

| TEST REPORT IES LM-79-08 TÜV SÜD Test Report for Electrical and Photometric Measurements of Solid-State Lighting Products | |
|--|---|
| Report reference No..... | 68.184.15.290.01 |
| Date of issue..... | 2015-09-15 |
| Project handler..... | Levi Guo |
| Testing laboratory..... | TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch |
| Address..... | Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District 518052 Shenzhen, CHINA |
| Testing location | Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District 518052 Shenzhen, CHINA |
| Client..... | NEKO Lighting AG |
| Client number | 90185 |
| Address..... | Flüelastrasse 12, 8048 Zürich, SWITZERLAND |
| Contact person | SVEN SPEISSEGGER |
| Standard | This TÜV SÜD test program is based on the following requirements: IES LM-79-08 |
| TRF originated by..... | TÜV SÜD Product Service GmbH, Mr. Kenneth Lau |
| Copyright blank test report..... | This test report is based on the content of the standard (see above). The test report considered selected clauses of the a.m. standard(s) and experience gained with product testing. It was prepared by TÜV SÜD Product Service GmbH. TUV SUD Group takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context. |
| Test procedure | <input type="checkbox"/> TÜV Mark <input checked="" type="checkbox"/> without certification |
| Non-standard test method | N/A |
| National deviations | N/A |
| Number of pages (Report) | 12 |
| Number of pages (Attachments)..... | 2 |
| Compiled by..... : Levi Guo (+ signature) | Approved by : Daniel Chen (+ signature) |



| | |
|--|---|
| Test sample..... : LED Downlight | |
| Type of test object : LED Downlight | |
| Trade mark..... : | NEKO |
| Model and/or type reference..... : EF125-18W-840 | |
| Rating(s)..... : 220-240V~; 50/60HZ; 22W | |
| Manufacturer : NEKO LIGHTING LTD | |
| Manufacturer number : 90243 | |
| Address : SenYang High-Tech Park, GuangMing high-tech Area, West Zone, GuangMing District, 518132 Shenzhen, PEOPLE'S REPUBLIC OF CHINA | |
| Contact person..... : Stone Shaw | |
| Sub-contractors/ tests (clause)..... : N/A | |
| Name : N/A | |
| Order description | <input checked="" type="checkbox"/> Complete test according to TRF |
| | <input type="checkbox"/> Partial test according to manufacturer's specifications |
| | <input type="checkbox"/> Preliminary test |
| | <input type="checkbox"/> Spot check |
| | <input type="checkbox"/> Other: |
| Date of order : 2015-09-06 | |
| Date of receipt of test item..... : 2015-09-06 | |
| Date(s) of performance of test..... : 2015-09-06 to 2015-09-15 | |
| Test item particulars (declared): | |
| Lamp type : | <input type="checkbox"/> Bare lamp <input type="checkbox"/> Covered lamp, no reflector <input type="checkbox"/> Lamp with reflector <input checked="" type="checkbox"/> other: LED Downlight |
| Lamp cap installed : | -- |
| Rated Voltage: | 220-240V~; 50/60Hz |
| Rated Power: | 22W |
| Rated Power Factor : | > 0.9 |
| Rated Luminous Flux : | 1600lm |
| Rated CCT : | 4000K |
| Rated CRI : | 83 |
| Attachments: | |
| <ol style="list-style-type: none"> 1. Test Equipment List 2. Lighting Facts Uniform Reporting Template | |

General remarks:

"(See remark #)" refers to a remark appended to the report.
 "(See appended table)" refers to a table appended to the report.
 Throughout this report a point is used as the decimal separator.
 The test results presented in this report relate only to the object tested.
 This report shall not be reproduced except in full without the written approval of the testing laboratory.

Measurement uncertainty budgets have been determined for applicable test methods and are available

TUV SUD Cert & Testing (China) Co., Ltd. Shenzhen Branch is an accredited Test Laboratory (NVLAP Lab Code: 500067-0) to IESNA LM-79-08 by NVLAP (National Voluntary Laboratory Accreditation Program).



NVLAP LAB CODE 500067-0

The report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of the federal government.

