PHOTOMETRIC LIGHT REPORT

Spot | Ø78*16mm | 24V | 4W | white | 2700K/3000K | dim

Article number: 148-860

Go to the webshop of Tronix Lighting

TRONIX

148-860 Spot | Ø78*16mm | 24V | 4W | white | 2700K/3000K | dim

Introduction

Purpose of this Document
This document provides accurate and objective photometric data for Tronix Lighting item 148-860. 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 148-860 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 148-860 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.

148-860 Spot | Ø78*16mm | 24V | 4W | white | 2700K/3000K | dim

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	Vitrek 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	7.5°
Test Distance	0.66 m
Room Temperature and Humidity	22°C +/- 10% – RH 50% +/- 20%
Input Power. Power and Displacement Factors	4.0 W – PF 1.0 – DPF 0.69
Frequency of Input Power	0 Hz
Warm-up Time and Variation	Lamp stabilized in 15 min 3 sec –-1.3%

Tested light source

Manufacturer and Order Code	Tronix Lighting – 148-860
Product Description	Spot	Ø78*16mm	24V	4W	white	2700K/3000K	dim nog meten

Main Light Measurement Results

Output – Total Lumen (Up% / Down%)	223 lm – 0.52% / 99.48%
Efficiency	56 lm/W
Energy efficiency class	G
Peak Intensity and Beam Angle	77.7 cd – 111.9°
Correlated Colour Temperature	CCT = 2596 K
Colour Shift. CIE duv	Duv 0.0023
Colour Rendering Index	CRI 92.8
Colour Rendering TM30-18	R_f 91.5 – R_g 100.1
Television Lighting Consistency Index	TLCI = 81
Flicker	SVM n/a – PstLM n/a

Document revision date: 31-8-2026 Measurement serial: VFR-260622-13621-SW

148-860 Spot | Ø78*16mm | 24V | 4W | white | 2700K/3000K | dim

Electrical measurement details

Input Power

RMS Input voltage feed. V_{RMS}	24.0 V
RMS Input current feed. I_{RMS}	0.167 A
Total input power	4.0 W
Frequency of input power	0 Hz
Power factor	1.0
Displacement power factor	0.69
Total harmonic distortion of the current	0%
Total harmonic distortion of the voltage	0%

Input Power Curve Voltage - Current

Efficiency

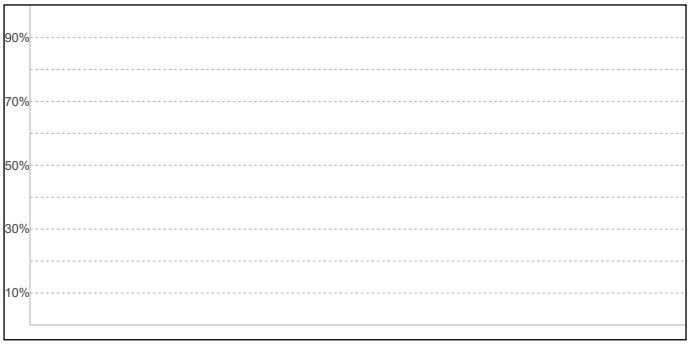
Radiated power efficiency: 17.4%

Lumen efficiency: 56 lm/W

Harmonics

3rd Harmonic	n/a
5th Harmonic	n/a
7th Harmonic	n/a
9th Harmonic	n/a
11th Harmonic	n/a

Current Harmonics %



Stabilization Details

Warm-up Conditions

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

Warm-up Results

Total warmup time	Lamp stabilized in 15 min 3 sec
Warmup variation	-1.3%

Colour temperature change during warm-up

CCT start	2598 K
CCT shift	-2 K
CCT end	2596 K

Output intensity change during warm-up

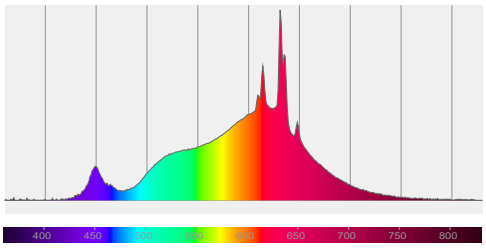
Output start	225 lm
Output change	-3 lm
Output end	223 lm

