



PHOTOMETRIC LIGHT REPORT

LED P45 | 1 watt | white | 6000K | white PC cap

Article number: 165-031



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Introduction

Purpose of this Document

This document provides accurate and objective photometric data for Tronix Lighting item 165-031. All information is based on actual measurements taken from standard production units. No modifications were made to enhance performance results. In some cases, minor adjustments—such as temporary removal of covers, cables, or mounting features—were necessary for testing purposes. These did not influence product performance.

Test Methodology

Testing was conducted using randomly selected, unopened samples from regular inventory. All tests comply with the LM-79-19 standard, the recognized method for photometric and electrical measurements of LED and OLED luminaires. This standard, an update of IES LM-79-2008, outlines environmental test conditions, stabilization procedures, measurement methods, and approved instruments. It uses absolute photometry, meaning results directly reflect the performance of the tested product, without comparison to rated lamp standards.

Product 165-031 was tested using:

- A photogoniometer to measure luminous intensity distribution at various angles
- An integrating sphere to determine total luminous flux and colour characteristics

Compliance & Certification

Item 165-031 meets the requirements of the following EU directives. Tronix Lighting certifies that all relevant tests were executed in accordance with the applicable standards, and the CE mark is applied accordingly:

- General Product Safety – Directive 2023/988/EC
- Low Voltage Directive (LVD) – Directive 2014/35/EU
- Electromagnetic Compatibility (EMC) – Directive 2004/108/EC
- Ecodesign – Directive 2009/125/EC
- RoHS 3 – Directive 2011/65/EU + Amendment 2015/863/EU

Recycling & Sustainability

Tronix Lighting is affiliated with national recycling systems for electrical and electronic waste. The luminaire is over 90% recyclable when disposed of as electronic waste at end of life. In addition, Tronix Lighting participates in national packaging recycling schemes, ensuring full compliance with both the WEEE and packaging directives.



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Laboratory and equipment

Laboratory owner and location	Tronix Lighting BV. Uden. The Netherlands
Gonio spectrometer system and type	Viso Systems Type C. horizontal
Spectrometer manufacturer and model	(Gonio) Ocean Optics STS VIS (Sphere) Admesy HERA VIS 380–780nm
Flicker meter manufacturer and model	Viso Systems LabFlicker
Oscilloscope manufacturer and model	Tektronix MDO3024 oscilloscope (4 Channels. 200 MHz)
Power meter manufacturer and model	Vitretek PA900 Precision Multi-Channel Harmonic Power Analyzer
Power source manufacturer and model	(DC) Keithley Source Measure Unit SMU-2420 3A DC Source Meter (AC) Chroma 61601 AC Source
Datalogger Manufacturer and Model	Omega 8-Channel Thermocouple Thermometer/Data Logger

Measurement conditions gonio spectrometer

Number of C-planes and Resolution	2 planes – 180°
γ (gamma)-Resolution	5°
Test Distance	0.66 m
Room Temperature and Humidity	22°C +/- 10% – RH 50% +/- 20%
Input Power. Power and Displacement Factors	0.76 W – PF 0.15 – DPF 0.15
Frequency of Input Power	50 Hz
Warm-up Time and Variation	Lamp stabilized in 15 min 4 sec --1.8%

Tested light source

Manufacturer and Order Code	Tronix Lighting – 165-031
Product Description	LED P45 1 watt white 6000K white PC cap

Main Light Measurement Results

Output – Total Lumen (Up% / Down%)	23.7 lm – 37.32% / 62.68%
Efficiency	31 lm/W
Energy efficiency class	G
Peak Intensity and Beam Angle	2.43 cd – 261.4°
Correlated Colour Temperature	CCT = 6967 K
Colour Shift. CIE duv	Duv 0.0061
Colour Rendering Index	CRI 78.2
Colour Rendering TM30-18	R _f 78.1 – R _g 91.1
Television Lighting Consistency Index	TLCI = 62
Flicker	SVM 2.74 – PstLM 0.25



