



## PHOTOMETRIC LIGHT REPORT

**T48/20 | pendant |  
Ø26mm | black | 5W |  
2700K | 36° | DALI**

**Article number: 168-176**



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Lighting



**TRONIX**

168-176 T48/20 | pendant | Ø26mm | black | 5W | 2700K | 36° | DALI

## Introduction

### Purpose of this Document

This document provides accurate and objective photometric data for Tronix Lighting item 168-176. 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 168-176 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 168-176 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.

168-176 T48/20 | pendant | Ø26mm | black | 5W | 2700K | 36° | DALI

## Laboratory and equipment

Laboratory owner and location  
Gonio spectrometer system and type  
Spectrometer manufacturer and model

Flicker meter manufacturer and model  
Oscilloscope manufacturer and model  
Power meter manufacturer and model

Power source manufacturer and model

Datalogger Manufacturer and Model

Tronix Lighting BV. Uden. The Netherlands  
Viso Systems Type C. horizontal  
(Gonio) Ocean Optics STS VIS  
(Sphere) Admesy HERA VIS 380–780nm  
Viso Systems LabFlicker  
Tektronix MDO3024 oscilloscope (4 Channels. 200 MHz)  
VitreK PA900 Precision Multi-Channel Harmonic Power Analyzer  
(DC) Keithley Source Measure Unit SMU-2420 3A DC Source Meter  
(AC) Chroma 61601 AC Source  
Omega 8-Channel Thermocouple Thermometer/Data Logger

## Measurement conditions gonio spectrometer

Number of C-planes and Resolution  
 $\gamma$  (gamma)-Resolution  
Test Distance  
Room Temperature and Humidity  
Input Power. Power and Displacement Factors  
Frequency of Input Power  
Warm-up Time and Variation

2 planes – 180°  
2°  
1.81 m  
22°C +/- 10% – RH 50% +/- 20%  
5.0 W – PF 1.0 – DPF 1.0  
0 Hz  
Lamp stabilized in 15 min 3 sec --0.7%

## Tested light source

Manufacturer and Order Code  
Product Description

Tronix Lighting – 168-176  
T48/20 | pendant | Ø26mm | black | 5W | 2700K | 36° | DALI

## Main Light Measurement Results

Output – Total Lumen (Up% / Down%)  
Efficiency  
Energy efficiency class  
Peak Intensity and Beam Angle  
Correlated Colour Temperature  
Colour Shift. CIE duv  
Colour Rendering Index  
Colour Rendering TM30-18  
Television Lighting Consistency Index  
Flicker

327 lm – 0.4% / 99.6%  
65 lm/W  
G  
817 cd – 34.7°  
CCT = 2722 K  
Duv -0.0021  
CRI 94.3  
 $R_f$  91.1 –  $R_g$  103.7  
TLCI = 89  
SVM 0 – PstLM 0.01

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## Electrical measurement details

### Input Power

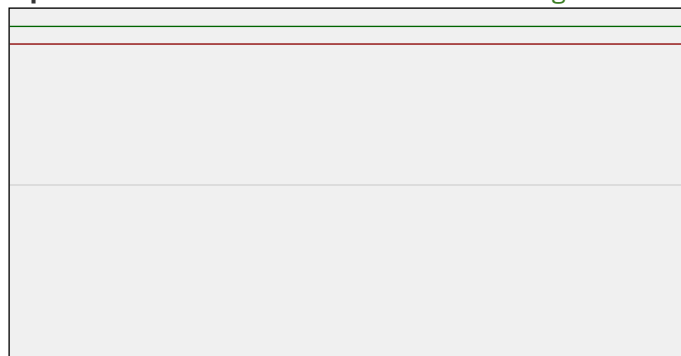
RMS Input voltage feed.  $V_{RMS}$  48.0 V  
 RMS Input current feed.  $I_{RMS}$  0.104 A  
 Total input power 5.0 W

Frequency of input power 0 Hz  
 Power factor 1.0  
 Displacement power factor 1.0

Total harmonic distortion of the current 0%  
 Total harmonic distortion of the voltage 0%

