11,1	12,3	9,5	10,4	10,5	11,3	12,4
	4H	9,7	10,5	10,7	11,4	12,6	9,9	10,7	10,9	11,6	12,8
	6H	9,9	10,6	10,9	11,6	12,7	10,1	10,7	11,0	11,8	12,9
	8H	10,0	10,8	11,0	11,7	12,9	10,2	10,9	11,1	11,8	13,0
	12H	10,2	11,0	11,1	11,8	13,0	10,3	11,1	11,3	11,9	13,1
4H	2H	7,7	8,5	8,7	9,4	10,6	7,6	8,4	8,6	9,3	10,5
	3H	9,9	10,7	10,8	11,5	12,7	10,0	10,8	11,0	11,6	12,8
	4H	10,2	11,3	11,2	11,8	13,0	10,3	11,4	11,4	12,0	13,2
	6H	10,5	11,1	11,5	12,0	13,1	10,6	11,2	11,6	12,1	13,3
	8H	10,6	11,1	11,6	12,1	13,3	10,8	11,2	11,8	12,2	13,4
	12H	10,9	11,2	11,8	12,3	13,4	11,0	11,3	11,9	12,4	13,5
8H	4H	10,2	10,6	11,2	11,6	12,8	10,3	10,8	11,3	11,8	13,0
	6H	10,6	10,9	11,6	12,0	13,2	10,7	11,0	11,7	12,1	13,3
	8H	10,9	11,1	11,9	12,2	13,5	11,0	11,2	12,0	12,3	13,6
	12H	11,2	11,5	12,3	12,5	13,7	11,3	11,5	12,3	12,6	13,8
12H	4H	10,1	10,5	11,1	11,6	12,7	10,3	10,7	11,3	11,7	12,9
	6H	10,6	10,9	11,6	12,0	13,2	10,7	11,0	11,7	12,1	13,3
	8H	10,9	11,2	12,0	12,2	13,4	11,0	11,3	12,1	12,3	13,5

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

S = 1.0H	0,1 / -0,1	0,1 / -0,1
S = 1.5H	0,2 / -0,3	0,2 / -0,3
S = 2.0H	0,6 / -0,9	0,6 / -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	106	106	106	106	98	98	98	98	82	82	82	67	67	67	53	53	53	47
1	95	90	85	81	87	83	79	75	69	66	63	56	54	52	44	42	41	35
2	86	77	70	64	78	71	65	59	59	54	50	47	44	41	37	35	33	28
3	77	67	59	52	70	61	54	48	51	45	41	41	37	33	32	29	26	22
4	70	58	50	43	64	54	46	40	44	38	34	36	31	28	28	25	22	18
5	64	52	43	36	58	47	39	34	39	33	28	32	27	23	25	21	18	15
6	59	46	37	31	53	42	34	29	35	29	24	28	24	20	22	19	16	13
7	54	41	33	27	49	38	30	25	31	25	21	26	21	17	20	16	14	11
8	50	37	29	23	46	34	27	22	29	23	18	23	19	15	18	15	12	10
9	47	34	26	21	42	31	24	19	26	20	16	21	17	14	17	13	11	9
10	43	31	23	18	40	28	22	17	24	18	15	20	15	12	15	12	10	8