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Electrical measurement details

Input Power

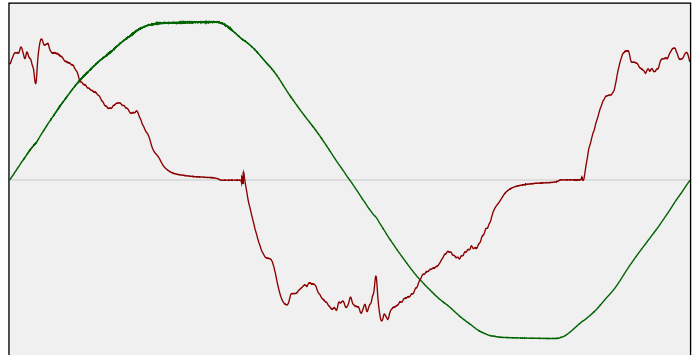
RMS Input voltage feed. V_{RMS} 230 V
 RMS Input current feed. I_{RMS} 0.022 A
 Total input power 0.76 W

Frequency of input power 50 Hz
 Power factor 0.15
 Displacement power factor 0.15

Total harmonic distortion of the current 19.81%
 Total harmonic distortion of the voltage 2.41%

Input Power Curve

Voltage - Current

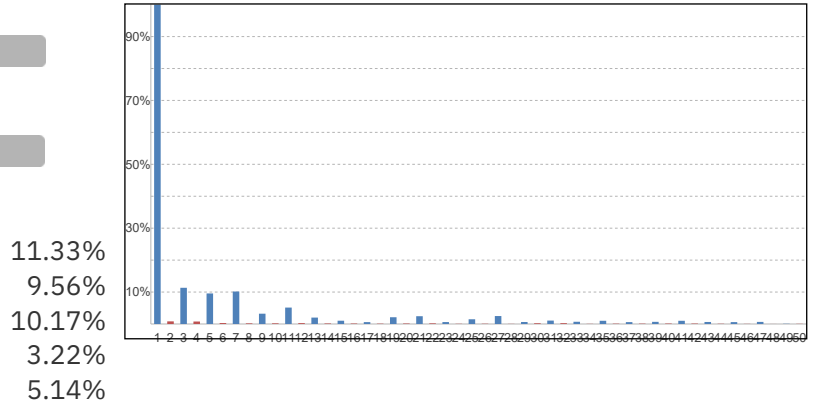


Efficiency

Radiated power efficiency: 10.0%

 Lumen efficiency: 31 lm/W

Current Harmonics %



Harmonics

3rd Harmonic 11.33%
 5th Harmonic 9.56%
 7th Harmonic 10.17%
 9th Harmonic 3.22%
 11th Harmonic 5.14%

Stabilization Details

Warm-up Conditions

Stable period 15 min
 Stable change max 2.0%
 Minimum warm-up time 15 min

Colour temperature change during warm-up

CCT start 6715 K
 CCT shift +252 K
 CCT end 6967 K

Warm-up Results

Total warmup time Lamp stabilized in 15 min 4 sec
 Warmup variation -1.8%

Output intensity change during warm-up

Output start 23.8 lm
 Output change -0.1 lm
 Output end 23.7 lm



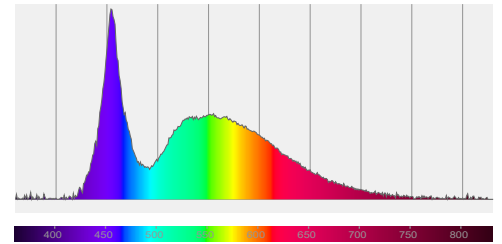
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Colour measurement details

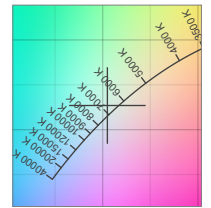
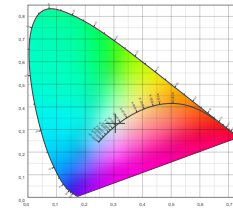
Total lumen output 23.7 lm
 Correlated Colour Temperature 6967 K
 Colour coordinates CIE 1931 (x;y) = (0.305;0.327)
 Colour deviation from BBL Duv = 0.0061