### Input Power Curve

Voltage - Current



### Efficiency

Radiated power efficiency: 24.4%



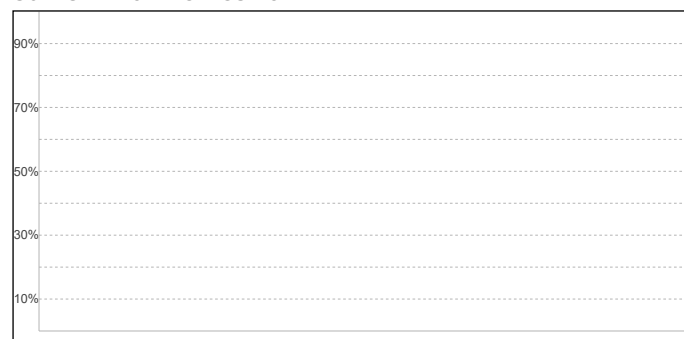
Lumen efficiency: 65 lm/W



### 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 | CCT start | 2743 K |
| Stable change max    | 2.0%   | CCT shift | -21 K  |
| Minimum warm-up time | 15 min | CCT end   | 2722 K |

### Colour temperature change during warm-up

### Warm-up Results

|                   |                                 |               |        |
|-------------------|---------------------------------|---------------|--------|
| Total warmup time | Lamp stabilized in 15 min 3 sec | Output start  | 329 lm |
| Warmup variation  | -0.7%                           | Output change | -2 lm  |
|                   |                                 | Output end    | 327 lm |

### Output intensity change during warm-up

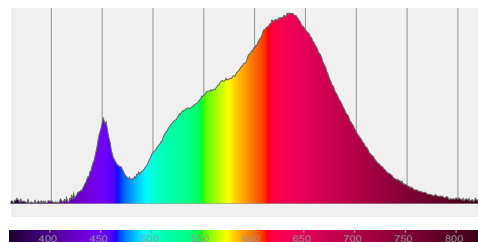
168-176 T48/20 | pendant | Ø26mm | black | 5W | 2700K | 36° | DALI

## Colour measurement details

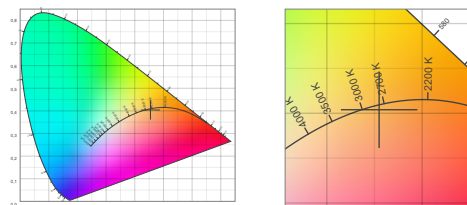
Total lumen output 327 lm  
 Correlated Colour Temperature 2722 K  
 Colour coordinates CIE 1931 (x;y) = (0.455;0.404)  
 Colour deviation from BBL Duv = -0.0021

TM30-18 Colour Fidelity Index  $R_f$  91.1  
 TM30-18 Colour Gamut Index  $R_g$  103.7  
 Colour Rendering Index (Ra) CRI 94.3  
 Colour Rendering Index. (red component)  $R_9 = 76.5$

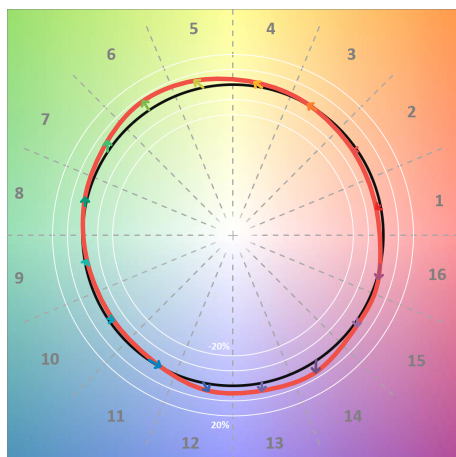
Colour Quality Scale CQS = 89.8  
 Television Lighting Consistency Index TLCI = 89



