**BESTWAY COMPLIANCE CO., LTD.**

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# LM-79-19 Test Report

For

## RAB LIGHTING Inc

## (Brand Name: RAB LIGHTING)

Room 609, Building C, MixC, No. 1799 Wuzhong Road

Minhang District, Shanghai, China

Xiao Xiang,15921313292, gary.xiao@rablighting.com

# Model name(s):
# FR1X4[Blank, /E, /LCB]

| | |
|---|---|
| **Report Type:** | Testing and Report According to IES LM-79-2019 |
| **Type of Luminaire:** | 1x4 Luminaires for Ambient Lighting of Interior Commercial Spaces |
| **Report Date:** | 2024-09-30 |

Test & Report By:

Engineer: Ferrum Li

Review By:

Manager: Garman Mo

Note: 1.The results contained in this report pertain only to the tested samples.

2.This report does not imply product certification, approval, or endorsement by A2LA or any agency of the Federal Government.

| **1.1 Product Information:** | | |
|---|---|---|
| Model Number | FR1X4[Blank, /E, /LCB] | |
| Remark | The [Blank, /E, /LCB] can be E=emergency backup, LCB=smart controller or Blank=no emergency backup and smart controller provided. | |
| Representative (Tested) Model | FR1X4(0%,3000K)<br>FR1X4(50%,4000K)<br>FR1X4(100%,6500K) | |
| Model Difference | N/A | |
| SKU (if available) | -- | |
| Type of Luminaire<br>(for integral lamps, list base type and lamp type) | 1x4 Luminaires for Ambient Lighting of Interior Commercial Spaces | |
| LED Manufacturer | Bridgelux Inc. | |
| LED Model | BXEN-30E-21L-3F<br>BXEN-65E-21L-3F | |
| Integral Controls Availability | Yes | |
| Dimming | Continuous | |
| Sample Number | JDE240618-B1 | |
| Date of Receipt | 2024-09-23 | |
| Luminaire Aperture (for downlights) | -- | in. |
| Luminaire Length | -- | mm |
| Luminaire Width | -- | mm |
| Number of Units (modular products) | N/A | s |

| **1.2 Rated Values:** | |
|---|---|
| Rated Voltage / Frequency | 120-277Vac, 50/60Hz |
| Nominal Power | 20W/25W/30W/35W/40W (Power adjustable) |
| Rated Initial Lamp Lumen | -- |
| Declared CCT | 3000K/3500K/4000K/5000K/6500K<br>(Color Tunable) |

## 1.3 Test Specifications:

| | |
|---|---|
| Test item | 1. Total Luminous Flux<br>2. Luminous Distribution Intensity<br>3. Luminous Efficacy<br>4. Correlated Color Temperature<br>5. Color Rendering Index<br>6. Chromaticity Coordinate<br>7. Electrical Parameters |
| Reference Standard | 1. IES LM-79-2019 Optical and Electrical Measurements of Solid-State Lighting Products<br>2. ANSI C78.377-2015 Specifications for the Chromaticity of Solid State Lighting Products<br>3. CIE 13.3-1995 Method of Measuring and Specifying Colour Rendering Properties of Light Sources<br>4. CIE 15-2004 Technical Report Colorimetry<br>5. IESNA LM-16-93 Practical Guide to Colorimetry of Light Source<br>6. IESNA TM-16-05 Technical Memorandum on Light Emitting Diode (LED) Sources and Systems |
| Reference Work Instruction | QD25 |

## 1.4 Test Methods

**1) Photometric and Light Distribution Measurement – Goniophotometer Method:**

Photometric parameters were measured using the goniophotometer and software. The ambient temperature shall be maintained at 25 °C ±1.2 °C, measured at a point not more than 1.5 m from the sample and at the same height as the sample. The humidity should be maintained between 10% and 65%. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 1 °vertical intervals and 22.5 °horizontal intervals.

**2) Chromaticity Measurement – Sphere-Spectroradiometer Method:**

Chromaticity parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 ºC ±1.2 ºC. The humidity should be maintained between 10% and 65%. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral power distribution taken at 5 nm intervals over the range of 380 to 780 nm.

**3) Electrical Measurements:**

Electrical parameters were measured using power meters incorporated in goniophotometer or sphere-spectroradiometer system. The ambient temperature surrounding the sample was maintained at 25 ºC ±1.2 ºC. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Voltage, frequency, current, power, power factor and total harmonic distortion were measured by and read from the power meter.

## 2.1 Summary of Test Result

| Criteria Item | Measured Value | | Compliance | Requirement (DLC V5.1) | |
|---|---|---|---|---|---|
| Minimum Total Luminous | 4714.0 | | Pass | >=1500(-10%) | |
| Minimum Luminous Efficacy | 127.34 | | Pass | Standard: >= 110(-3%) | Premium: >= 125(-3%) |
| Minimum Power Factor | 0.9635 | | Pass | >= 0.9(-3%) | |
| Maximum THD % | 12.61 | | Pass | <= 20(+5) | |
| Minimum CRI | 82.9 | | Pass | >= 80(-1) | |
| Minimum R9 | 15 | | Pass | >= 0(-1) | |
| Minimum Rg | 95 | | Pass | >= 89(-1) | |
| Minimum Rf | 83 | | Pass | >= 70(-1) | |
| Rcs, h1(%) | -12 | | Pass | -12%-23%(-1%) | |
| CCT (K) | 3000K | 3044 | Pass | <=6500K | |
| | 4000K | 4186 | | | |
| | 6500K | 6613 | | | |
| Zonal Lumen Requirement(%) | 0-60 ° | 72.8 | Pass | >=75(-3) | |
| SC: 0-180 ° | 1.23 | | Pass | 1.0-2.0(±0.1) | |
| SC: 90-270 ° | 1.21 | | Pass | 1.0-2.0(±0.1) | |
| Corrected UGR | 21.9 | | Pass | Premium: <22.0 | |

## 2.2 Electrical, Photometric and Chromaticity Measurements

| | | | |
|---|---|---|---|
| **Test date** | 2024-09-25 | **Test Ambient:** | 25±1 ℃ |
| **Test Orientation** | As intended | **Stabilization Time (min)** | 60 |
| **Model Number** | FR1X4(0%,3000K) | **Total Operating Time (min)** | 75 |