TM30-18 Colour Fidelity Index R_f 78.1
 TM30-18 Colour Gamut Index R_g 91.1
 Colour Rendering Index (Ra) CRI 78.2
 Colour Rendering Index. (red component) $R_9 = -8.1$

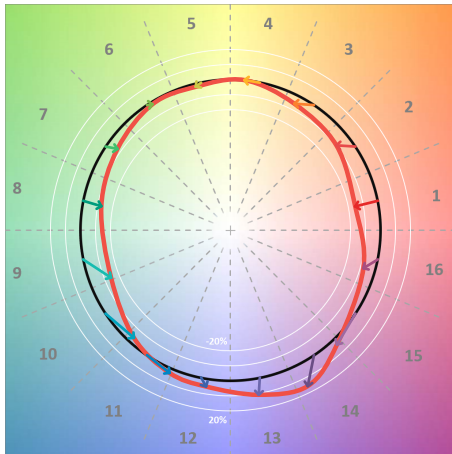
Colour Quality Scale CQS = 75.2
 Television Lighting Consistency Index TLCI = 62



Relative spectral power distribution



TM30 details

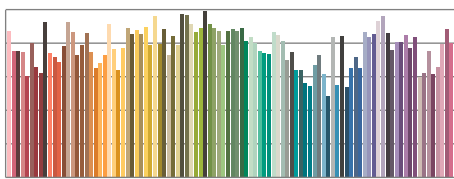


TM30 Colour vectors per hue bin

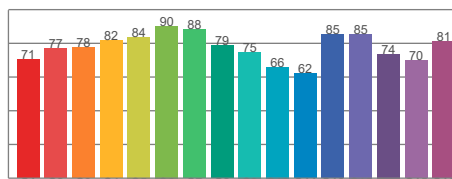


TM30 Colour distortion

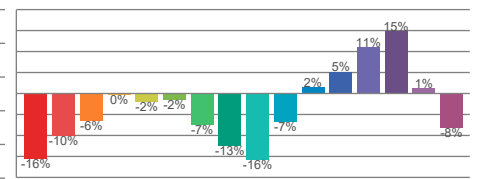
Hue Bin	R_f	Shifts (%)	
		Chroma	Hue
C1	71	-16%	-1%
C2	77	-10%	8%
C3	78	-6%	11%
C4	82	0%	10%
C5	84	-2%	4%
C6	90	-2%	-3%
C7	88	-7%	-3%
C8	79	-13%	1%
C9	75	-16%	16%
C10	66	-7%	24%
C11	62	2%	19%
C12	85	5%	4%
C13	85	11%	-3%
C14	74	15%	-15%
C15	70	1%	-24%
C16	81	-8%	-8%



TM30-18 R_f -values per reference colour

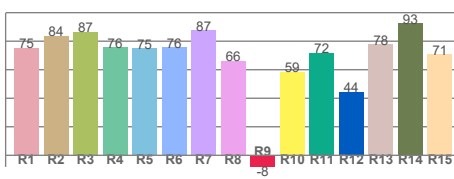


TM30-18 R_f -values per hue bin

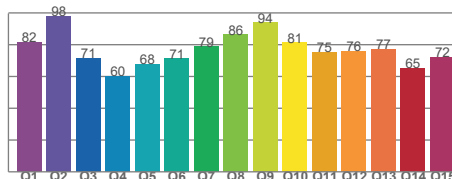


TM30 Chroma shift

Colour Quality details



Colour Rendering Index



Colour Quality Scale



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Flicker / temporal light artefacts details

Measurement conditions

Flicker meter type	Viso Systems LabFlicker
Flicker/TLA sample rate	20000 samples/s
Measurement time	5x 180 seconds (15 minutes) for PstLM. 1.2 sec for all other indices