Relative spectral power distribution



## TM30 details

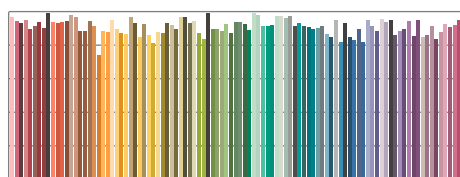


TM30 Colour vectors per hue bin

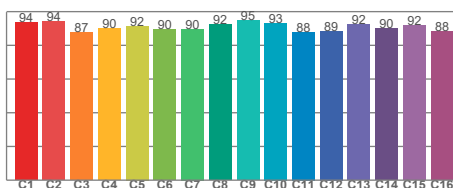


TM30 Colour distortion

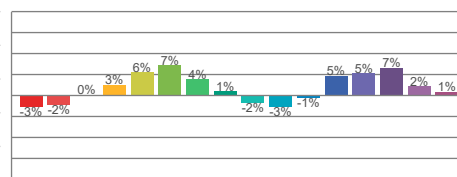
| Hue Bin | $R_f$ | Shifts (%) |     |
|---------|-------|------------|-----|
|         |       | Chroma     | Hue |
| C1      | 94    | -3%        | -1% |
| C2      | 94    | -2%        | 3%  |
| C3      | 87    | 0%         | 7%  |
| C4      | 90    | 3%         | 5%  |
| C5      | 92    | 6%         | 5%  |
| C6      | 90    | 7%         | 0%  |
| C7      | 90    | 4%         | -6% |
| C8      | 92    | 1%         | -5% |
| C9      | 95    | -2%        | -2% |
| C10     | 93    | -3%        | 3%  |
| C11     | 88    | -1%        | 8%  |
| C12     | 89    | 5%         | 4%  |
| C13     | 92    | 5%         | -1% |
| C14     | 90    | 7%         | -5% |
| C15     | 92    | 2%         | -5% |
| C16     | 88    | 1%         | -9% |



TM30-18  $R_f$ -values per reference colour

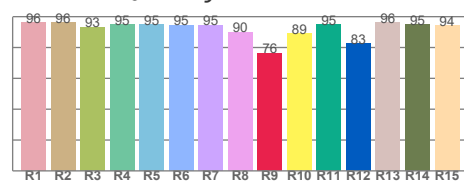


TM30-18  $R_f$ -values per hue bin

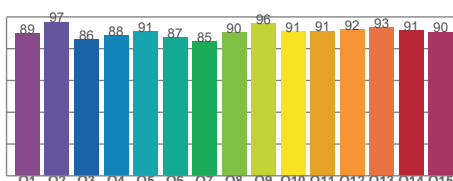


TM30 Chroma shift

## 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)

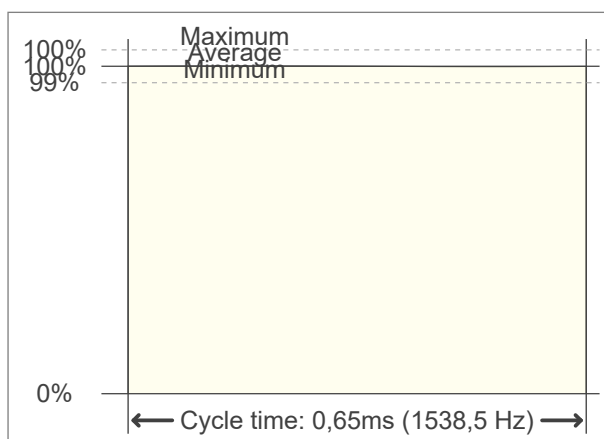
|                   |            |
|-------------------|------------|
| Flicker frequency | 1538.46 Hz |
| Percent flicker   | 0.17 %     |
| Flicker index     | 0          |

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

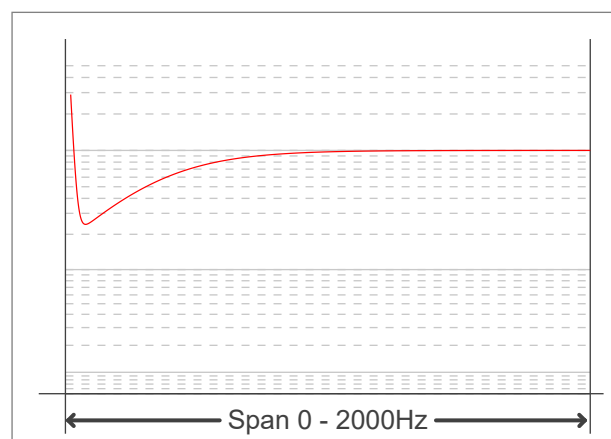
An LED luminaire is considered flicker-free if the SVM value is  $\leq 0.4$  and if the PstLM value is  $\leq 1.0$

|                                 |      |
|---------------------------------|------|
| PstLM value ( $F < 80$ Hz)      | 0.01 |
| SVM value ( $80 < F < 2000$ Hz) | 0    |