### Electrical Measurement:

| Sample No. | Voltage (Vac) | Frequency (Hz ) | Current (A) | Power (W) | Power Factor | THD % |
|---|---|---|---|---|---|---|
| JDE240618-B1 | 120.1 | 60 | 0.3161 | 37.85 | 0.9968 | 6.53 |
| | 277.3 | 60 | 0.1373 | 36.68 | 0.9635 | 12.61 |

### Photometric Measurement – Goniophotometer Method(Test Distance:26.000m):

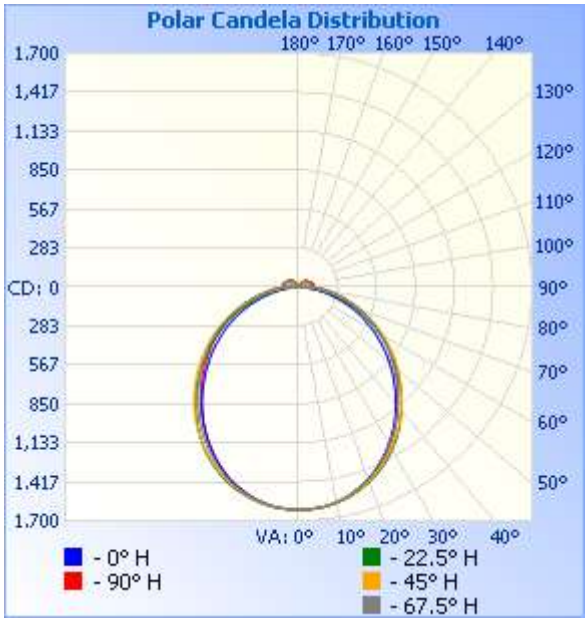
| Parameter | Result | |
|---|---|---|
| Test Voltage (V) | 120 | 277 |
| Frequency (Hz) | 60 | 60 |
| Total Luminous (lm) | 4820.0 | 4714.0 |
| Luminous Efficacy (lm/W) | 127.34 | 128.53 |
| Zonal lumens in the 0-60 °zone (%) | 72.8 | -- |
| SC: 0-180 ° | 1.23 | -- |
| SC: 90-270 ° | 1.21 | -- |
| Corrected UGR(Crosswise) | 20.5 | -- |
| Corrected UGR(Endwise) | 21.9 | -- |
| Beam Angle ( °) | 106.6 | -- |
| Center Beam Candle Power (cd) | 1618 | -- |

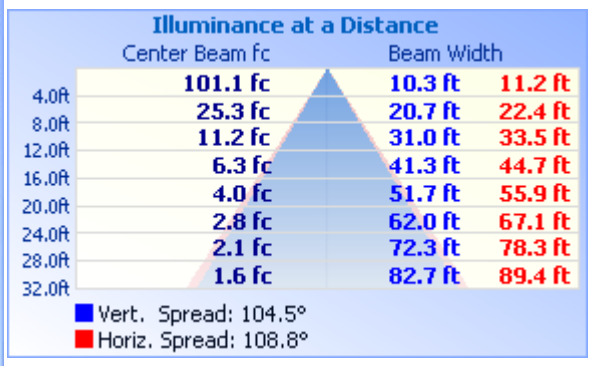
## Zonal Lumen Tabulation

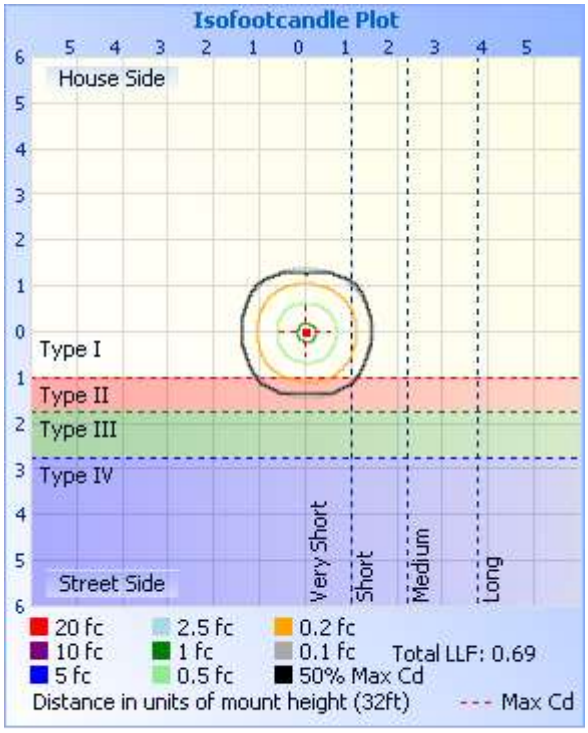
| Zonal Lumen Summary | | |
|---|---|---|
| Zone | Lumens | % Luminaire |
| 0-30 | 1,241.3 | 25.8% |
| 0-40 | 2,013.1 | 41.8% |
| 0-60 | 3,511.1 | 72.8% |
| 60-90 | 1,059.1 | 22% |
| 70-100 | 536.7 | 11.1% |
| 90-120 | 158.5 | 3.3% |
| 0-90 | 4,570.2 | 94.8% |
| 90-180 | 249.5 | 5.2% |
| 0-180 | 4,819.6 | 100% |

| Lumens Per Zone | | | | | |
|---|---|---|---|---|---|
| Zone | Lumens | % Total | Zone | Lumens | % Total |
| 0-10 | 153.1 | 3.2% | 90-100 | 33.7 | 0.7% |
| 10-20 | 436.0 | 9.0% | 100-110 | 68.4 | 1.4% |
| 20-30 | 652.2 | 13.5% | 110-120 | 56.4 | 1.2% |
| 30-40 | 771.8 | 16.0% | 120-130 | 42.6 | 0.9% |
| 40-50 | 788.0 | 16.3% | 130-140 | 26.7 | 0.6% |
| 50-60 | 710.0 | 14.7% | 140-150 | 12.5 | 0.3% |
| 60-70 | 556.1 | 11.5% | 150-160 | 6.7 | 0.1% |
| 70-80 | 352.1 | 7.3% | 160-170 | 2.0 | 0% |
| 80-90 | 150.9 | 3.1% | 170-180 | 0.5 | 0% |

