

# Light Measurement Report

Print date: 11.06.2025

Measurement date and time: 11.06.2025 13:25:55 – Measurement no. VFR-250611-0166-MS

Measurement tracking No. and Link: [n/a](#)

Operator:

## Laboratory and Equipment

Laboratory Owner and Location

Goniospectrometer System and Type

Sensor Name, Calibr. Date and Serial No.

Spectrometer Manufacturer and Model

Viso Systems, awLed by audiowerk GmbH, Switzerland

LightSpion – Type C, horizontal

n/a – 08.04.2025 – 2772868121

Ibsen Photonics, Denmark – Pebble VIS (Custom Viso)

## Measurement Conditions

Number of C-planes and Resolution

$\gamma$  (gamma)-Resolution

Test Distance

Input Power, Power and Displ. Factors

Input RMS Voltage and Current

Frequency of Input Power

Warm-up Time and Variation

4 planes – 90°

7.5°

0.66 m

20.2 W – PF 1.0 – DPF 0.0

24.0 V – 0.840 A

0 Hz

Lampe stabilisiert in 3 Min. 2 Sek. – 2.0%

## Tested Light Source

Product Name

Item No. and Manufacturer

Shape an dimension

FLEX STRIP HP-COB 288 MONO WW 1m 241120

AS1COB28806 – awLed by audiowerk GmbH

Length: 1000mm

Width: 10mm

Height: 5mm

Charge: 241120

Product Description

## Main Light Measurement Results

Output – Total Lumen (Up% / Down%)

Output – Lumen/m

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

2777 lm – 11.99% / 88.01%

2776 lm/m

138 lm/W

677 cd – 130.5°

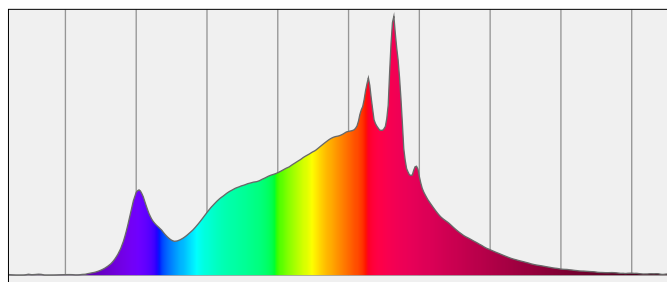
CCT = 3032 K / 3032 K

CRI 92.6

R<sub>f</sub> 91.1 – R<sub>g</sub> 98.3

Duv 0.0012 – SDCM n/a

SVM n/a – PstLM n/a



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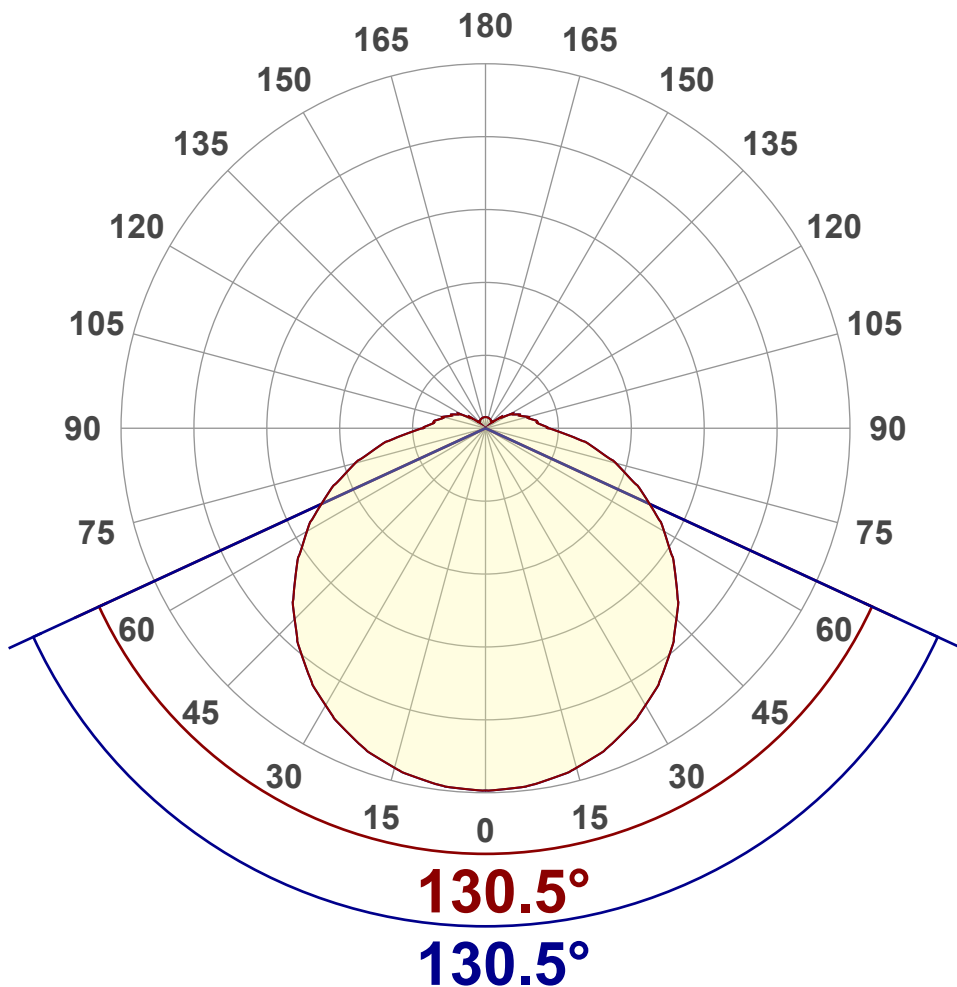
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## Luminous Intensity diagram