Flicker indices according to Illuminating Engineering Society (IES)

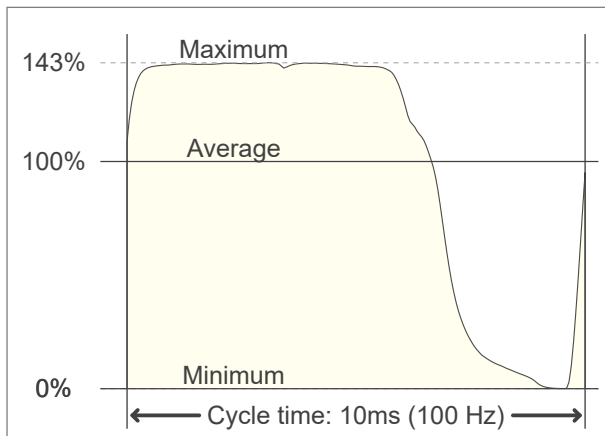
Flicker frequency	100 Hz
Percent flicker	99.96 %
Flicker index	0.26

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

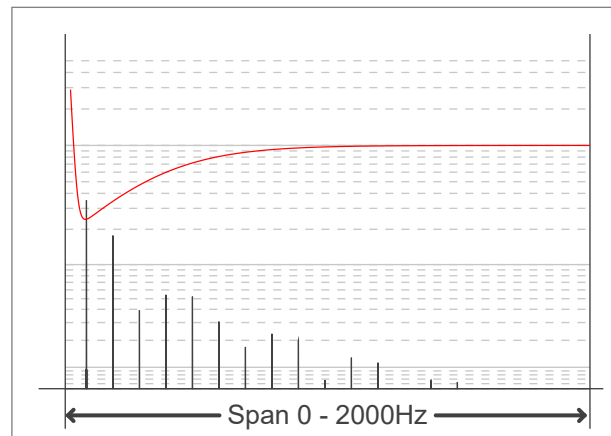
An LED luminaire is considered flicker-free if the SVM value is ≤ 0.4 and if the PstLM value is ≤ 1.0

PstLM value ($F < 80$ Hz)	0.25
SVM value ($80 < F < 2000$ Hz)	2.74

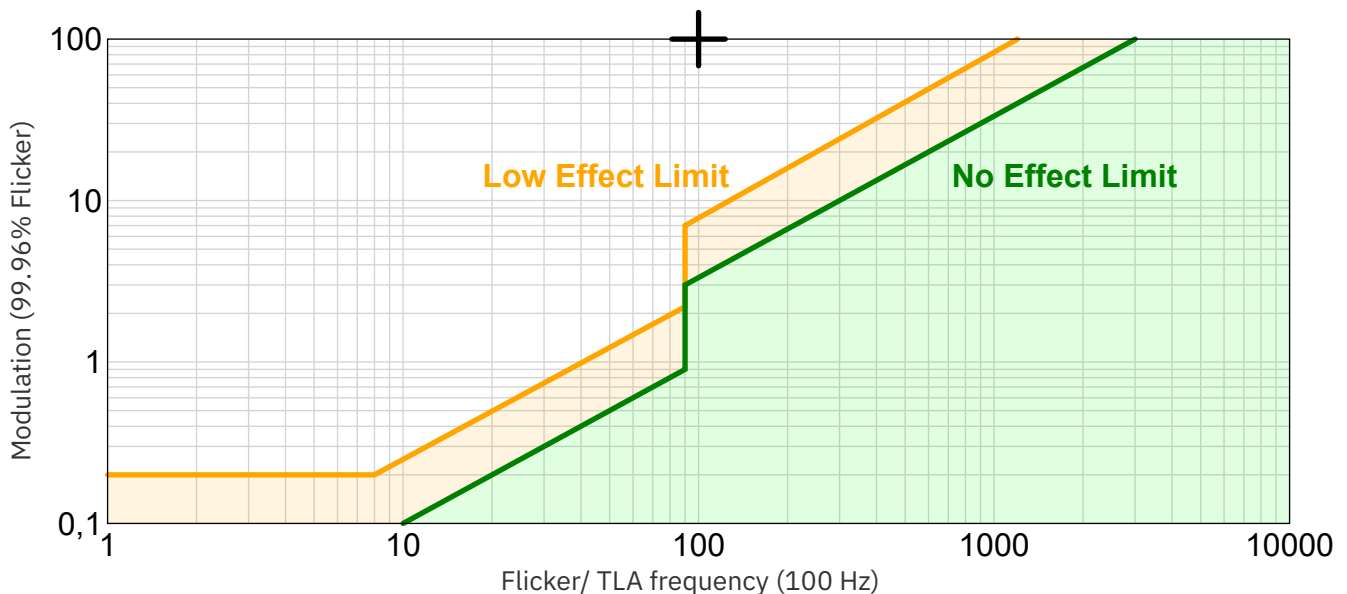
Flicker frame (one flicker period in time domain)