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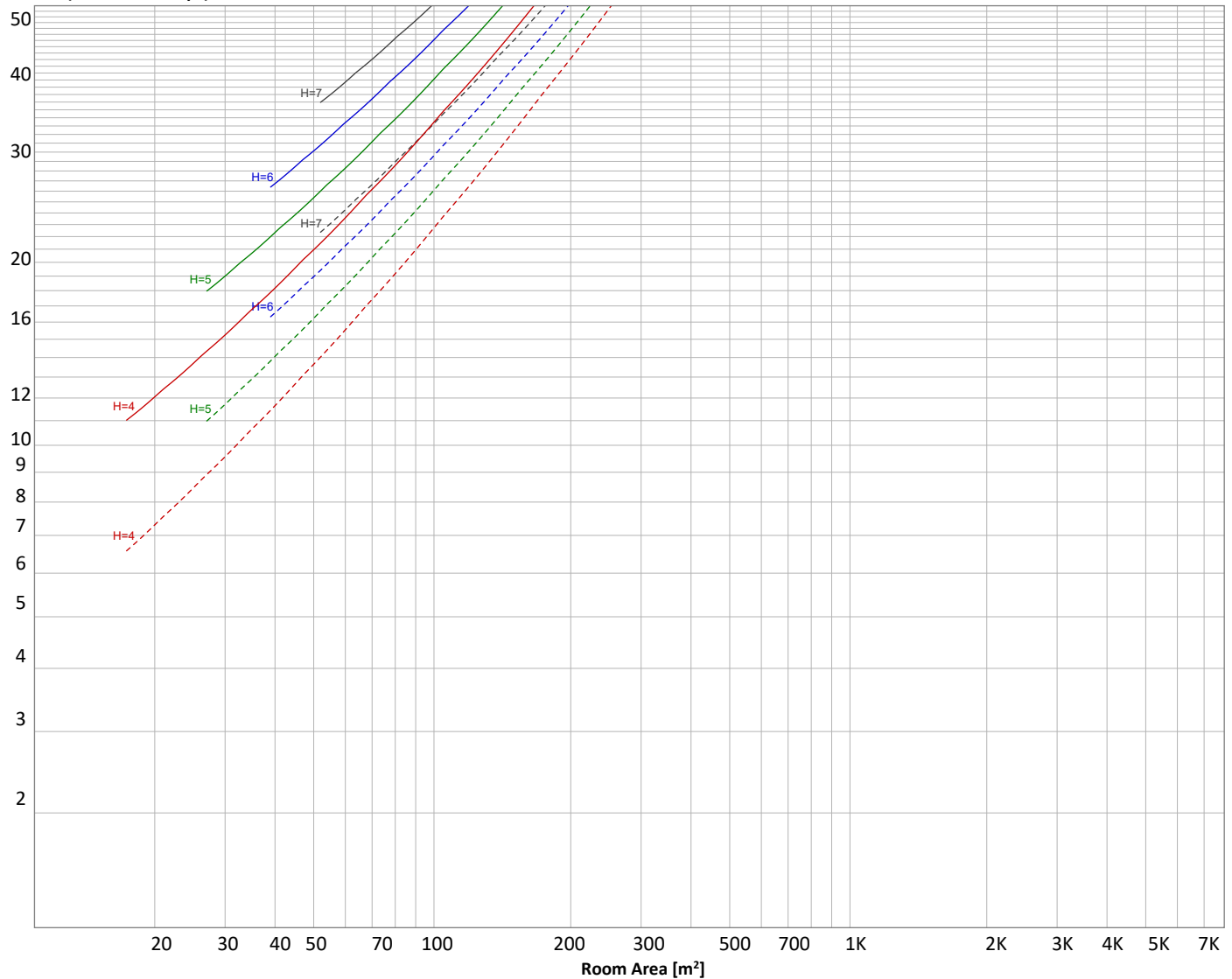
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 796 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°
6,39 lm	21,2 lm	38,2 lm	47,8 lm	50,9 lm	61,0 lm	78,6 lm	37,8 lm	30,1 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
33,8 lm	41,3 lm	43,6 lm	39,6 lm	38,3 lm	60,8 lm	81,0 lm	63,5 lm	22,0 lm

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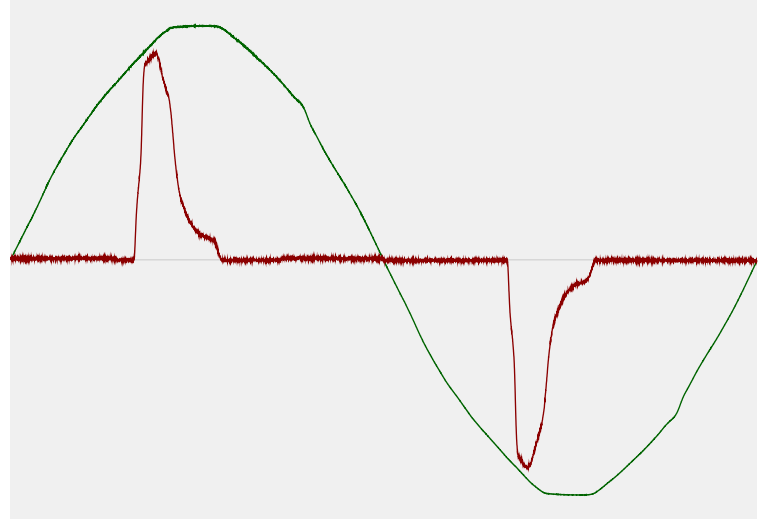
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Power Details

Input Power

Power feed to light source	13,9 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	228 V
RMS Input current feed, I_{RMS}	0,119 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	27,02 VA
Displacement factor of AC power feed	0,96
Power factor of AC current feed	0,51
Total harmonic distortion of the current	156,71%
Total harmonic distortion of the voltage	1,58%