Document revision date: 31-8-2026 Measurement serial: VFR-260622-13621-SW

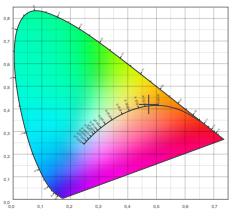
148-860 Spot | Ø78*16mm | 24V | 4W | white | 2700K/3000K | dim

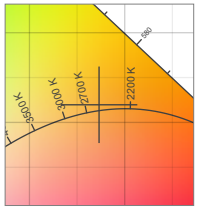
Colour measurement details

Total lumen output	223 lm
Correlated Colour Temperature	2596 K
Colour coordinates CIE 1931	(x;y) = (0.473;0.420)
Colour deviation from BBL	Duv = 0.0023
TM30-18 Colour Fidelity Index	R_f 91.5
TM30-18 Colour Gamut Index	R_g 100.1
Colour Rendering Index (Ra)	CRI 92.8
Colour Rendering Index. (red component)	R9 = 51.6
Colour Quality Scale	CQS = 89.3
Television Lighting Consistency Index	TLCI = 81

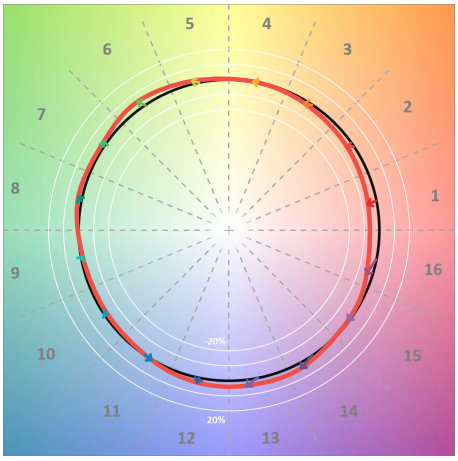


Relative spectral power distribution





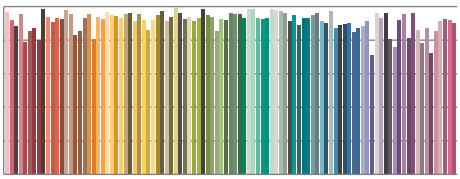
TM30 details



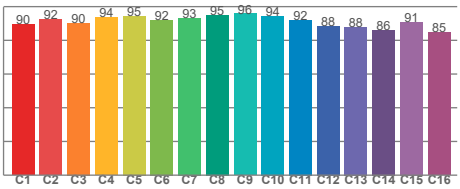
TM30 Colour vectors per hue bin

TM30 Colour distortion

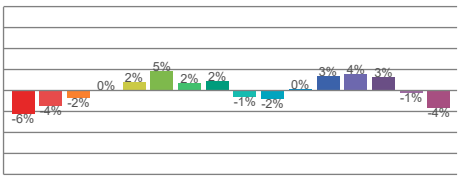
		Shifts (%)	
Hue Bin	R_f	Chroma	Hue
C1	90	-6%	-1%
C2	92	-4%	2%
C3	90	-2%	5%
C4	94	0%	3%
C5	95	2%	4%
C6	92	5%	3%
C7	93	2%	-3%
C8	95	2%	-2%
C9	96	-1%	-2%
C10	94	-2%	1%
C11	92	0%	5%
C12	88	3%	-1%
C13	88	4%	-8%
C14	86	3%	-11%
C15	91	-1%	-6%
C16	85	-4%	-11%