Unit: 0-100% of peak intensity



## Main Values

|                      |                 |
|----------------------|-----------------|
| Output (total Lumen) | 2777 lm         |
| Lumen Up% / Down%    | 11.99% / 88.01% |
| Peak Intensity       | 677 cd          |
| Beam Angle (50%)     | 130.5°          |
| Beam Angle (90%)     | 130.5°          |
| Beam Angle (10%)     | 130.5°          |

## Cut-off Angle

|              |      |
|--------------|------|
| Average 2,5% | 360° |
|--------------|------|

## Field Angle

|             |        |
|-------------|--------|
| Average 10% | 224.8° |
|-------------|--------|

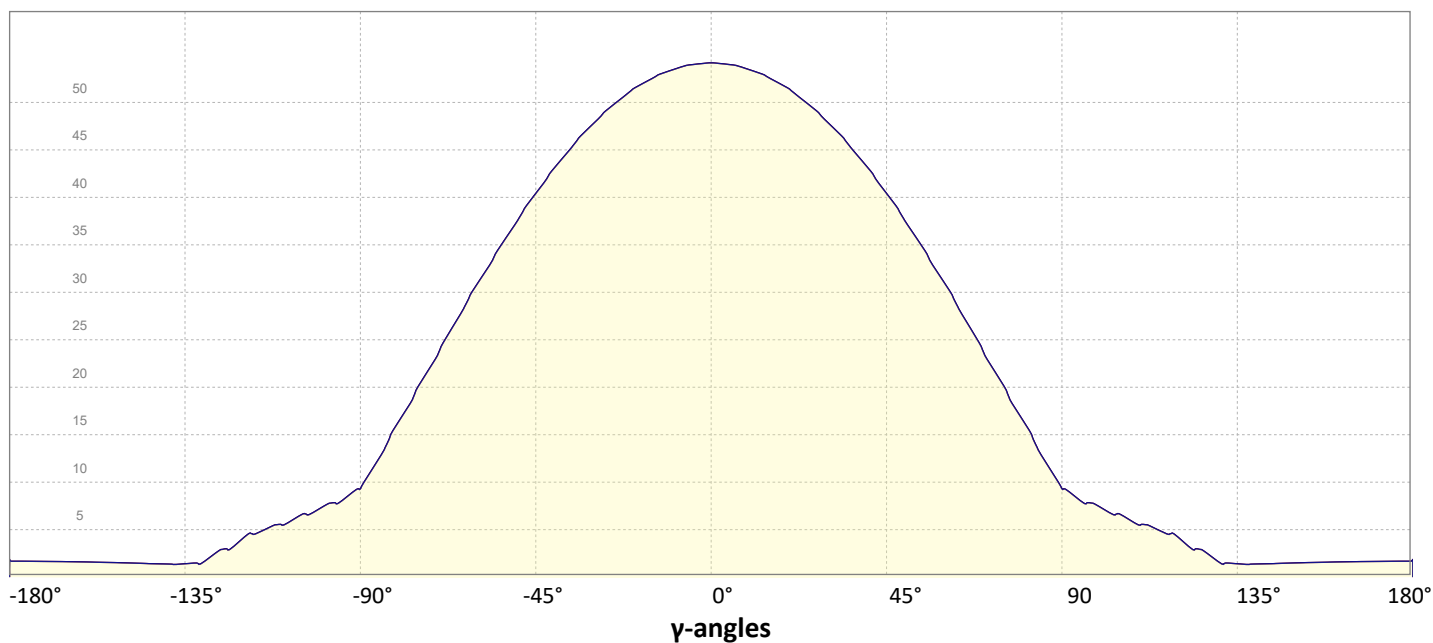
## Intensity Ratio

|              |       |
|--------------|-------|
| In 120° cone | 60.0% |
| In 90° cone  | 39.2% |