## Photometric Data



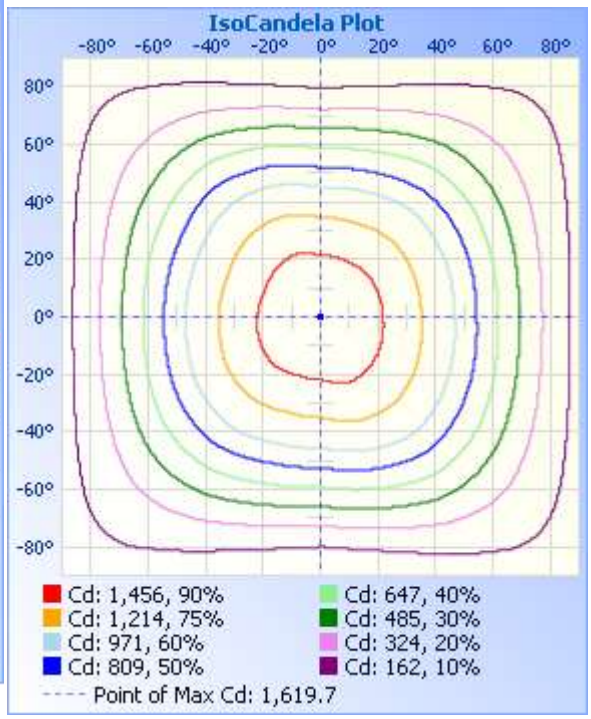



Table--1 UNIT: cd

| C(DEG) / γ (DEG) | 0 | 22.5 | 45 | 67.5 | 90 | 112.5 | 135 | 157.5 | 180 | 202.5 | 225 | 247.5 | 270 | 292.5 | 315 | 337.5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1618 | 1618 | 1618 | 1618 | 1618 | 1618 | 1618 | 1618 | 1618 | 1618 | 1618 | 1618 | 1618 | 1618 | 1618 | 1618 | | | |
| 5 | 1611 | 1610 | 1609 | 1609 | 1612 | 1610 | 1610 | 1610 | 1614 | 1614 | 1613 | 1610 | 1610 | 1613 | 1611 | 1613 | | | |
| 10 | 1583 | 1584 | 1582 | 1582 | 1587 | 1592 | 1588 | 1587 | 1591 | 1593 | 1593 | 1582 | 1586 | 1594 | 1591 | 1589 | | | |
| 15 | 1540 | 1539 | 1539 | 1538 | 1543 | 1557 | 1550 | 1543 | 1548 | 1554 | 1553 | 1538 | 1539 | 1559 | 1554 | 1549 | | | |
| 20 | 1475 | 1477 | 1482 | 1478 | 1483 | 1507 | 1495 | 1483 | 1489 | 1498 | 1497 | 1475 | 1479 | 1512 | 1502 | 1490 | | | |
| 25 | 1399 | 1400 | 1409 | 1401 | 1404 | 1443 | 1429 | 1407 | 1414 | 1426 | 1427 | 1398 | 1399 | 1447 | 1439 | 1419 | | | |
| 30 | 1307 | 1313 | 1324 | 1313 | 1314 | 1362 | 1349 | 1321 | 1328 | 1339 | 1341 | 1306 | 1308 | 1367 | 1362 | 1333 | | | |
| 35 | 1209 | 1215 | 1230 | 1213 | 1213 | 1270 | 1261 | 1225 | 1230 | 1243 | 1243 | 1205 | 1205 | 1271 | 1276 | 1238 | | | |
| 40 | 1109 | 1112 | 1129 | 1106 | 1101 | 1165 | 1163 | 1124 | 1125 | 1142 | 1141 | 1096 | 1094 | 1166 | 1178 | 1139 | | | |
| 45 | 1000 | 1005 | 1021 | 992 | 985 | 1053 | 1057 | 1018 | 1022 | 1034 | 1035 | 986 | 977 | 1051 | 1073 | 1034 | | | |
| 50 | 895 | 897 | 909 | 878 | 867 | 933 | 947 | 910 | 916 | 925 | 921 | 871 | 858 | 928 | 961 | 928 | | | |
| 55 | 787 | 789 | 795 | 759 | 746 | 809 | 833 | 802 | 807 | 816 | 802 | 753 | 739 | 803 | 845 | 818 | | | |
| 60 | 679 | 680 | 681 | 643 | 625 | 684 | 717 | 692 | 696 | 705 | 686 | 638 | 618 | 678 | 727 | 708 | | | |
| 65 | 571 | 570 | 565 | 527 | 504 | 559 | 598 | 581 | 586 | 591 | 568 | 520 | 497 | 553 | 606 | 595 | | | |
| 70 | 464 | 460 | 451 | 410 | 384 | 434 | 478 | 470 | 476 | 478 | 452 | 403 | 377 | 429 | 481 | 480 | | | |
| 75 | 360 | 354 | 338 | 297 | 268 | 314 | 358 | 363 | 369 | 366 | 337 | 290 | 261 | 308 | 362 | 369 | | | |
| 80 | 264 | 255 | 233 | 191 | 159 | 201 | 248 | 259 | 268 | 262 | 230 | 184 | 152 | 197 | 248 | 268 | | | |
| 85 | 181 | 171 | 145 | 103 | 68.5 | 106 | 150 | 173 | 183 | 174 | 140 | 96.6 | 63.7 | 104 | 154 | 179 | | | |
| 90 | 14.4 | 15.4 | 21.1 | 21.1 | 13.5 | 23.5 | 29.4 | 23.7 | 22.2 | 12.6 | 7.76 | 5.27 | 1.32 | 8.70 | 15.9 | 20.1 | | | |
| 95 | 1.21 | 1.96 | 50.4 | 25.6 | 18.0 | 23.1 | 12.5 | 2.54 | 3.03 | 2.51 | 27.7 | 29.5 | 20.4 | 30.0 | 56.0 | 3.90 | | | |
| 100 | 116 | 102 | 66.3 | 32.8 | 16.9 | 32.2 | 62.7 | 92.7 | 111 | 96.8 | 67.6 | 35.5 | 19.4 | 36.8 | 72.5 | 106 | | | |
| 105 | 110 | 99.0 | 68.1 | 34.0 | 15.2 | 33.5 | 65.2 | 91.5 | 104 | 91.4 | 63.9 | 34.9 | 17.6 | 37.9 | 70.4 | 103 | | | |
| 110 | 103 | 93.0 | 64.2 | 32.9 | 9.74 | 33.6 | 63.3 | 86.2 | 98.4 | 90.2 | 61.9 | 33.3 | 14.0 | 36.8 | 67.9 | 96.1 | | | |
| 115 | 95.0 | 85.8 | 61.9 | 30.2 | 11.6 | 32.0 | 60.0 | 84.0 | 90.9 | 83.3 | 55.4 | 31.9 | 13.0 | 34.1 | 64.9 | 88.4 | | | |
| 120 | 87.5 | 78.9 | 57.7 | 17.2 | 11.5 | 19.2 | 56.8 | 76.9 | 83.0 | 77.0 | 53.7 | 17.2 | 2.20 | 22.5 | 60.8 | 81.9 | | | |
| 125 | 80.1 | 72.4 | 51.7 | 23.5 | 5.34 | 22.4 | 52.0 | 71.2 | 75.5 | 70.1 | 50.5 | 22.8 | 9.87 | 25.4 | 56.2 | 74.7 | | | |
| 130 | 72.7 | 65.5 | 45.5 | 22.4 | 8.07 | 22.2 | 47.2 | 64.0 | 68.5 | 63.1 | 45.2 | 20.6 | 6.78 | 21.7 | 50.7 | 67.0 | | | |
| 135 | 63.0 | 56.5 | 9.05 | 20.2 | 6.43 | 19.6 | 12.1 | 56.6 | 60.6 | 55.5 | 24.8 | 21.0 | 4.88 | 20.5 | 11.8 | 58.4 | | | |
| 140 | 54.5 | 48.6 | 30.8 | 10.0 | 7.89 | 13.3 | 31.3 | 49.5 | 52.6 | 48.1 | 24.2 | 19.4 | 10.3 | 11.3 | 33.8 | 47.5 | | | |
| 145 | 3.23 | 12.1 | 26.1 | 8.19 | 6.79 | 9.28 | 26.6 | 14.8 | 2.93 | 15.8 | 26.4 | 17.7 | 5.70 | 13.3 | 28.4 | 36.3 | | | |
| 150 | 34.1 | 29.5 | 22.0 | 8.80 | 4.74 | 10.6 | 22.2 | 29.4 | 32.1 | 29.2 | 21.4 | 8.02 | 5.61 | 7.33 | 21.3 | 28.8 | | | |
| 155 | 24.7 | 23.1 | 3.93 | 7.07 | 3.86 | 7.05 | 17.8 | 23.0 | 24.4 | 23.0 | 18.0 | 5.21 | 5.61 | 7.51 | 4.49 | 22.1 | | | |
| 160 | 20.2 | 12.4 | 6.06 | 6.19 | 3.42 | 5.01 | 4.82 | 17.0 | 18.3 | 17.5 | 13.7 | 7.98 | 4.22 | 3.34 | 9.15 | 3.53 | | | |
| 165 | 5.40 | 8.70 | 9.33 | 6.62 | 5.18 | 5.51 | 7.11 | 2.73 | 11.4 | 11.1 | 2.57 | 6.09 | 4.74 | 4.12 | 7.77 | 9.38 | | | |
| 170 | 6.48 | 8.14 | 7.77 | 6.62 | 5.71 | 5.38 | 7.18 | 7.97 | 5.23 | 5.67 | 5.57 | 4.97 | 4.27 | 5.57 | 5.87 | 6.86 | | | |
| 175 | 4.55 | 5.30 | 5.76 | 5.32 | 5.71 | 5.01 | 5.51 | 5.15 | 3.80 | 3.28 | 3.48 | 3.92 | 4.04 | 5.66 | 4.63 | 4.95 | | | |
| 180 | 2.93 | 3.63 | 3.65 | 3.83 | 5.35 | 4.08 | 4.23 | 3.22 | 3.23 | 3.24 | 3.38 | 3.83 | 4.13 | 5.57 | 4.43 | 4.44 | | | |