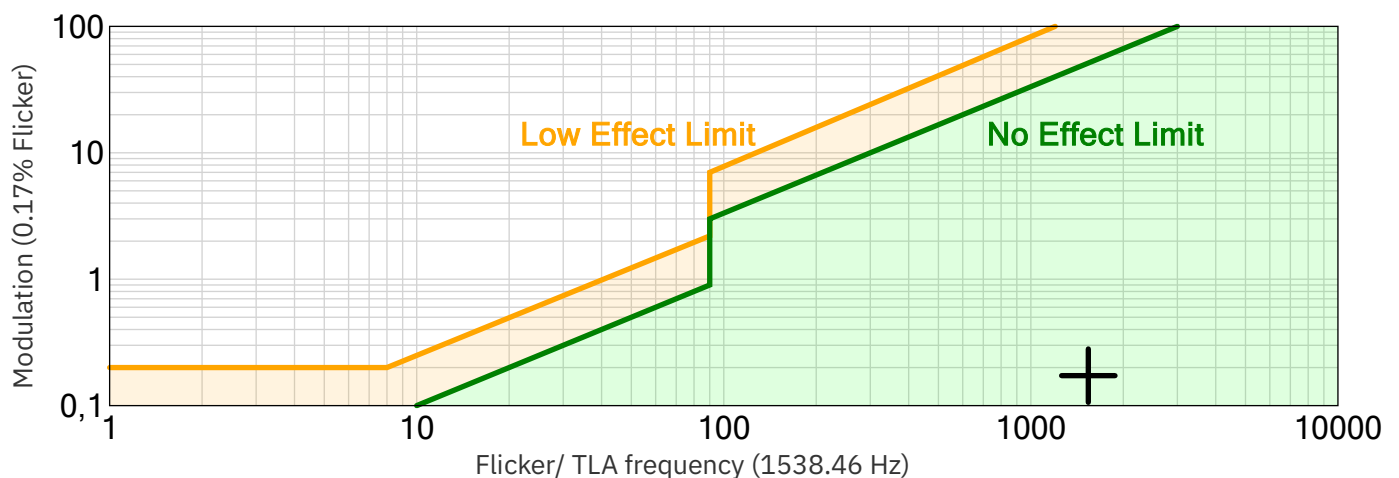
### Flicker frame (one flicker period in time domain)



### Flicker FFT (flicker curve in frequency domain)



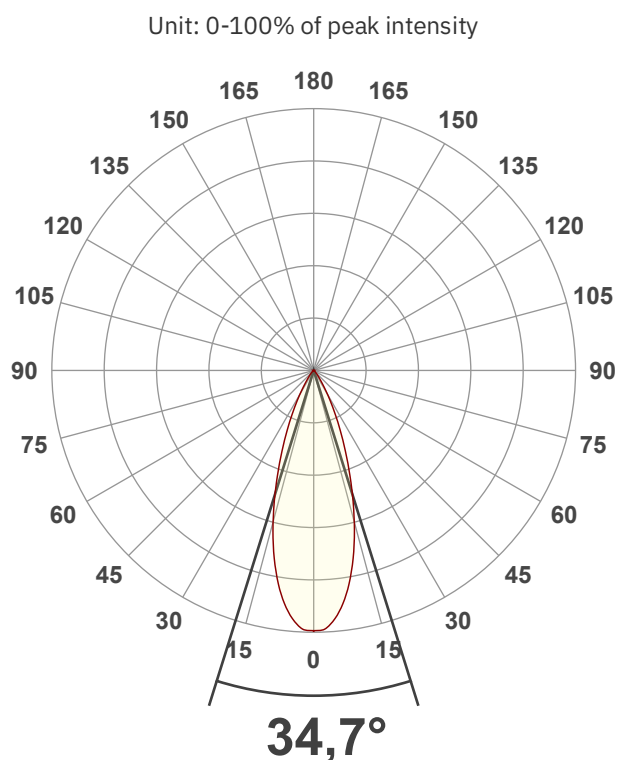
### IEEE 1789-2015 Lighting Flicker Risk Zones