TM30-18 Rf-values per reference colour

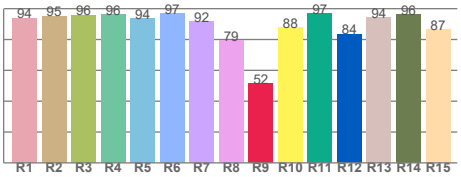


TM30-18 Rf-values per hue bin

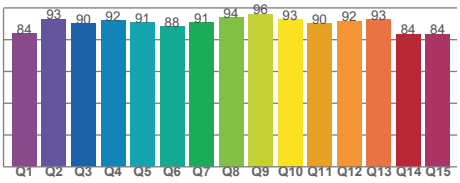


TM30 Chroma shift

Colour Quality details



Colour Rendering Index



Colour Qualitity Scale

Document revision date: 31-8-2026 Measurement serial: VFR-260622-13621-SW

148-860 Spot | Ø78*16mm | 24V | 4W | white | 2700K/3000K | dim

Flicker / temporal light artefacts details

Measurement conditions

Flicker meter type	Viso Systems LabFLicker
Flicker/TLA sample rate	n/a 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)

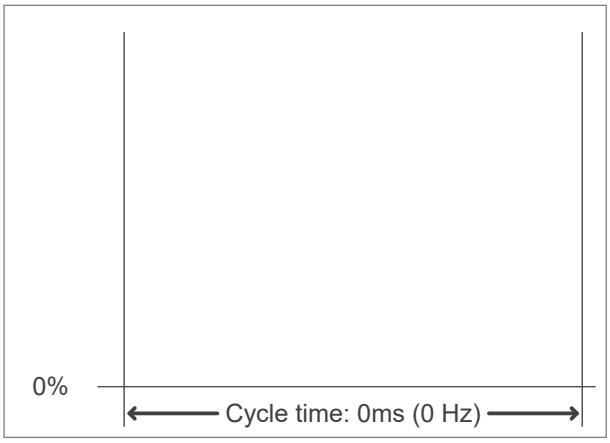
Flicker frequency	n/a Hz
Percent flicker	n/a %
Flicker index	n/a

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

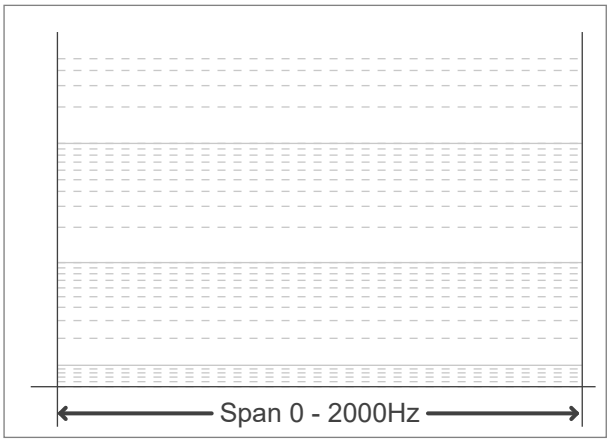
An LED luminaire is considered flicker-free if the SVM value is <= 0.4 and if the PstLM value is <=1.0