## 2.3 Electrical, Photometric and Chromaticity Measurements

| | | | |
|---|---|---|---|
| **Test date** | 2024-09-25 | **Test Ambient:** | 25±1 ºC |
| **Test Orientation** | As intended | **Stabilization Time (min)** | 60 |
| **Model Number** | FR1X4(0%,3000K) | **Total Operating Time (min)** | 61 |

### Electrical Measurement:

| Sample No. | Voltage (Vac) | Frequency (Hz ) | Current (A) | Power (W) | Power Factor | THD % |
|---|---|---|---|---|---|---|
| JDE240618-B1 | 120.0 | 60 | 0.3184 | 38.15 | 0.9984 | 6.41 |
| | 277.0 | 60 | 0.1383 | 36.97 | 0.9650 | 12.50 |

### Chromaticity Measurement - Sphere-Spectroradiometer Method(Self-absorption:1.1436) (4π geometry):

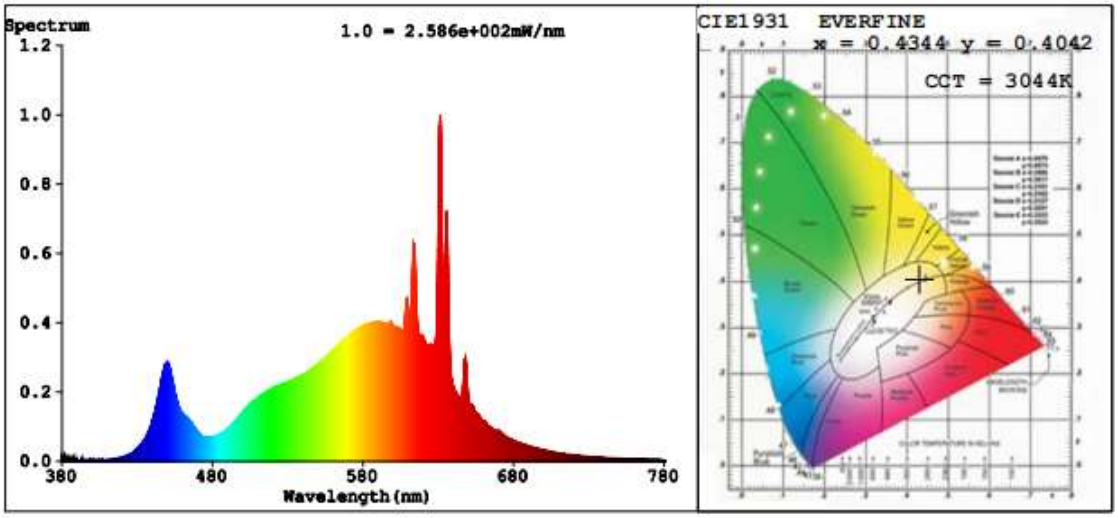
| Parameter | Result |
|---|---|
| Test Voltage (V) | 120 |
| Frequency (Hz) | 60 |
| CCT (K) | 3044 |
| Duv | 0.0004 |
| Chromaticity (x, y) | x=0.4344 y=0.4042 |
| Chromaticity (u', v') | u'=0.2489 v'=0.5211 |