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Beam angle

### Luminous Intensity diagram



### Main Values

|                      |              |
|----------------------|--------------|
| Output (total Lumen) | 327 lm       |
| Lumen Up/Down        | 0.4% / 99.6% |
| Peak Intensity       | 817 cd       |
| Beam Angle (50%)     | 34.7°        |
| Beam Angle (90%)     | 34.7°        |
| Beam Angle (10%)     | 34.7°        |

### Cut-off Angle

|              |     |
|--------------|-----|
| Average 2.5% | 78° |
|--------------|-----|

### Field Angle

|             |       |
|-------------|-------|
| Average 10% | 60.8° |
|-------------|-------|

### Intensity Ratio

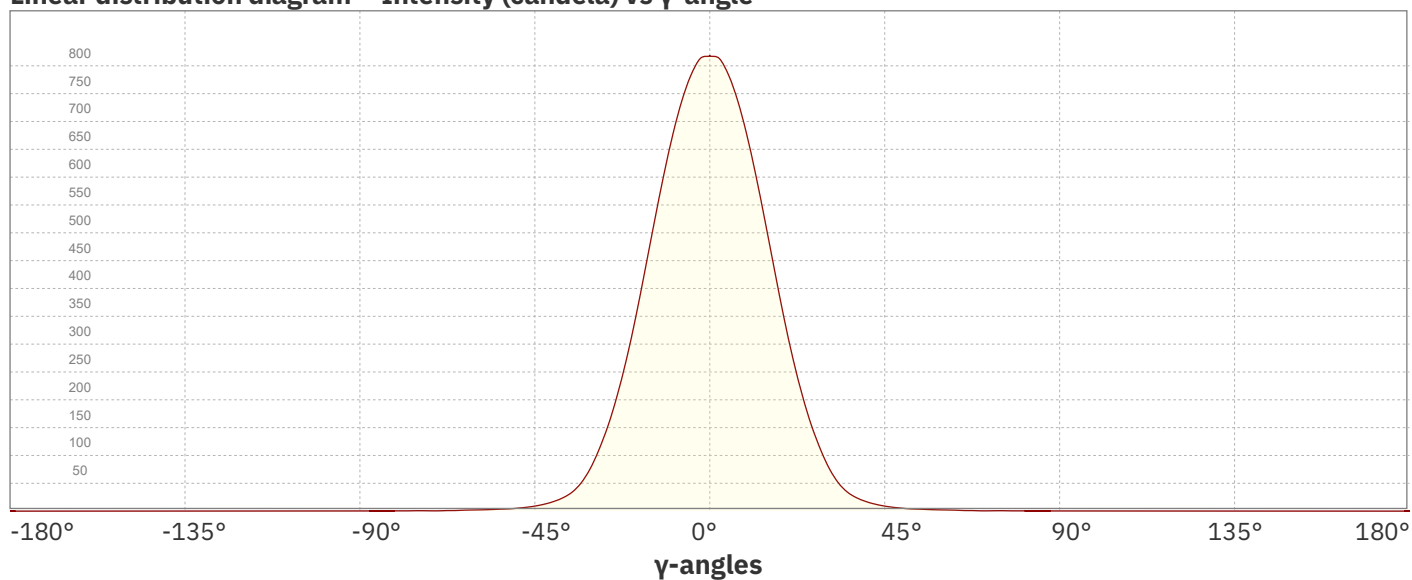
|              |       |
|--------------|-------|
| In 120° cone | 98.8% |
| In 90° cone  | 97.1% |