**C000-C180**

**C090-C270**

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



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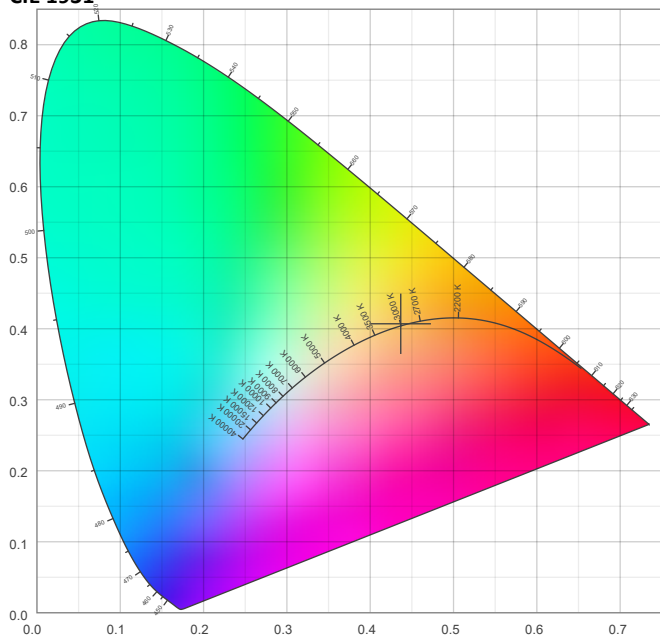
Operator:

## Color details

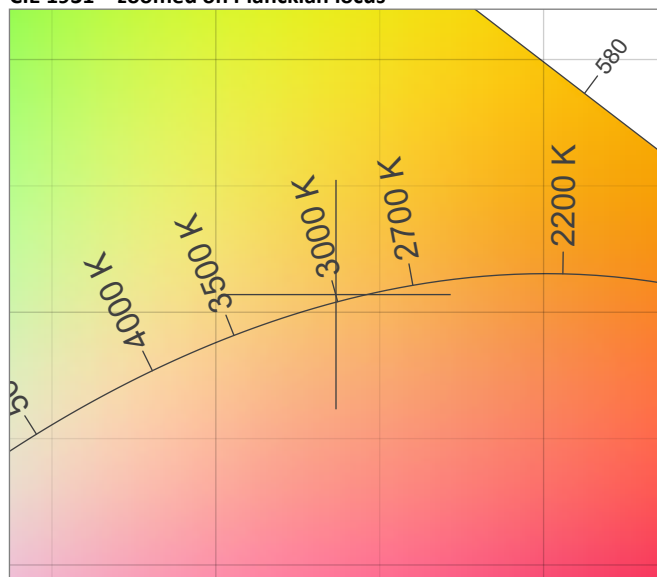
Correlated Color Temperature, Target CCT = 3032 K  
Correlated Color Temperature, Measured CCT = 3032 K  
Color Rendering Index CRI 92.6  
Color Rendering Index, R9 (red component) R9 = 51.6  
Color Rendering TM30-18 R<sub>f</sub> 91.1 – R<sub>g</sub> 98.3  
Color Quality Scale CQS = 90.8

MacAdam Steps  
Color coordinates CIE 1931 (x;y) = (0.437;0.407)  
Color coordinate CIEs 1960 (u;v) = (0.249;0.348)  
Color deviation from BBL Duv = 0.0012  
Color coordinate CIEs 1976 (CIELUV) (u';v') = (0.249;0.522)

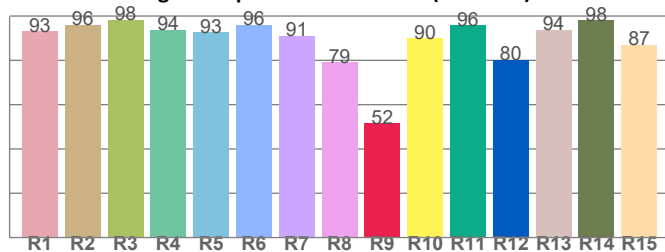
### CIE 1931



### CIE 1931 – zoomed on Planckian locus



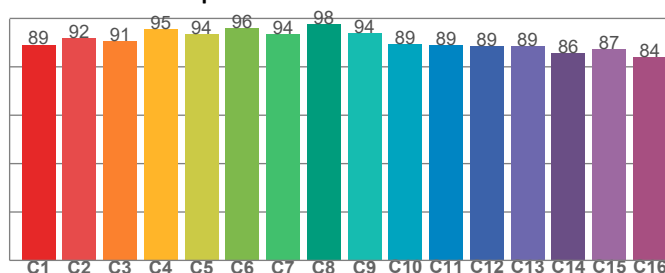
### Color Rendering Index per reference color (CIE 1995)