| Parameter | Result |
|---|---|
| Color Rendering Index (CRI) | 82.9 |
| R9 | 15 |
| Rg | 97 |
| Rf | 84 |
| Rcs,h1(%) | -11 |

### Photometric Measurement –Sphere-Spectroradiometer Method:

| Parameter | Result | |
|---|---|---|
| Test Voltage (V) | 120 | 277 |
| Frequency (Hz) | 60 | 60 |
| Total Luminous (lm) | 4868 | 4761 |
| Luminous Efficacy (lm/W) | 127.60 | 128.78 |

## Spectral Power Distribution & Chromaticity Diagram



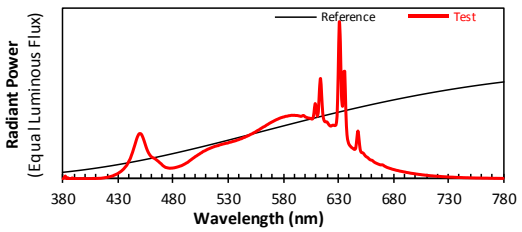

## Special Color Rendering Indices

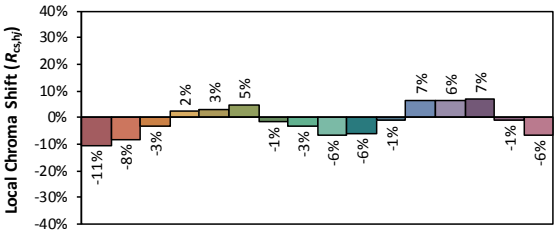
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| R1 =81 | R2 =89 | R3 =96 | R4 =81 | R5 =81 | R6 =87 | R7 =85 | |
| R8 =63 | R9 =15 | R10=75 | R11=80 | R12=67 | R13=82 | R14=98 | R15=75 |

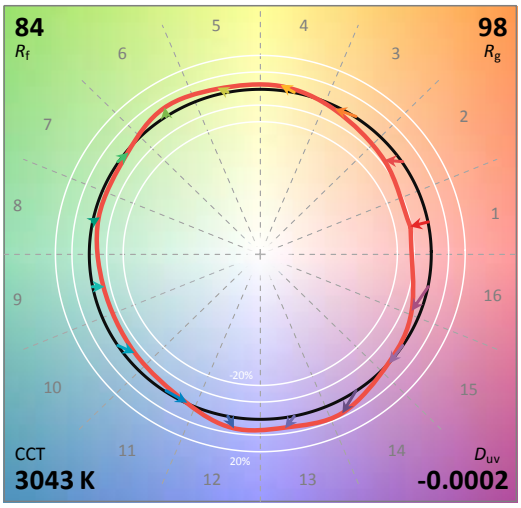
# TM30

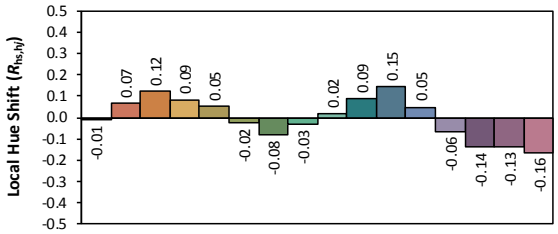
## ANSI/IES TM-30-18 Color Rendition Report

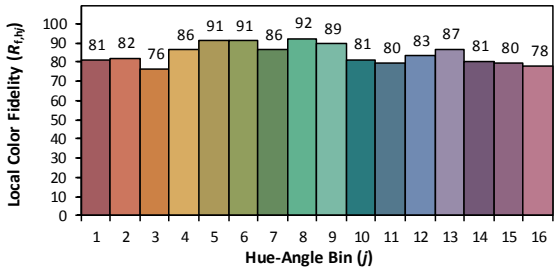
| | | | |
|---|---|---|---|
| **Source:** | BXEN-30E-21L-3F | **Manufacturer:** | RAB LIGHTING Inc |
| **Date:** | 2024-09-25 | **Model:** | FR1X4(0%, 3000K) |

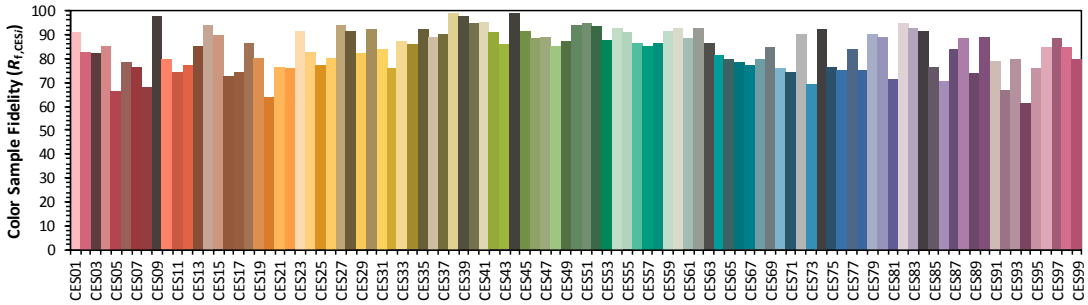



**Notes:** This is a recommended method for displaying ANSI/IES TM-30-18 information.

| | |
|---|---|
| $x$ | 0.4337 |
| $y$ | 0.4025 |
| $u'$ | 0.2491 |
| $v'$ | 0.5203 |