### C planes

C000-C180

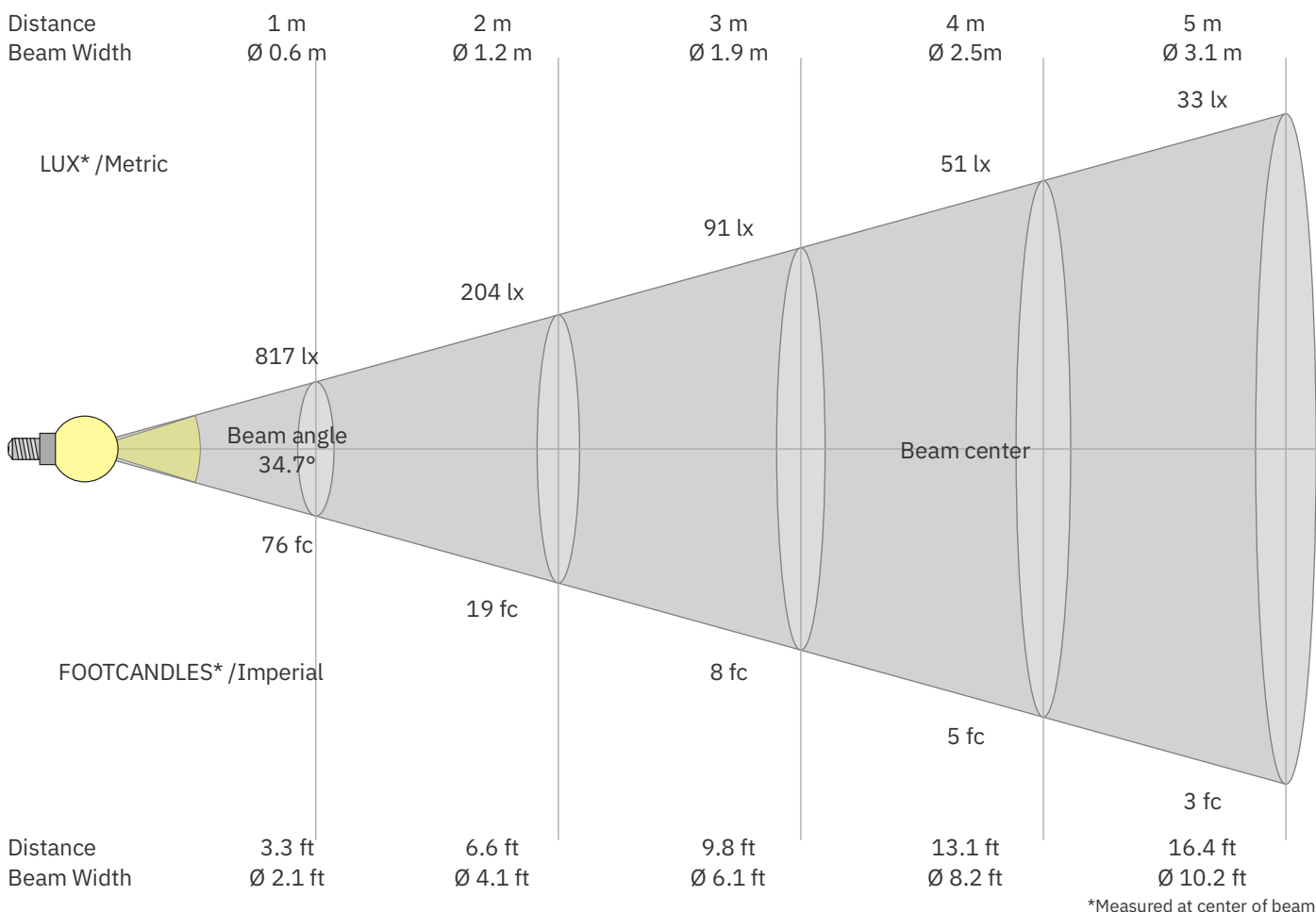
C090-C270

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



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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  |
| 817  | 204 | 91  | 51   | 33   | 23   | 17  | 13   | 10   | 8    | 7    | 6    | 5    | 4    | 4    | 3    | 3    | 3    | 2    | 2    | lux |
| 75.9 | 19  | 8.4 | 4.7  | 3    | 2.1  | 1.5 | 1.2  | 0.9  | 0.8  | 0.6  | 0.5  | 0.4  | 0.4  | 0.3  | 0.3  | 0.3  | 0.2  | 0.2  | 0.2  | fc  |

### Intensities in 0° c-plane

| 0°   | 2°   | 4°  | 6°  | 8°  | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ        |
|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|
| 817  | 814  | 793 | 760 | 716 | 661 | 598 | 528 | 456 | 385 | 318 | 257 | 203 | 157 | 120 | 88  | 62  | 44  | 32  | 23  | cd       |
| 100% | 100% | 97% | 93% | 88% | 81% | 73% | 65% | 56% | 47% | 39% | 31% | 25% | 19% | 15% | 11% | 8%  | 5%  | 4%  | 3%  | of 0°val |