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  |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 93.1 | 96.1 | 98.4 | 93.9 | 92.8 | 96.1 | 91.1 | 79.3 | 51.6 | 90.0 | 95.8 | 80.2 | 93.9 | 98.2 | 87.1 |

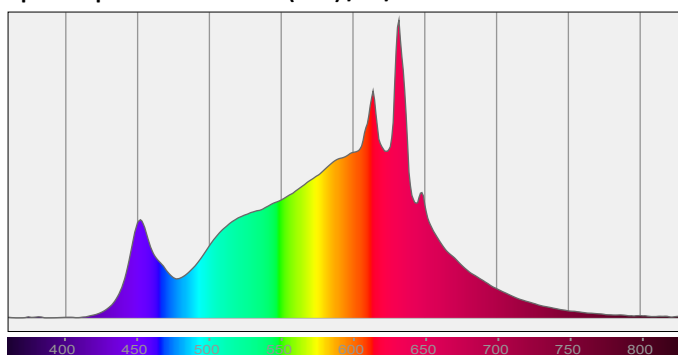
### TM30-18 R<sub>f</sub>-values per hue bin



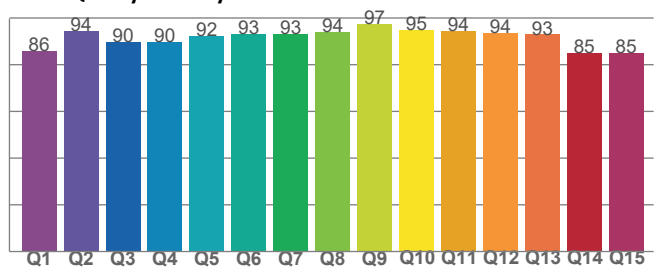
TM30 C values, 16 binned values out of total of 99 C values

| C1   | C2   | C3   | C4   | C5   | C6   | C7   | C8   | C9   | C10  | C11  | C12  | C13  | C14  | C15  | C16  |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 89.1 | 91.9 | 90.7 | 95.4 | 93.5 | 96.1 | 93.6 | 97.8 | 93.9 | 89.3 | 89.1 | 88.6 | 88.6 | 85.5 | 87.2 | 84.1 |

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



### Color Quality Scale by reference color



CQS Q values

| Q1   | Q2   | Q3   | Q4   | Q5   | Q6   | Q7   | Q8   | Q9   | Q10  | Q11  | Q12  | Q13  | Q14  | Q15  |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 85.8 | 94.3 | 89.7 | 89.7 | 92.4 | 93.2 | 93.1 | 93.9 | 97.5 | 95.0 | 94.5 | 93.8 | 93.0 | 85.1 | 85.1 |