CIE 13.3-1995 (CRI)

| | |
|---|---|
| $R_a$ | 83 |
| $R_9$ | 17 |

lors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.0

## 2.4 Electrical, Photometric and Chromaticity Measurements

| | | | |
|---|---|---|---|
| **Test date** | 2024-09-25 | **Test Ambient:** | 25±1 ºC |
| **Test Orientation** | As intended | **Stabilization Time (min)** | 60 |
| **Model Number** | FR1X4(50%,4000K) | **Total Operating Time (min)** | 61 |

### Electrical Measurement:

| Sample No. | Voltage (Vac) | Frequency (Hz ) | Current (A) | Power (W) | Power Factor | THD % |
|---|---|---|---|---|---|---|
| JDE240618-B1 | 120.0 | 60 | 0.3108 | 37.23 | 0.9983 | 6.42 |
| | 277.0 | 60 | 0.1350 | 36.08 | 0.9649 | 12.51 |

### Chromaticity Measurement - Sphere-Spectroradiometer Method(Self-absorption:1.1439) (4π geometry):

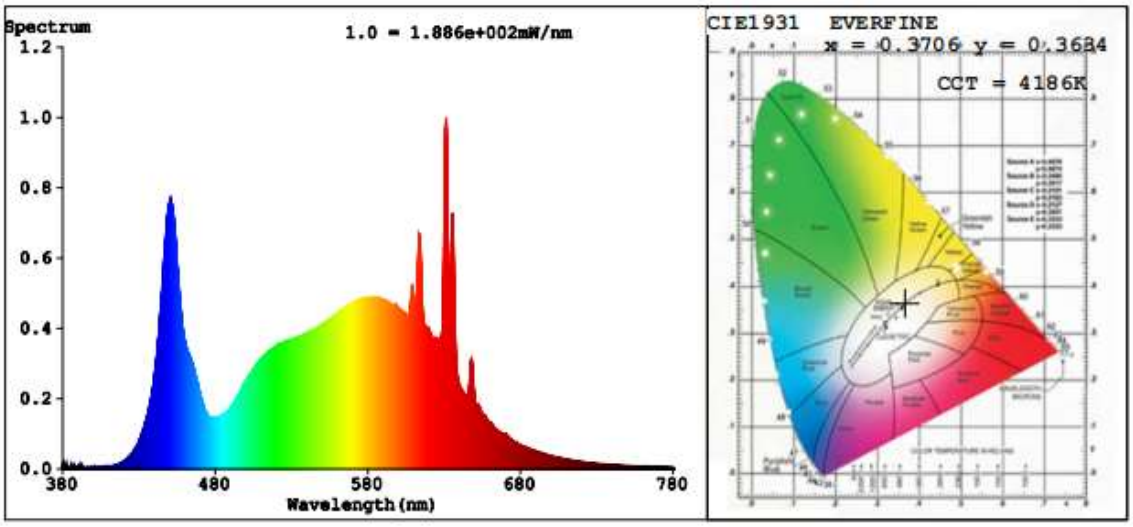
| Parameter | Result |
|---|---|
| Test Voltage (V) | 120 |
| Frequency (Hz) | 60 |
| CCT (K) | 4186 |
| Duv | -0.0034 |
| Chromaticity (x, y) | x=0.3706 y=0.3634 |
| Chromaticity (u', v') | u'=0.2240 v'=0.4941 |

| Parameter | Result |
|---|---|
| Color Rendering Index (CRI) | 85.9 |
| R9 | 30 |
| Rg | 98 |
| Rf | 84 |
| Rcs,h1(%) | -11 |

### Photometric Measurement –Sphere-Spectroradiometer Method:

| Parameter | Result | |
|---|---|---|
| Test Voltage (V) | 120 | 277 |
| Frequency (Hz) | 60 | 60 |
| Total Luminous (lm) | 4932 | 4824 |
| Luminous Efficacy (lm/W) | 132.47 | 133.70 |

## Spectral Power Distribution & Chromaticity Diagram



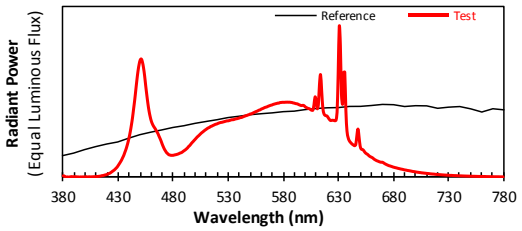

## Special Color Rendering Indices

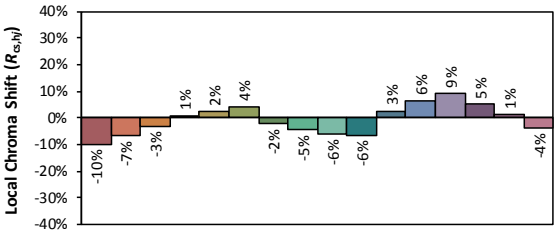
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| R1 =85 | R2 =91 | R3 =93 | R4 =85 | R5 =85 | R6 =86 | R7 =88 | |
| R8 =73 | R9 =30 | R10=77 | R11=85 | R12=63 | R13=87 | R14=96 | R15=82 |

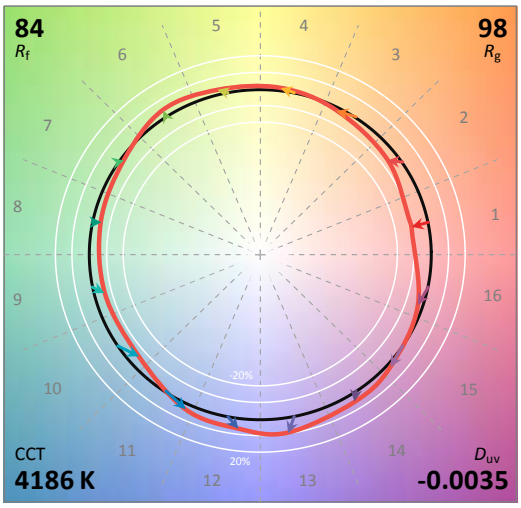
## TM30

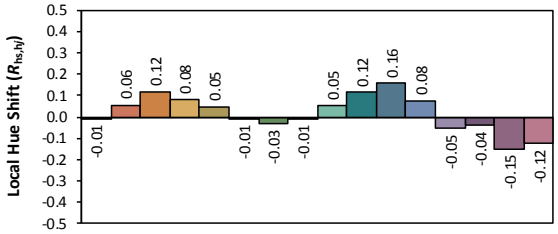
### ANSI/IES TM-30-18 Color Rendition Report