Flicker FFT (flicker curve in frequency domain)



IEEE 1789-2015 Lighting Flicker Risk Zones



Document revision date: 3-7-2025 Measurement serial: VFR-250630-9920-SW

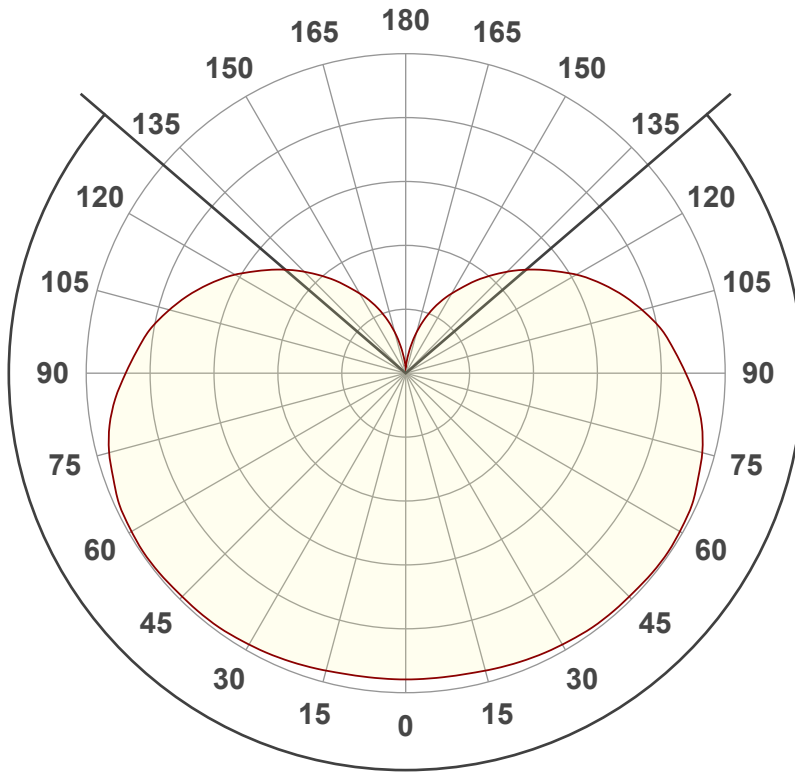


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Beam angle

Luminous Intensity diagram

Unit: 0-100% of peak intensity



261,4°

Main Values

Output (total Lumen)	23.7 lm
Lumen Up/Down	37.32% / 62.68%
Peak Intensity	2.43 cd
Beam Angle (50%)	261.4°
Beam Angle (90%)	261.4°
Beam Angle (10%)	261.4°

Cut-off Angle

Average 2.5%	355.1°
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Field Angle