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

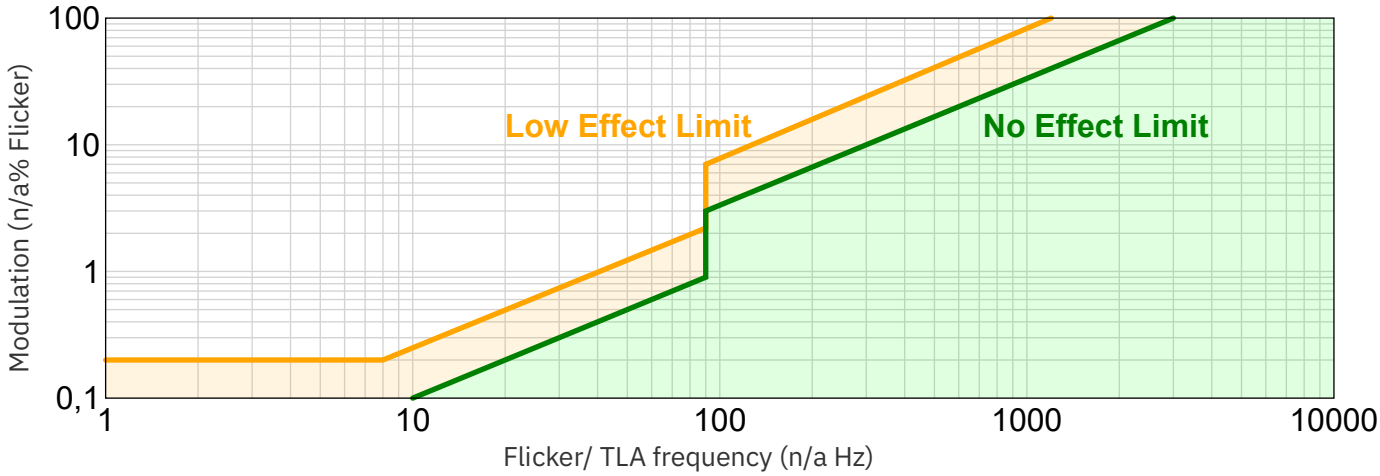
Flicker frame (one flicker period in time domain)



Flicker FFT (flicker curve in frequency domain)



IEEE 1789-2015 Lighting Flicker Risk Zones



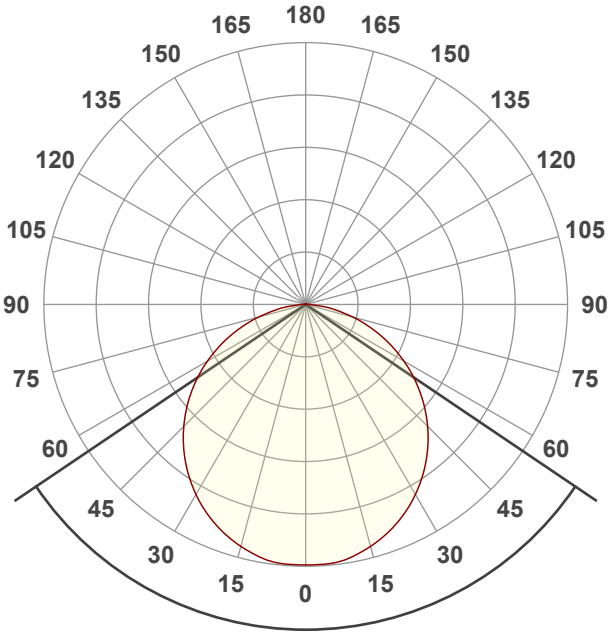
Document revision date: 31-8-2026 Measurement serial: VFR-260622-13621-SW

148-860 Spot | Ø78*16mm | 24V | 4W | white | 2700K/3000K | dim

Beam angle

Luminous Intensity diagram

Unit: 0-100% of peak intensity



111,9°

Main Values

Output (total Lumen)	223 lm
Lumen Up/Down	0.52% / 99.48%
Peak Intensity	77.7 cd
Beam Angle (50%)	111.9°
Beam Angle (90%)	111.9°
Beam Angle (10%)	111.9°