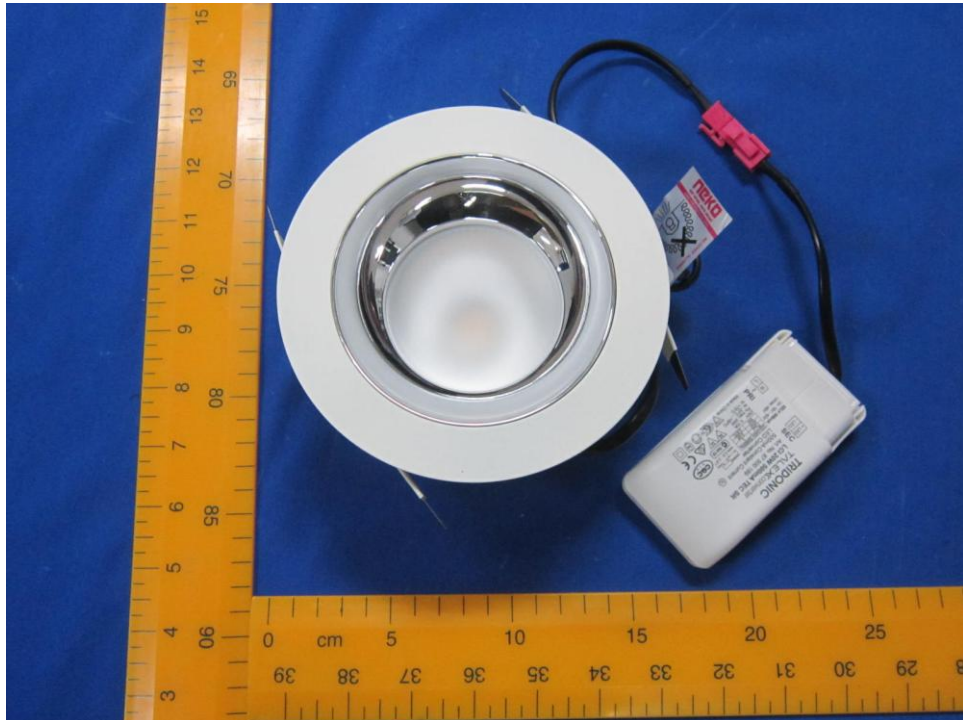
Summary of testing:

| | |
|--|---------------|
| Model: | EF125-18W-840 |
| Luminous Efficacy (Lumens/Watt) | 86.2 |
| Luminous Flux (Lumens) | 1738 |
| Input Power (Watts) | 20.2 |
| Power Factor | 0.9416 |
| CCT (K) | 4031 |
| CRI | 82.2 |
| Stabilisation Time (Light Power) (minutes) | 90 |
| ISTMT (In-Situ Temp Test) (°C) | -- |

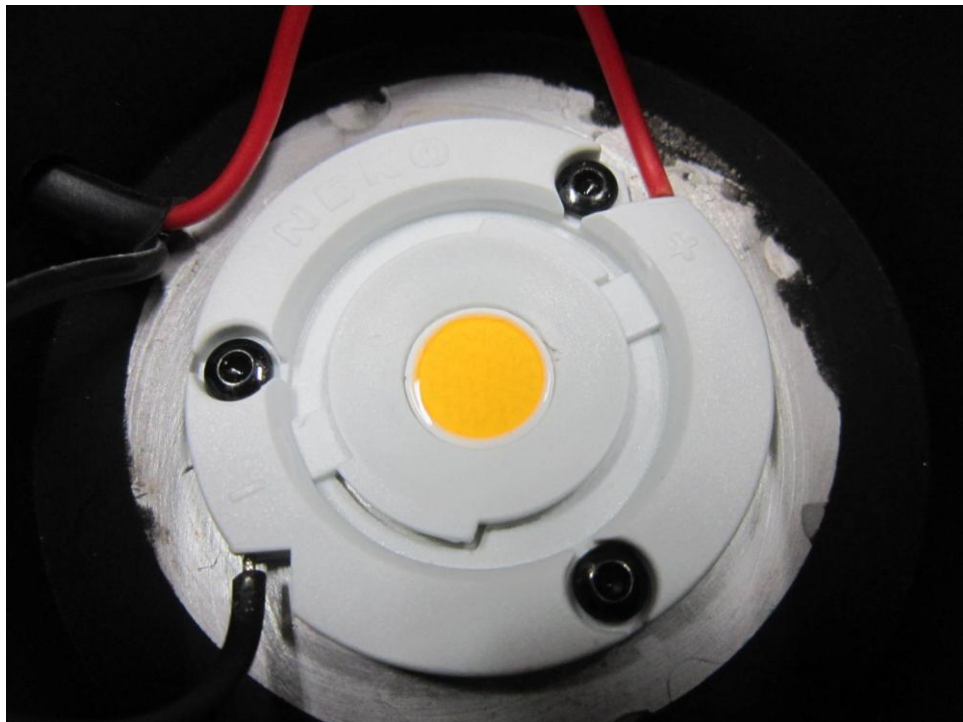
LED specification:

| Model: | Manufactory | Vf (V) | If (mA) | Viewing angle (°) | CCT(K) | Ra |
|-----------------------|-------------|-----------|---------|-------------------|--------|----|
| CLU026-1204C1-403M2G2 | CITIZEN | 31.8~37.5 | 360 | -- | 4000 | 80 |