Average 10%	336.4°
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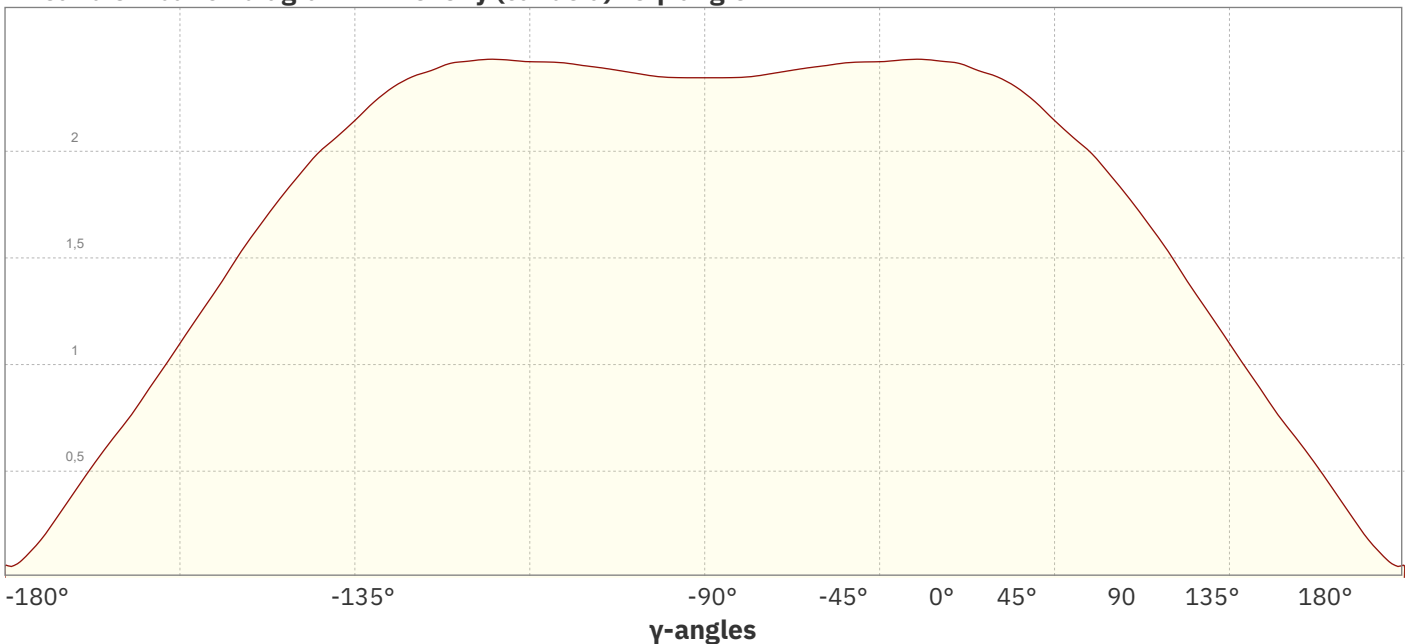
Intensity Ratio