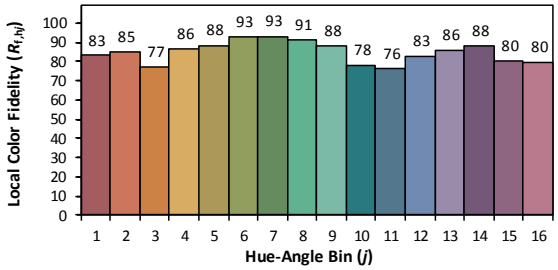
| | | | |
|---|---|---|---|
| **Source:** | BXEN-30E-21L-3F<br>BXEN-65E-21L-3F | **Manufacturer:** | RAB LIGHTING Inc |
| **Date:** | 2024-09-25 | **Model:** | FR1X4(50%, 4000K) |

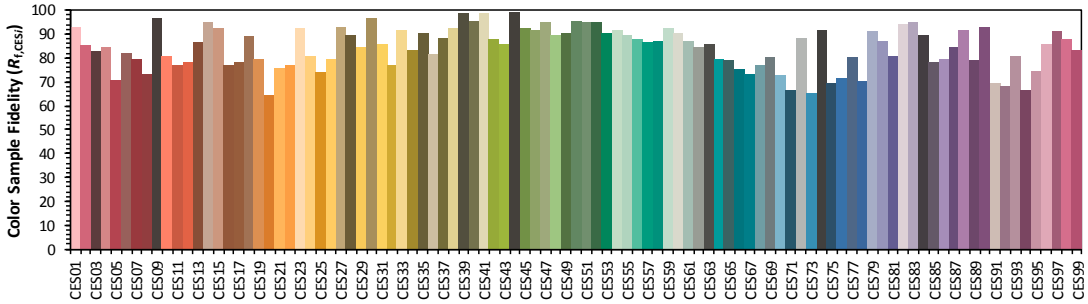



**Notes:** This is a recommended method for displaying ANSI/IES TM-30-18 information.

| | |
|---|---|
| $x$ | 0.3706 |
| $y$ | 0.3632 |
| $u'$ | 0.2240 |
| $v'$ | 0.4940 |

CIE 13.3-1995 (CRI)

| | |
|---|---|
| $R_a$ | 86 |
| $R_9$ | 30 |

lors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.0

## 2.5 Electrical, Photometric and Chromaticity Measurements

| | | | |
|---|---|---|---|
| **Test date** | 2024-09-25 | **Test Ambient:** | 25±1 ºC |
| **Test Orientation** | As intended | **Stabilization Time (min)** | 60 |
| **Model Number** | FR1X4(100%,6500 K) | **Total Operating Time (min)** | 61 |

### Electrical Measurement:

| Sample No. | Voltage (Vac) | Frequency (Hz ) | Current (A) | Power (W) | Power Factor | THD % |
|---|---|---|---|---|---|---|
| JDE240618-B1 | 120.0 | 60 | 0.3128 | 37.47 | 0.9982 | 6.43 |
| | 277.0 | 60 | 0.1359 | 36.31 | 0.9649 | 12.52 |

### Chromaticity Measurement - Sphere-Spectroradiometer Method(Self-absorption:1.1438) (4π geometry):

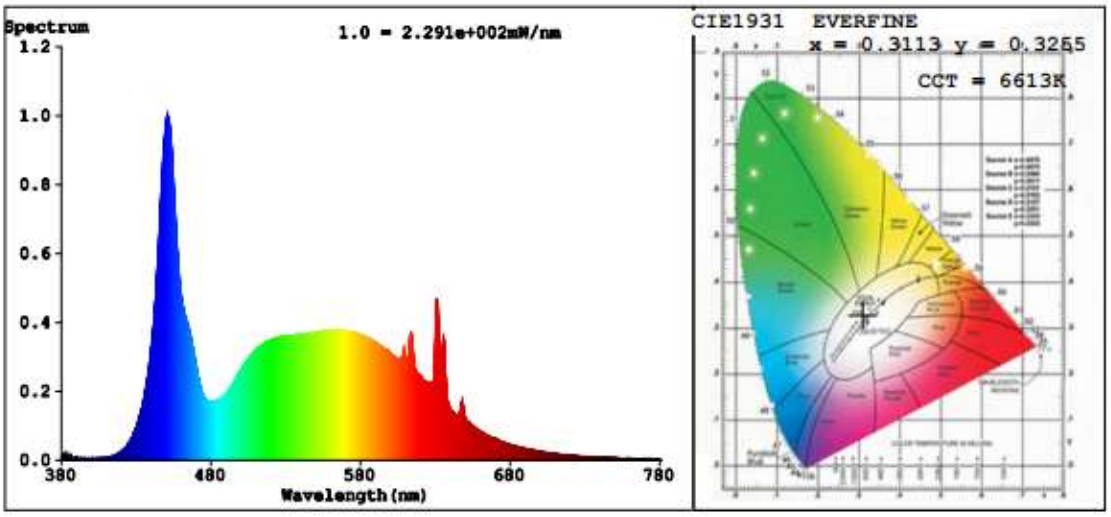
| Parameter | Result |
|---|---|
| Test Voltage (V) | 120 |
| Frequency (Hz) | 60 |
| CCT (K) | 6613 |
| Duv | 0.0021 |
| Chromaticity (x, y) | x=0.3113 y=0.3255 |
| Chromaticity (u', v') | u'=0.1981 v'=0.4662 |

| Parameter | Result |
|---|---|
| Color Rendering Index (CRI) | 84.0 |
| R9 | 19 |
| Rg | 95 |
| Rf | 83 |
| Rcs,h1(%) | -12 |

### Photometric Measurement –Sphere-Spectroradiometer Method:

| Parameter | Result | |
|---|---|---|
| Test Voltage (V) | 120 | 277 |
| Frequency (Hz) | 60 | 60 |
| Total Luminous (lm) | 4876 | 4769 |
| Luminous Efficacy (lm/W) | 130.13 | 131.34 |