## Beam Details

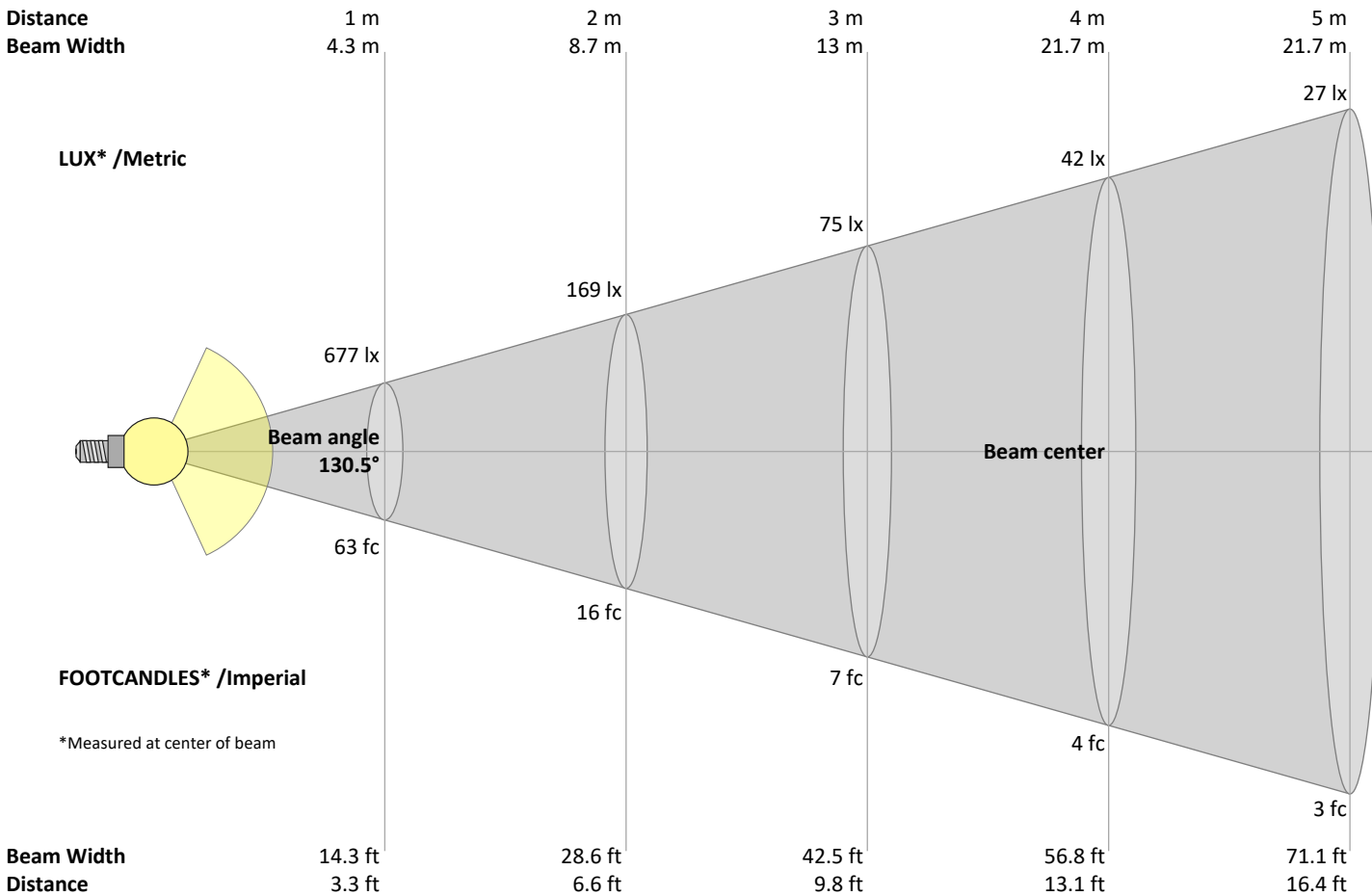
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### Beam intensities from 1 – 20 m