### Intensities in 90° c-plane

| 0°   | 2°   | 4°  | 6°  | 8°  | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ        |
|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|
| 817  | 814  | 793 | 760 | 716 | 661 | 598 | 528 | 456 | 385 | 318 | 257 | 203 | 157 | 120 | 88  | 62  | 44  | 32  | 23  | cd       |
| 100% | 100% | 97% | 93% | 88% | 81% | 73% | 65% | 56% | 47% | 39% | 31% | 25% | 19% | 15% | 11% | 8%  | 5%  | 4%  | 3%  | of 0°val |

### Intensities in 180° c-plane

| 0°   | 2°   | 4°  | 6°  | 8°  | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ        |
|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|
| 817  | 814  | 793 | 760 | 716 | 661 | 598 | 528 | 456 | 385 | 318 | 257 | 203 | 157 | 120 | 88  | 62  | 44  | 32  | 23  | cd       |
| 100% | 100% | 97% | 93% | 88% | 81% | 73% | 65% | 56% | 47% | 39% | 31% | 25% | 19% | 15% | 11% | 8%  | 5%  | 4%  | 3%  | of 0°val |

### Intensities in 270° c-plane

| 0°   | 2°   | 4°  | 6°  | 8°  | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ        |
|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|
| 817  | 814  | 793 | 760 | 716 | 661 | 598 | 528 | 456 | 385 | 318 | 257 | 203 | 157 | 120 | 88  | 62  | 44  | 32  | 23  | cd       |
| 100% | 100% | 97% | 93% | 88% | 81% | 73% | 65% | 56% | 47% | 39% | 31% | 25% | 19% | 15% | 11% | 8%  | 5%  | 4%  | 3%  | 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<br>above eye level                               |     | (Viewing direction orthogonal to lamp length axis) |      |      |      |      | (Viewing direction parallel to lamp length axis) |      |      |      |      |
| X                                                                    | Y   |                                                    |      |      |      |      |                                                  |      |      |      |      |
| 2H                                                                   | 2H  | 20.3                                               | 20.8 | 20.4 | 21.0 | 21.2 | 20.3                                             | 20.8 | 20.4 | 21.0 | 21.2 |
|                                                                      | 3H  | 20.1                                               | 20.8 | 20.5 | 20.9 | 21.1 | 20.1                                             | 20.8 | 20.5 | 20.9 | 21.1 |
|                                                                      | 4H  | 20.1                                               | 20.7 | 20.5 | 20.9 | 21.2 | 20.1                                             | 20.7 | 20.5 | 20.9 | 21.2 |
|                                                                      | 6H  | 20.2                                               | 20.7 | 20.5 | 21.0 | 21.3 | 20.2                                             | 20.7 | 20.5 | 21.0 | 21.3 |
|                                                                      | 8H  | 20.2                                               | 20.7 | 20.5 | 21.0 | 21.4 | 20.2                                             | 20.7 | 20.5 | 21.0 | 21.4 |
|                                                                      | 12H | 20.3                                               | 20.7 | 20.6 | 21.1 | 21.5 | 20.3                                             | 20.7 | 20.6 | 21.1 | 21.5 |
| 4H                                                                   | 2H  | 20.0                                               | 20.7 | 20.4 | 20.9 | 21.1 | 20.0                                             | 20.7 | 20.4 | 20.9 | 21.1 |
|                                                                      | 3H  | 20.0                                               | 20.5 | 20.4 | 20.9 | 21.3 | 20.0                                             | 20.5 | 20.4 | 20.9 | 21.3 |
|                                                                      | 4H  | 20.0                                               | 20.5 | 20.4 | 20.9 | 21.4 | 20.0                                             | 20.5 | 20.4 | 20.9 | 21.4 |
|                                                                      | 6H  | 20.1                                               | 20.6 | 20.6 | 20.9 | 21.2 | 20.1                                             | 20.6 | 20.6 | 20.9 | 21.2 |
|                                                                      | 8H  | 20.1                                               | 20.6 | 20.6 | 20.9 | 21.3 | 20.1                                             | 20.6 | 20.6 | 20.9 | 21.3 |
|                                                                      | 12H | 20.3                                               | 20.6 | 20.8 | 21.0 | 21.5 | 20.3                                             | 20.6 | 20.8 | 21.0 | 21.5 |
| 8H                                                                   | 4H  | 19.9                                               | 20.4 | 20.4 | 20.7 | 21.1 | 19.9                                             | 20.4 | 20.4 | 20.7 | 21.1 |
|                                                                      | 6H  | 20.1                                               | 20.4 | 20.6 | 20.8 | 21.4 | 20.1                                             | 20.4 | 20.6 | 20.8 | 21.4 |
|                                                                      | 8H  | 20.3                                               | 20.5 | 20.8 | 21.0 | 21.6 | 20.3                                             | 20.5 | 20.8 | 21.0 | 21.6 |
|                                                                      | 12H | 20.6                                               | 20.8 | 21.2 | 21.3 | 21.9 | 20.6                                             | 20.8 | 21.2 | 21.3 | 21.9 |
| 12H                                                                  | 4H  | 19.9                                               | 20.2 | 20.4 | 20.6 | 21.1 | 19.9                                             | 20.2 | 20.4 | 20.6 | 21.1 |
|                                                                      | 6H  | 20.1                                               | 20.3 | 20.6 | 20.9 | 21.5 | 20.1                                             | 20.3 | 20.6 | 20.9 | 21.5 |
|                                                                      | 8H  | 20.3                                               | 20.5 | 20.9 | 21.0 | 21.6 | 20.3                                             | 20.5 | 20.9 | 21.0 | 21.6 |
| Variations with the observer position for the luminaire spacings. S: |     |                                                    |      |      |      |      |                                                  |      |      |      |      |
| S = 1.0H                                                             |     | 3.8 / -2.5                                         |      |      |      |      | 3.8 / -2.5                                       |      |      |      |      |
| S = 1.5H                                                             |     | 6.3 / -2.9                                         |      |      |      |      | 6.3 / -2.9                                       |      |      |      |      |
| S = 2.0H                                                             |     | 8.1 / -3.6                                         |      |      |      |      | 8.1 / -3.6                                       |      |      |      |      |