## Spectral Power Distribution & Chromaticity Diagram



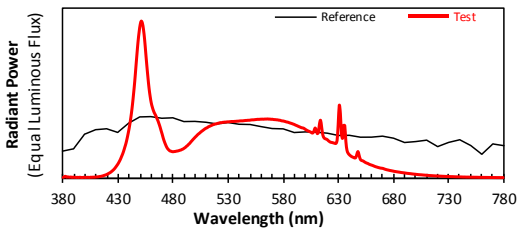

## Special Color Rendering Indices

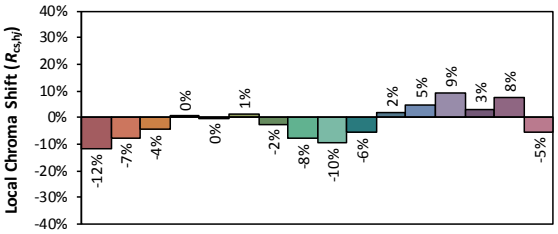
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| R1 =83 | R2 =88 | R3 =89 | R4 =84 | R5 =83 | R6 =82 | R7 =89 | |
| R8 =74 | R9 =19 | R10=69 | R11=84 | R12=56 | R13=84 | R14=94 | R15=80 |

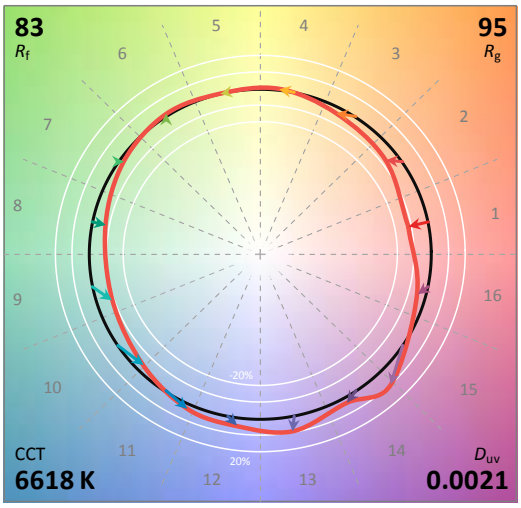
## TM30

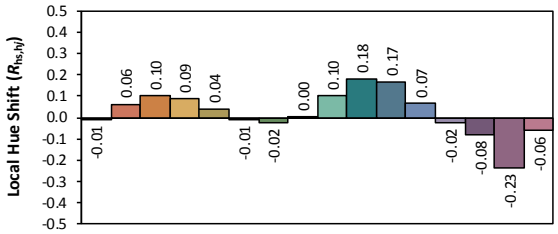
### ANSI/IES TM-30-18 Color Rendition Report

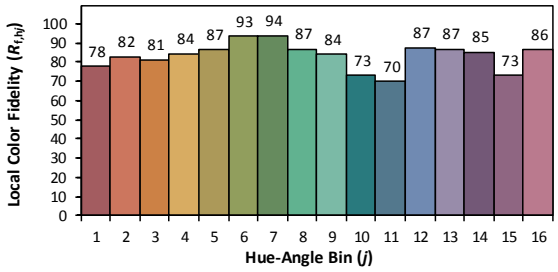
| | | | |
|---|---|---|---|
| **Source:** | BXEN-65E-21L-3F | **Manufacturer:** | RAB LIGHTING Inc |
| **Date:** | 2024-09-25 | **Model:** | FR1X4(100%, 6500K) |

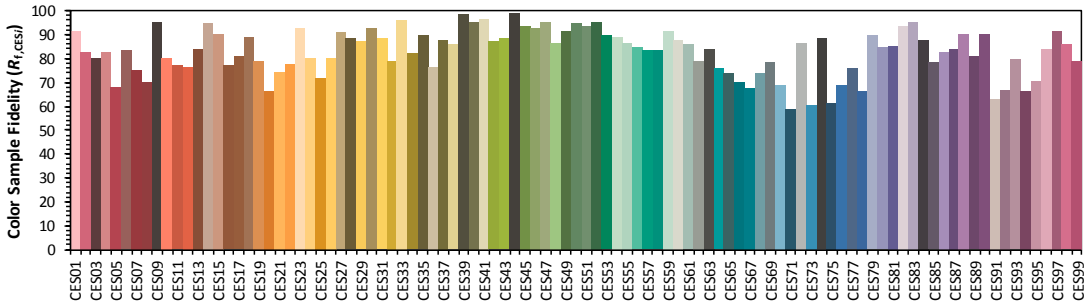



**Notes:** This is a recommended method for displaying ANSI/IES TM-30-18 information.

| | |
|---|---|
| $x$ | 0.3112 |
| $y$ | 0.3253 |
| $u'$ | 0.1982 |
| $v'$ | 0.4661 |

| CIE 13.3-1995 (CRI) | |
|---|---|
| $R_a$ | 84 |
| $R_9$ | 19 |

lors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.0

## 3. Test Equipment

| Equipment ID | Equipment Name | Last Calibration Date | Next Calibration Date |
|---|---|---|---|
| ST-R-S-451 | 2 meter Integrating Sphere | Verified by D204 standard lamp | |
| ST-R-S-455 | Spectral analysis system HAAS-1200 | Verified by D204 standard lamp | |
| ST-R-S-452 | Standard Lamp D204 | 2023-06-26 | 2026-06-25 |
| ST-R-S-453 | Power Meter for Integrating Sphere | 2024-05-29 | 2025-05-28 |
| ST-R-S-467 | Hygrothermograph | 2024-06-06 | 2025-06-05 |
| ST-R-355 | Goniophotometer system | Verified by D908S standard lamp | |
| ST-R-359 | Standard Lamp D908S | 2022-07-19 | 2025-07-18 |
| ST-R-357 | AC Power Source | 2024-01-29 | 2025-01-28 |
| ST-R-S-422 | Power Meter for Goniophotometer | 2024-05-29 | 2025-05-28 |
| ST-R-S-354 | hygrothermograph for Goniophotometer | 2024-05-29 | 2025-05-28 |
| Uncertainty:<br>Photometric Measurement (Sphere):2.94%, k=2<br>Chromaticity Measurement(Sphere):52.28K, k=2<br>Photometric Measurement(Goniophotometer): 2.94%, k=2 | | | |

## 4. Product Photo

******** END OF REPORT ********