|      |      |     |      |      |      |     |      |      |      |      |      |      |      |      |      |      |      |      |      |     |
|------|------|-----|------|------|------|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|
| 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  |
| 677  | 169  | 75  | 42   | 27   | 19   | 14  | 11   | 8    | 7    | 6    | 5    | 4    | 3    | 3    | 3    | 2    | 2    | 2    | 2    | lux |
| 62.9 | 15.7 | 7   | 3.9  | 2.5  | 1.7  | 1.3 | 1    | 0.8  | 0.6  | 0.5  | 0.4  | 0.4  | 0.3  | 0.3  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 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° | $\gamma$ |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|----------|
| 677  | 669 | 649 | 614 | 565 | 505 | 436 | 359 | 277 | 198 | 117 | 94  | 73   | 57   | 35   | 18   | 18   | 19   | 20   | 21   | cd       |
| 100% | 99% | 96% | 91% | 83% | 75% | 64% | 53% | 41% | 29% | 17% | 14% | 11%  | 8%   | 5%   | 3%   | 3%   | 3%   | 3%   | 3%   | 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        |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|----------|
| 677  | 669 | 649 | 614 | 565 | 505 | 436 | 359 | 277 | 198 | 117 | 94  | 73   | 57   | 35   | 18   | 18   | 19   | 20   | 21   | cd       |
| 100% | 99% | 96% | 91% | 83% | 75% | 64% | 53% | 41% | 29% | 17% | 14% | 11%  | 8%   | 5%   | 3%   | 3%   | 3%   | 3%   | 3%   | 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° | $\gamma$ |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|----------|
| 677  | 669 | 649 | 614 | 565 | 505 | 436 | 359 | 277 | 198 | 117 | 94  | 73   | 57   | 35   | 18   | 18   | 19   | 20   | 21   | cd       |
| 100% | 99% | 96% | 91% | 83% | 75% | 64% | 53% | 41% | 29% | 17% | 14% | 11%  | 8%   | 5%   | 3%   | 3%   | 3%   | 3%   | 3%   | 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        |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|----------|
| 677  | 669 | 649 | 614 | 565 | 505 | 436 | 359 | 277 | 198 | 117 | 94  | 73   | 57   | 35   | 18   | 18   | 19   | 20   | 21   | cd       |
| 100% | 99% | 96% | 91% | 83% | 75% | 64% | 53% | 41% | 29% | 17% | 14% | 11%  | 8%   | 5%   | 3%   | 3%   | 3%   | 3%   | 3%   | 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                                                            |     | 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  | 26.6                                               | 27.8 | 27.0       | 28.3 | 28.7 | 28.6                                             | 29.8       | 29.0 | 30.3 | 30.8 |
|                                                                      | 3H  | 28.1                                               | 29.3 | 28.6       | 29.8 | 30.2 | 30.7                                             | 31.9       | 31.3 | 32.4 | 32.8 |
|                                                                      | 4H  | 28.8                                               | 29.9 | 29.3       | 30.4 | 30.9 | 31.8                                             | 32.9       | 32.4 | 33.4 | 33.9 |
|                                                                      | 6H  | 29.4                                               | 30.4 | 29.9       | 30.9 | 31.5 | 33.0                                             | 34.0       | 33.5 | 34.5 | 35.1 |
|                                                                      | 8H  | 29.7                                               | 30.7 | 30.2       | 31.2 | 31.8 | 33.6                                             | 34.6       | 34.1 | 35.1 | 35.7 |
|                                                                      | 12H | 29.9                                               | 30.9 | 30.4       | 31.4 | 32.0 | 34.2                                             | 35.2       | 34.7 | 35.7 | 36.3 |
| 4H                                                                   | 2H  | 27.3                                               | 28.5 | 27.9       | 29.0 | 29.5 | 28.9                                             | 30.0       | 29.5 | 30.5 | 31.0 |
|                                                                      | 3H  | 29.1                                               | 30.1 | 29.6       | 30.6 | 31.3 | 31.2                                             | 32.3       | 31.8 | 32.7 | 33.4 |
|                                                                      | 4H  | 29.8                                               | 30.9 | 30.5       | 31.4 | 32.1 | 32.4                                             | 33.4       | 33.0 | 33.9 | 34.6 |
|                                                                      | 6H  | 30.6                                               | 31.4 | 31.2       | 32.0 | 32.6 | 33.6                                             | 34.5       | 34.3 | 35.0 | 35.6 |
|                                                                      | 8H  | 30.9                                               | 31.7 | 31.5       | 32.2 | 32.8 | 34.3                                             | 35.0       | 34.9 | 35.6 | 36.2 |
|                                                                      | 12H | 31.2                                               | 31.8 | 31.8       | 32.4 | 33.1 | 35.0                                             | 35.6       | 35.6 | 36.2 | 36.9 |
| 8H                                                                   | 4H  | 30.3                                               | 31.1 | 31.0       | 31.6 | 32.2 | 32.5                                             | 33.3       | 33.2 | 33.9 | 34.5 |
|                                                                      | 6H  | 31.2                                               | 31.8 | 31.9       | 32.5 | 33.2 | 33.9                                             | 34.5       | 34.6 | 35.2 | 35.9 |
|                                                                      | 8H  | 31.6                                               | 32.2 | 32.3       | 32.9 | 33.7 | 34.6                                             | 35.2       | 35.3 | 35.9 | 36.7 |
|                                                                      | 12H | 32.0                                               | 32.5 | 32.8       | 33.2 | 34.0 | 35.4                                             | 35.9       | 36.2 | 36.6 | 37.4 |
| 12H                                                                  | 4H  | 30.4                                               | 31.0 | 31.0       | 31.6 | 32.3 | 32.5                                             | 33.2       | 33.2 | 33.8 | 34.5 |
|                                                                      | 6H  | 31.4                                               | 31.9 | 32.0       | 32.6 | 33.4 | 33.9                                             | 34.5       | 34.6 | 35.2 | 36.0 |
|                                                                      | 8H  | 31.8                                               | 32.3 | 32.6       | 33.0 | 33.8 | 34.7                                             | 35.2       | 35.4 | 35.9 | 36.6 |
| Variations with the observer position for the luminaire spacings, S: |     |                                                    |      |            |      |      |                                                  |            |      |      |      |
| S = 1.0H                                                             |     |                                                    |      | 0.1 / -0.1 |      |      |                                                  | 0.1 / -0.1 |      |      |      |
| S = 1.5H                                                             |     |                                                    |      | 0.1 / -0.2 |      |      |                                                  | 0.3 / -0.3 |      |      |      |
| S = 2.0H                                                             |     |                                                    |      | 0.3 / -0.4 |      |      |                                                  | 0.7 / -0.7 |      |      |      |