Cut-off Angle

Average 2.5%	175.3°

Field Angle

Average 10%	162°

Intensity Ratio

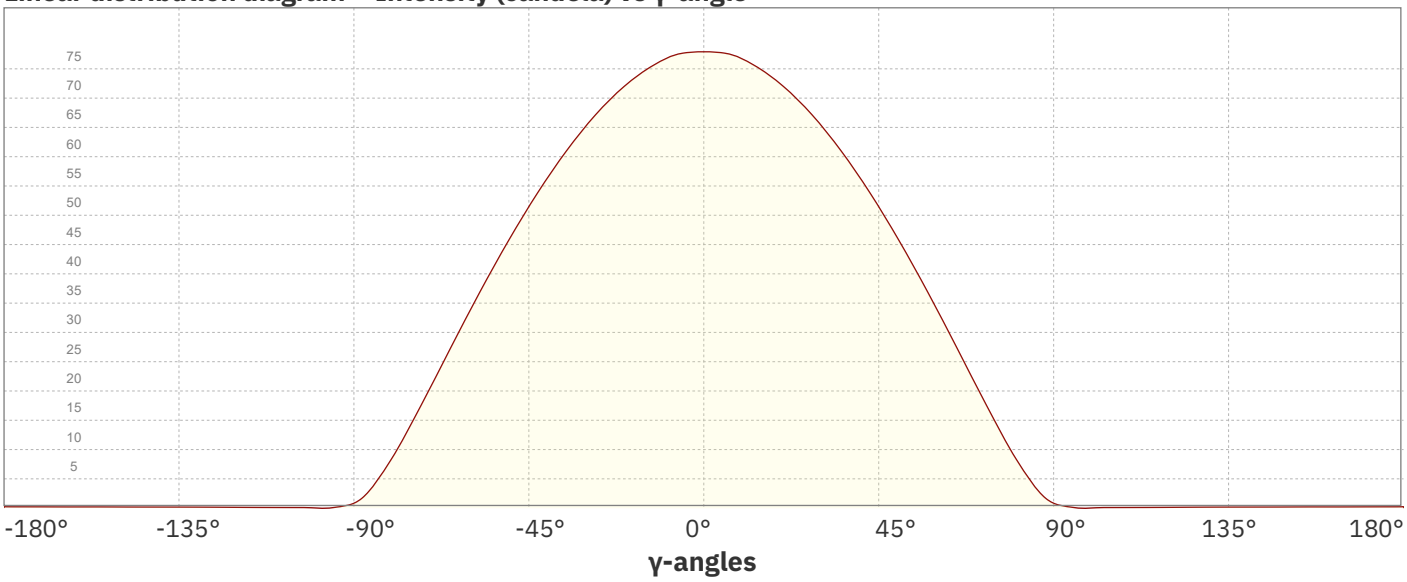
In 120° cone	78.2%
In 90° cone	53.3%

C planes

C000-C180

C090-C270

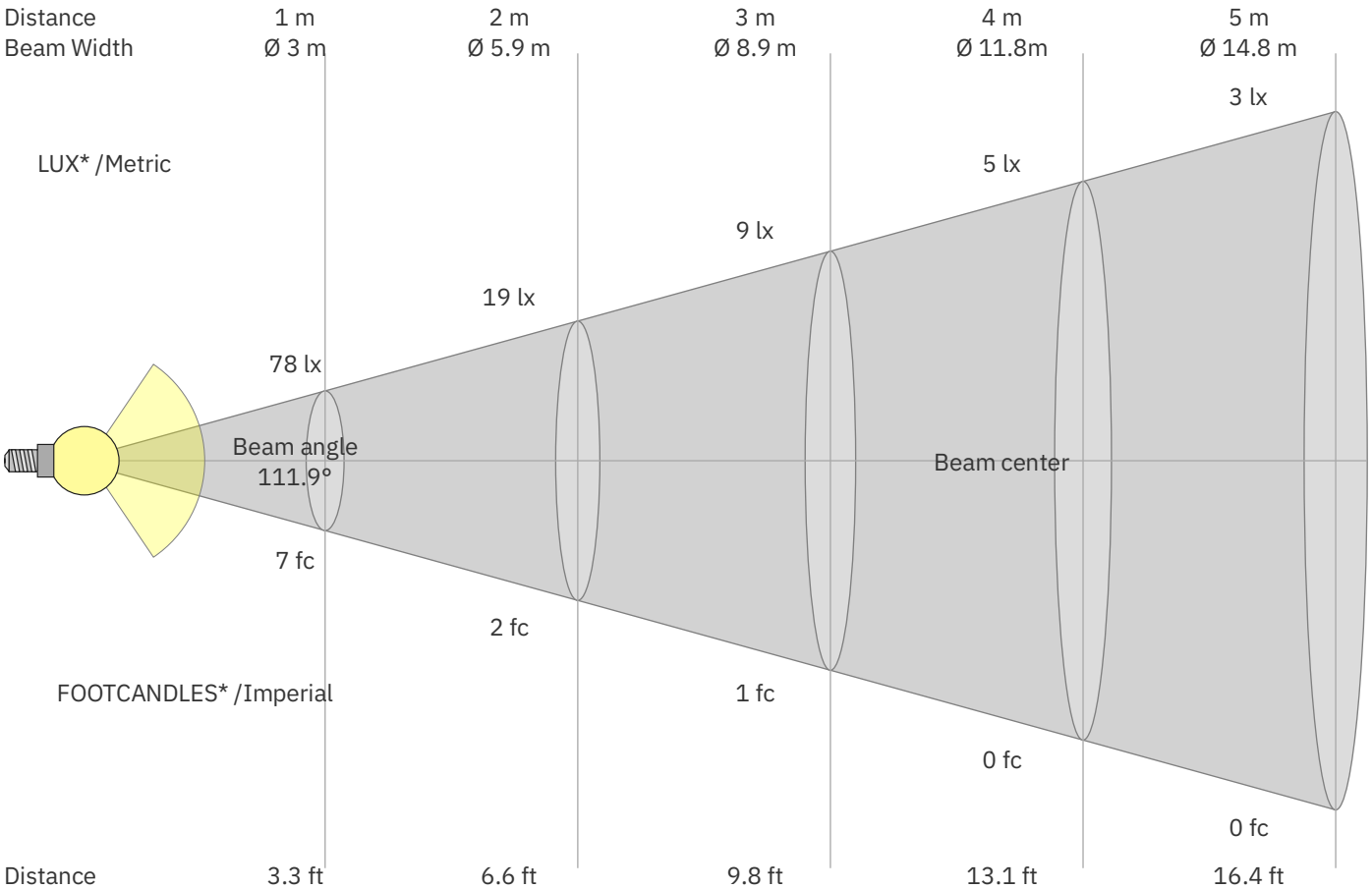
Linear distribution diagram - Intensity (candela) vs γ-angle



Document revision date: 31-8-2026 Measurement serial: VFR-260622-13621-SW

148-860 Spot | Ø78*16mm | 24V | 4W | white | 2700K/3000K | dim

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
78	19	9	5	3	2	2	1	1	1	1	1	0	0	0	0	0	0	0	0	lux
7.2	1.8	0.8	0.5	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0	0	0	0	0	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
77.7	77.7	76.4	74.6	72.2	69.0	65.4	61.2	56.5	51.4	45.9	40.0	33.8	27.5	21.1	14.8	8.8	4.3	1.2	0.2	cd
100%	100%	98%	96%	93%	89%	84%	79%	73%	66%	59%	51%	44%	35%	27%	19%	11%	5%	2%	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
77.7	77.7	76.4	74.6	72.2	69.0	65.4	61.2	56.5	51.4	45.9	40.0	33.8	27.5	21.1	14.8	8.8	4.3	1.2	0.2	cd
100%	100%	98%	96%	93%	89%	84%	79%	73%	66%	59%	51%	44%	35%	27%	19%	11%	5%	2%	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
77.7	77.7	76.4	74.6	72.2	69.0	65.4	61.2	56.5	51.4	45.9	40.0	33.8	27.5	21.1	14.8	8.8	4.3	1.2	0.2	cd
100%	100%	98%	96%	93%	89%	84%	79%	73%	66%	59%	51%	44%	35%	27%	19%	11%	5%	2%	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
77.7	77.7	76.4	74.6	72.2	69.0	65.4	61.2	56.5	51.4	45.9	40.0	33.8	27.5	21.1	14.8	8.8	4.3	1.2	0.2	cd
100%	100%	98%	96%	93%	89%	84%	79%	73%	66%	59%	51%	44%	35%	27%	19%	11%	5%	2%	0%	of 0°val