Input Power Curve



Efficiency

Radiated power efficiency 17,7%



Lumen efficiency 57 lm/W



Stabilization Details

Warmup Conditions

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

Color Temperature Change

CCT start	3103 K
CCT shift	+59 K
CCT end	3162 K

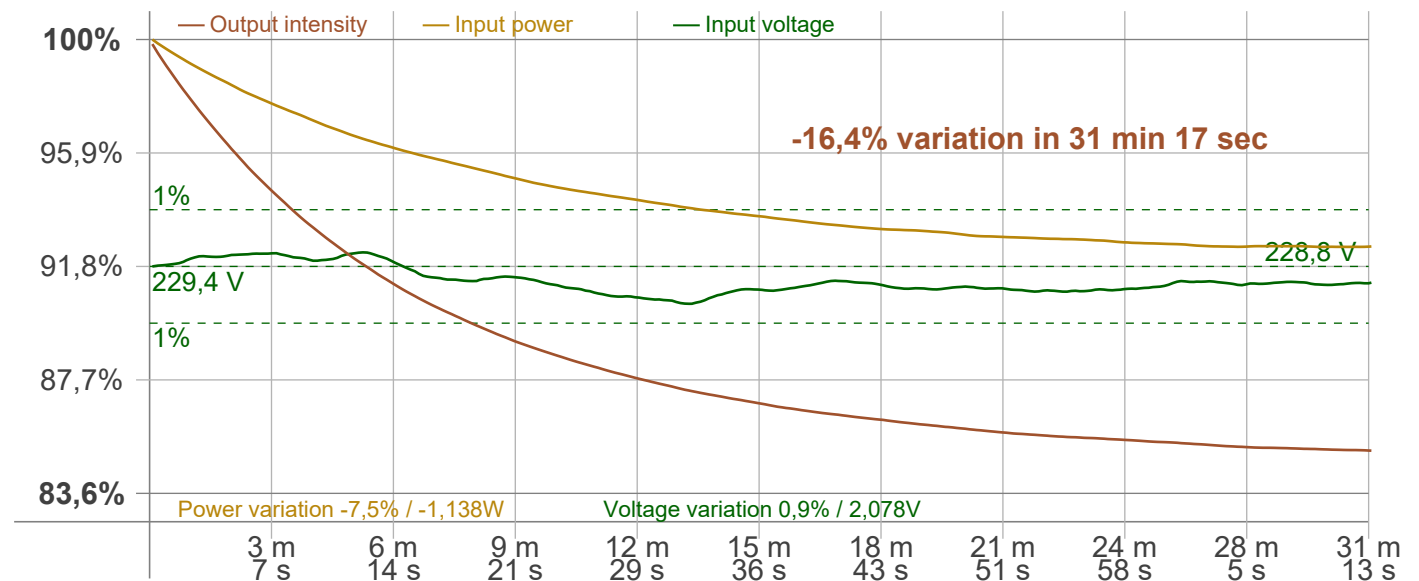
Warmup Result

Total warmup time	Lamp stabilized in 31 min 17 sec
Warmup variation	-16,4%

Output Change

Output start	949 lm
Output change	-153 lm
Output end	796 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 %

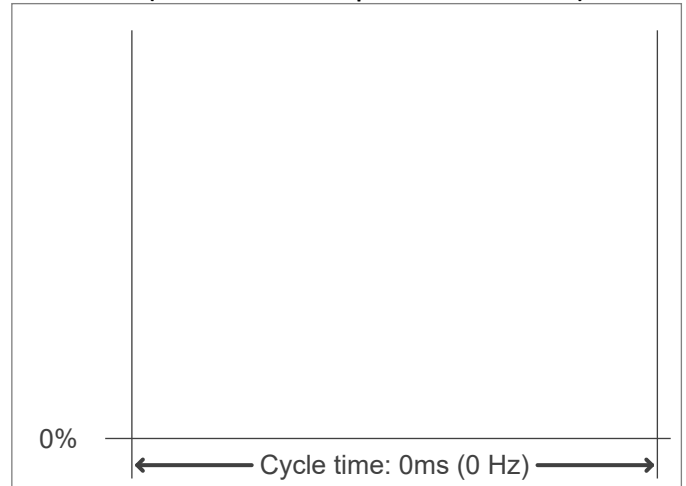
Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp n/a

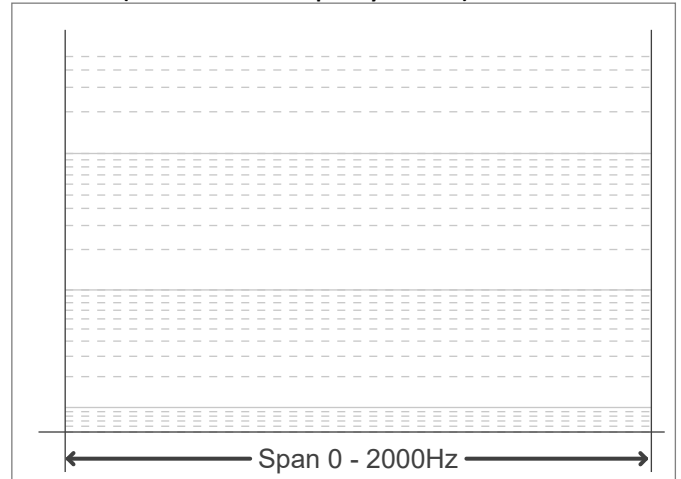
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

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 {FLPSTLM} Not compliant

SVM value {FLS} Not compliant

Product total Not compliant