In 120° cone	31.9%
In 90° cone	18.6%

C planes

- C000-C180
- C090-C270

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

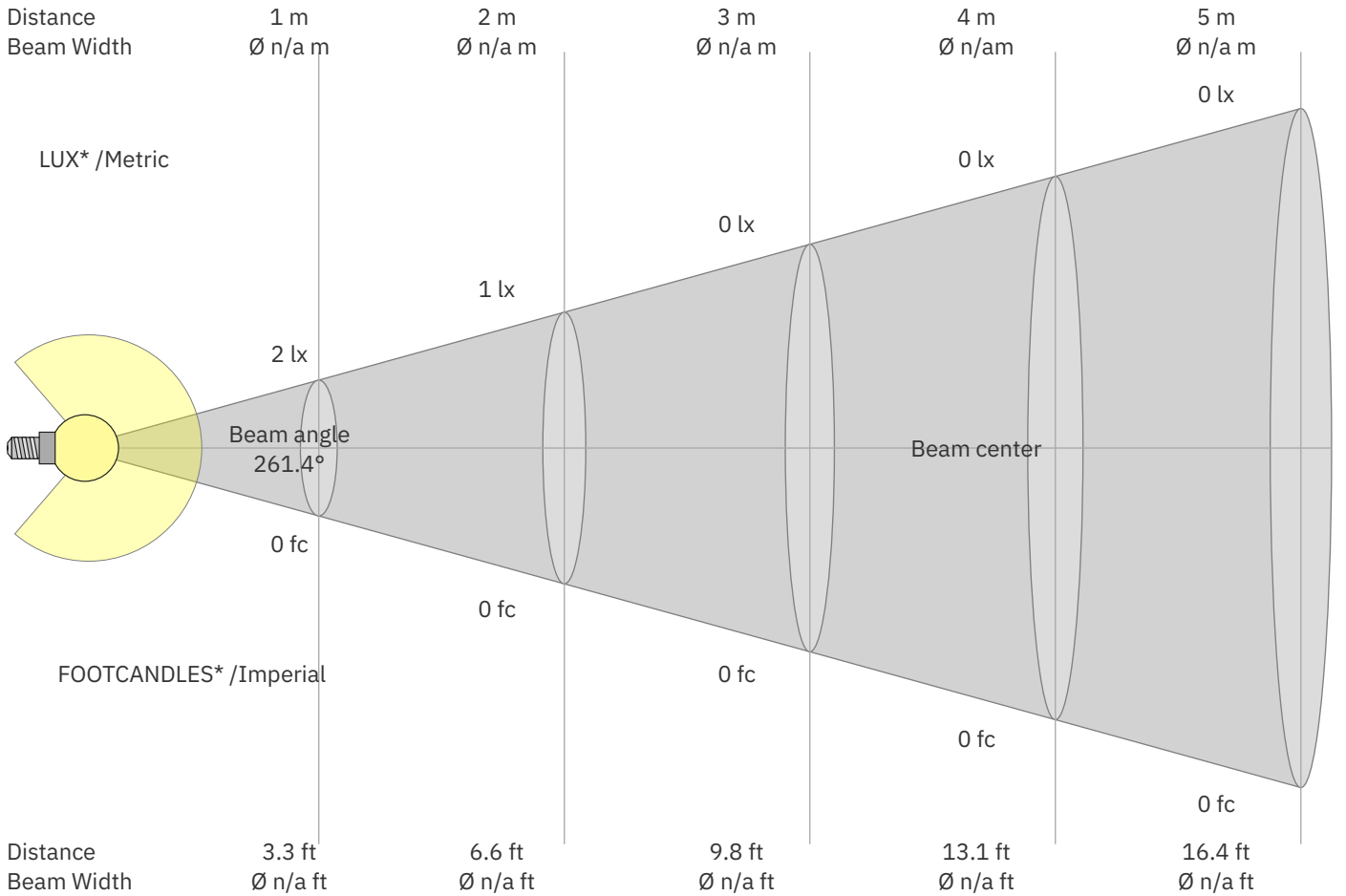


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Beam Details



*Measured at center of beam

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	
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	lux
0.2	0.1	0	0	0	0	0	0	0	0	0	0	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
2.34	2.35	2.37	2.39	2.41	2.42	2.43	2.42	2.37	2.29	2.14	2.00	1.81	1.59	1.34	1.10	0.86	0.63	0.41	0.17	cd
100%	100%	101%	102%	103%	103%	104%	103%	101%	98%	91%	85%	77%	68%	57%	47%	37%	27%	17%	7%	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
2.34	2.35	2.37	2.39	2.41	2.42	2.43	2.42	2.37	2.29	2.14	2.00	1.81	1.59	1.34	1.10	0.86	0.63	0.41	0.17	cd
100%	100%	101%	102%	103%	103%	104%	103%	101%	98%	91%	85%	77%	68%	57%	47%	37%	27%	17%	7%	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
2.34	2.35	2.37	2.39	2.41	2.42	2.43	2.42	2.37	2.29	2.14	2.00	1.81	1.59	1.34	1.10	0.86	0.63	0.41	0.17	cd
100%	100%	101%	102%	103%	103%	104%	103%	101%	98%	91%	85%	77%	68%	57%	47%	37%	27%	17%	7%	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
2.34	2.35	2.37	2.39	2.41	2.42	2.43	2.42	2.37	2.29	2.14	2.00	1.81	1.59	1.34	1.10	0.86	0.63	0.41	0.17	cd
100%	100%	101%	102%	103%	103%	104%	103%	101%	98%	91%	85%	77%	68%	57%	47%	37%	27%	17%	7%	of 0°val