Document revision date: 31-8-2026 Measurement serial: VFR-260622-13621-SW

148-860 Spot | Ø78*16mm | 24V | 4W | white | 2700K/3000K | dim

Light Planning – UGR table

Uncorrected. comprehensive UGR table according to CIE 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 25.8	27.0	26.1	27.3	27.6	25.8	27.0	26.1	27.3	27.6
		3H 26.9	28.2	27.3	28.5	28.7	26.9	28.2	27.3	28.5	28.7
		4H 27.3	28.5	27.7	28.8	29.1	27.3	28.5	27.7	28.8	29.1
		6H 27.6	28.7	28.0	29.0	29.4	27.6	28.7	28.0	29.0	29.4
		8H 27.7	28.7	28.0	29.0	29.5	27.7	28.7	28.0	29.0	29.5
		12H 27.7	28.7	28.1	29.0	29.5	27.7	28.7	28.1	29.0	29.5
	4H	2H 26.3	27.5	26.7	27.8	28.1	26.3	27.5	26.7	27.8	28.1
		3H 27.7	28.7	28.1	29.0	29.5	27.7	28.7	28.1	29.0	29.5
		4H 28.1	29.1	28.6	29.5	30.0	28.1	29.1	28.6	29.5	30.0
		6H 28.5	29.4	29.0	29.7	30.1	28.5	29.4	29.0	29.7	30.1
		8H 28.5	29.4	29.1	29.7	30.1	28.5	29.4	29.1	29.7	30.1
		12H 28.6	29.3	29.1	29.7	30.2	28.6	29.3	29.1	29.7	30.2
	8H	4H 28.3	29.1	28.8	29.5	29.9	28.3	29.1	28.8	29.5	29.9
		6H 28.8	29.4	29.3	29.9	30.4	28.8	29.4	29.3	29.9	30.4
		8H 28.9	29.5	29.4	30.0	30.6	28.9	29.5	29.4	30.0	30.6
		12H 29.0	29.5	29.6	30.0	30.6	29.0	29.5	29.6	30.0	30.6
	12H	4H 28.3	29.0	28.8	29.4	29.9	28.3	29.0	28.8	29.4	29.9
		6H 28.8	29.4	29.3	29.9	30.5	28.8	29.4	29.3	29.9	30.5
		8H 28.9	29.4	29.5	29.9	30.6	28.9	29.4	29.5	29.9	30.6

Variations with the observer position for the luminaire spacings. S:		
S = 1.0H	0.1 / -0.2	0.1 / -0.2
S = 1.5H	0.3 / -0.4	0.3 / -0.4
S = 2.0H	0.7 / -0.9	0.7 / -0.9

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	99
1	108	104	99	95	106	101	97	94	97	94	91	93	90	88	89	87	85	83
2	99	90	83	78	96	88	82	77	85	79	75	81	77	73	78	75	71	69
3	90	79	71	64	87	78	70	64	74	68	63	72	66	61	69	64	60	58
4	82	70	61	54	80	69	60	54	66	59	53	64	58	52	61	56	52	49
5	76	63	54	47	73	61	53	47	59	52	46	57	51	45	55	50	45	43
6	70	56	47	41	68	55	47	41	53	46	40	52	45	40	50	44	39	37
7	65	51	42	36	63	50	42	36	49	41	36	47	40	35	46	40	35	33
8	60	47	38	32	59	46	38	32	44	37	32	43	36	32	42	36	31	29
9	56	43	34	29	55	42	34	29	41	34	29	40	33	28	39	33	28	26
10	53	39	31	26	51	39	31	26	38	31	26	37	30	26	36	30	26	24

Document revision date: 31-8-2026 Measurement serial: VFR-260622-13621-SW