## 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                   | 116 | 116                      | 116 | 116 | 112                                                                            | 112 | 112 | 112 | 104 | 104 | 104 | 97 | 97 | 97 | 91 | 91 | 91 | 88 |
| 1                   | 103 | 98                       | 93  | 88  | 99                                                                             | 94  | 90  | 85  | 88  | 84  | 80  | 82 | 79 | 76 | 76 | 74 | 71 | 68 |
| 2                   | 93  | 84                       | 76  | 69  | 89                                                                             | 81  | 74  | 68  | 75  | 69  | 64  | 70 | 65 | 61 | 65 | 61 | 58 | 55 |
| 3                   | 84  | 73                       | 64  | 57  | 81                                                                             | 70  | 62  | 55  | 65  | 58  | 53  | 61 | 55 | 50 | 57 | 52 | 48 | 45 |
| 4                   | 77  | 64                       | 54  | 47  | 73                                                                             | 62  | 53  | 46  | 58  | 50  | 44  | 54 | 47 | 42 | 50 | 45 | 41 | 38 |
| 5                   | 70  | 57                       | 47  | 40  | 67                                                                             | 55  | 46  | 39  | 51  | 44  | 38  | 48 | 41 | 36 | 45 | 39 | 35 | 32 |
| 6                   | 65  | 51                       | 41  | 35  | 62                                                                             | 49  | 40  | 34  | 46  | 38  | 33  | 43 | 37 | 32 | 41 | 35 | 30 | 28 |
| 7                   | 60  | 46                       | 37  | 30  | 57                                                                             | 44  | 36  | 30  | 42  | 34  | 29  | 39 | 33 | 28 | 37 | 31 | 27 | 24 |
| 8                   | 56  | 42                       | 33  | 27  | 53                                                                             | 40  | 32  | 26  | 38  | 31  | 26  | 36 | 29 | 25 | 34 | 28 | 24 | 22 |
| 9                   | 52  | 38                       | 30  | 24  | 50                                                                             | 37  | 29  | 24  | 35  | 28  | 23  | 33 | 27 | 22 | 31 | 26 | 21 | 19 |
| 10                  | 49  | 35                       | 27  | 22  | 47                                                                             | 34  | 26  | 21  | 32  | 25  | 21  | 31 | 24 | 20 | 29 | 23 | 19 | 17 |

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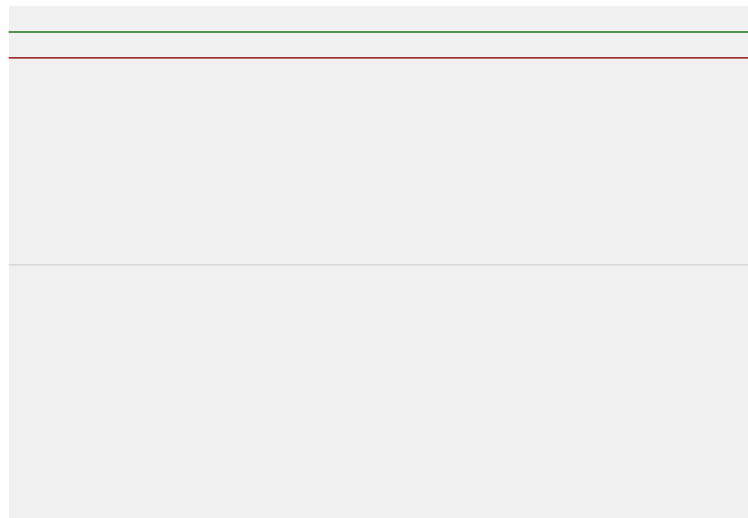
Operator:

## Power Details

### Input Power

|                                                     |          |
|-----------------------------------------------------|----------|
| Power feed to light source                          | 20.2 W   |
| Frequency of input power                            | 0 Hz     |
| RMS Input voltage feed, $V_{RMS}$                   | 24.0 V   |
| RMS Input current feed, $I_{RMS}$                   | 0.840 A  |
| Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$ | 20.17 VA |
| Displacement factor of AC power feed                | 0.0      |
| Power factor of AC current feed                     | 1.0      |
| Total harmonic distortion of the current            | 0%       |
| Total harmonic distortion of the voltage            | 0%       |

### Input Power Curve



### Efficiency

Radiated power efficiency 42.7%



Lumen efficiency 138 lm/W



## Stabilization Details

### Warmup Conditions

|                   |       |
|-------------------|-------|
| Stable period     | 3 Min |
| Stable change max | 2.0%  |
| Minimum time      | 3 Min |