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Light Planning – UGR table

Uncorrected, comprehensive UGR table according to CIE 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	11.5	12.5	12.3	13.3	14.3	11.5	12.5	12.3	13.3	14.3
	3H	13.8	14.9	14.7	15.6	16.6	13.8	14.9	14.7	15.6	16.6
	4H	15.0	16.0	15.9	16.8	17.8	15.0	16.0	15.9	16.8	17.8
	6H	16.2	17.1	17.0	17.9	18.9	16.2	17.1	17.0	17.9	18.9
	8H	16.8	17.7	17.6	18.5	19.5	16.8	17.7	17.6	18.5	19.5
	12H	17.3	18.3	18.1	19.0	20.0	17.3	18.3	18.1	19.0	20.0
4H	2H	12.3	13.3	13.1	14.1	15.0	12.3	13.3	13.1	14.1	15.0
	3H	14.9	15.9	15.7	16.6	17.6	14.9	15.9	15.7	16.6	17.6
	4H	16.2	17.3	17.0	17.9	18.9	16.2	17.3	17.0	17.9	18.9
	6H	17.5	18.3	18.4	19.1	20.1	17.5	18.3	18.4	19.1	20.1
	8H	18.1	18.8	19.0	19.7	20.6	18.1	18.8	19.0	19.7	20.6
	12H	18.8	19.3	19.6	20.2	21.2	18.8	19.3	19.6	20.2	21.2
8H	4H	16.7	17.3	17.5	18.2	19.2	16.7	17.3	17.5	18.2	19.2
	6H	18.3	18.8	19.1	19.7	20.7	18.3	18.8	19.1	19.7	20.7
	8H	19.0	19.5	19.9	20.5	21.6	19.0	19.5	19.9	20.5	21.6
	12H	19.8	20.2	20.8	21.2	22.2	19.8	20.2	20.8	21.2	22.2
12H	4H	16.8	17.3	17.6	18.2	19.2	16.8	17.3	17.6	18.2	19.2
	6H	18.4	18.9	19.3	19.8	20.9	18.4	18.9	19.3	19.8	20.9
	8H	19.3	19.7	20.2	20.6	21.7	19.3	19.7	20.2	20.6	21.7

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

S = 1.0H	0.1 / 0.0	0.1 / 0.0
S = 1.5H	0.1 / -0.1	0.1 / -0.1
S = 2.0H	0.1 / -0.2	0.1 / -0.2

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	0			
Floor reflectance	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	110	110	110	110	103	103	103	103	90	90	90	79	79	79	68	68	68	63
1	96	89	83	78	89	83	78	73	72	68	64	61	58	55	52	49	47	42
2	85	75	67	60	79	70	62	56	60	54	49	51	47	42	43	39	36	32
3	77	64	55	48	71	60	52	45	52	45	39	44	38	34	37	32	29	25
4	69	56	46	39	64	52	43	37	45	38	32	38	32	28	32	27	23	20
5	63	49	40	33	58	46	37	31	40	32	27	34	28	23	28	23	20	16
6	58	44	35	28	54	41	32	26	35	28	23	30	24	20	25	21	17	14
7	54	39	30	24	49	37	28	23	32	25	20	27	21	17	23	18	15	12
8	50	36	27	21	46	33	25	20	29	22	17	25	19	15	21	16	13	10
9	46	32	24	18	43	30	23	17	26	20	15	23	17	13	19	15	11	9
10	43	30	22	16	40	28	20	15	24	18	14	21	16	12	18	13	10	8