## 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                   | 114                                                                            | 112 | 110 | 108 | 112 | 110 | 108 | 106 | 105 | 104 | 103 | 102 | 101 | 99  | 98  | 97  | 96  | 95  |
| 2                   | 110                                                                            | 105 | 102 | 99  | 107 | 104 | 101 | 98  | 100 | 98  | 96  | 97  | 95  | 94  | 95  | 93  | 92  | 90  |
| 3                   | 105                                                                            | 100 | 96  | 92  | 103 | 98  | 95  | 91  | 96  | 93  | 90  | 93  | 91  | 89  | 91  | 89  | 87  | 86  |
| 4                   | 101                                                                            | 95  | 90  | 87  | 99  | 94  | 89  | 86  | 92  | 88  | 85  | 90  | 87  | 84  | 88  | 85  | 83  | 82  |
| 5                   | 97                                                                             | 90  | 85  | 82  | 96  | 89  | 85  | 81  | 88  | 84  | 81  | 86  | 83  | 80  | 84  | 82  | 79  | 78  |
| 6                   | 94                                                                             | 86  | 81  | 78  | 92  | 85  | 81  | 77  | 84  | 80  | 77  | 83  | 79  | 76  | 81  | 78  | 76  | 75  |
| 7                   | 90                                                                             | 82  | 77  | 74  | 89  | 82  | 77  | 74  | 81  | 76  | 73  | 79  | 76  | 73  | 78  | 75  | 73  | 71  |
| 8                   | 87                                                                             | 79  | 74  | 71  | 86  | 78  | 74  | 71  | 77  | 73  | 70  | 76  | 73  | 70  | 76  | 72  | 70  | 68  |
| 9                   | 84                                                                             | 76  | 71  | 68  | 83  | 75  | 71  | 68  | 75  | 70  | 67  | 74  | 70  | 67  | 73  | 69  | 67  | 66  |
| 10                  | 81                                                                             | 73  | 68  | 65  | 80  | 73  | 68  | 65  | 72  | 68  | 65  | 71  | 67  | 65  | 70  | 67  | 64  | 63  |