### Color Temperature Change

|           |        |
|-----------|--------|
| CCT start | 3045 K |
| CCT shift | -13 K  |
| CCT end   | 3032 K |

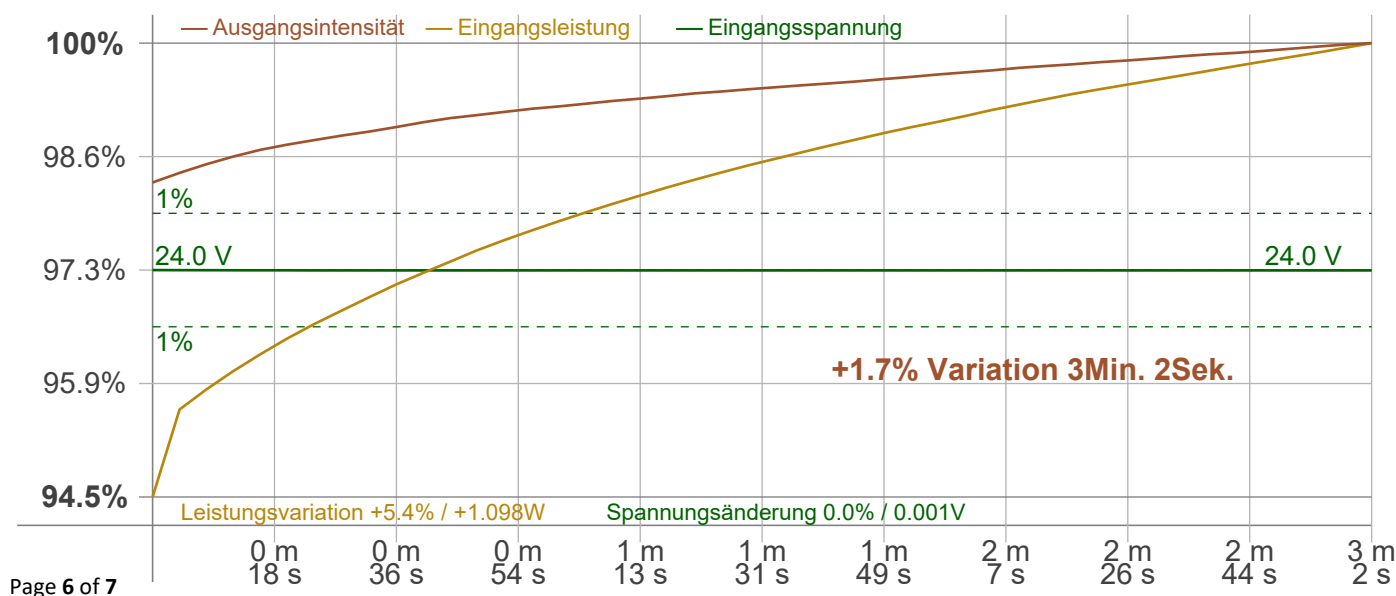
### Warmup Result

|                   |                                     |
|-------------------|-------------------------------------|
| Total warmup time | Lampe stabilisiert in 3 Min. 2 Sek. |
| Warmup variation  | +1.7%                               |

### Output Change

|               |         |
|---------------|---------|
| Output start  | 2736 lm |
| Output change | +41 lm  |
| Output end    | 2777 lm |

### Stabilization Curve



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## Flicker /TLA details

Flicker Meter Type Viso Systems LabFlicker  
Frequency of input power 0 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 %

### 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

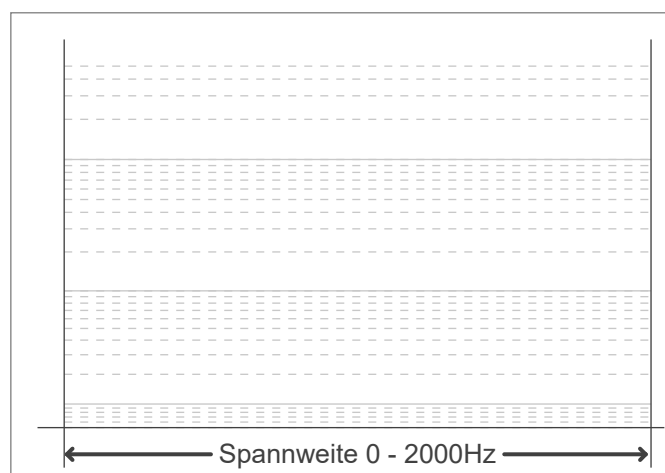
### Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp n/a

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



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



### IEEE 1789 Frequency/modulation plot