Picture of the product



1. Overview



2. LED view

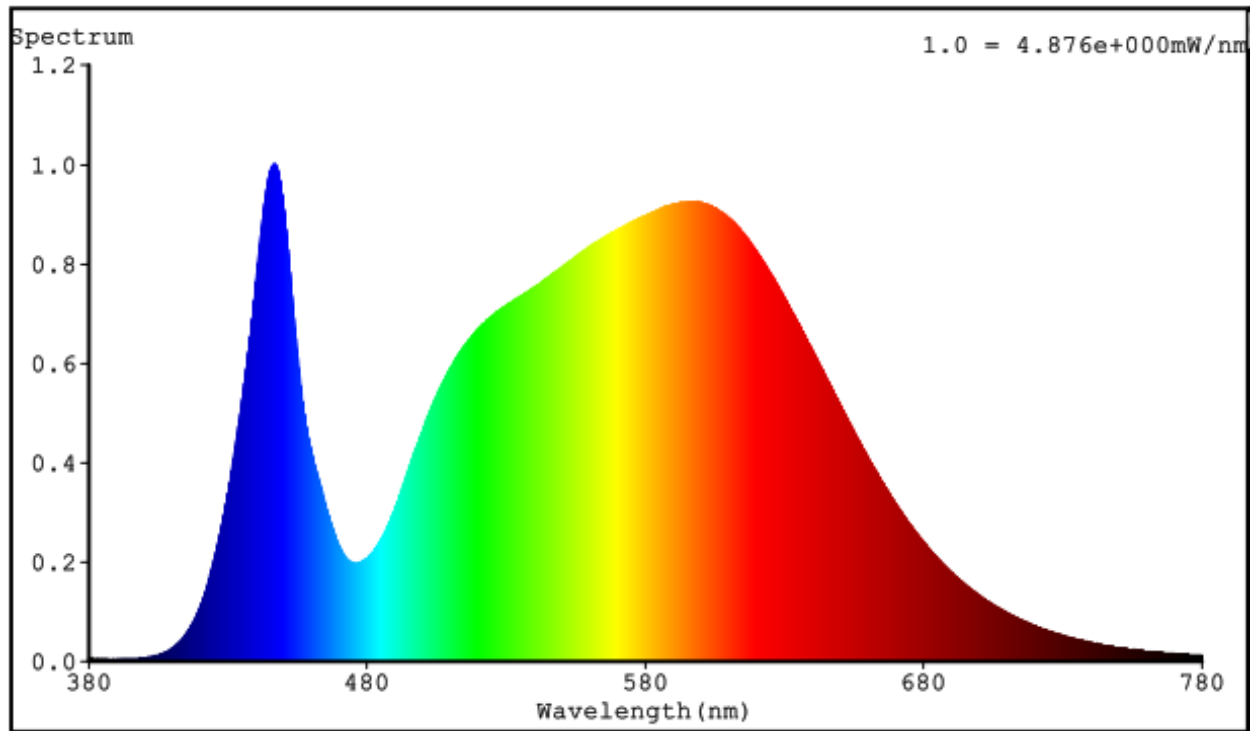
| |
|--|
| Copy of marking plate: -- |
| Characteristic data -- |
| Purpose of the product LED Downlight for general lighting purpose. |
| Possible test case verdicts: - test case does not apply to the test object:: N/A - test object does meet the requirement.....: P(ass) - test object does not meet the requirement:: F(ail) Possible suffixes to the verdicts: - suffix for detailed information for the client.....: - C(comment) - suffix for important information for factory inspection...: - M(manufacturing) |

| IES LM-79-08 | | | |
|--------------|---|-----------------------------|---------|
| Clause | Requirement – Test | Measuring result – Remark | Verdict |
| 1.0 | Introduction | | -- |
| 2.0 | Ambient Conditions | | P |
| 2.1 | General | | P |
| 2.2 | Air Temperature | | P |
| 2.3 | Thermal Condition for Mounting SSL Products | | P |
| 2.4 | Air Movement | | P |
| 3.0 | Power Supply Characteristics | | P |
| 3.1 | Wave shape of AC power supply | | P |
| 3.2 | Voltage regulation | | P |
| 4.0 | Seasoning of SSL Product | No seasoning of SSL product | N/A |
| 5.0 | Stabilization of SSL Product | | P |
| | SSL product has sufficiently stabilized before measurement | | P |
| 6.0 | Operation Orientation | | P |
| | SSL product shall be stabilized and measured in intended operating orientation | As normal working | P |
| 7.0 | Electrical Settings | | P |
| | SSL product shall be operated at rated voltage | | P |
| | SSL product with dimming capability are tested at maximum input power condition | | N/A |
| | SSL product with different modes are measured in all relevant modes | | N/A |
| 8.0 | Electrical Instrumentations | | P |
| 8.1 | Circuits | | P |
| 8.2 | Uncertainties | | P |
| 9.0 | Test methods for Luminous Flux measurement | | P |
| 9.1 | Integrating sphere with a spectroradiometer (Sphere-spectroradiometer system) | | P |
| 9.2 | Integrating sphere with a photometer head (Sphere-photometer system) | | N/A |
| 9.3 | Goniophotometer | | P |
| 10.0 | Luminous Intensity Distribution | | P |
| | Reporting acc, to IEC LM-63 | | P |
| 11.0 | Luminous Efficacy | | P |
| | Calculation | See table 1 | P |
| 12.0 | Test Methods for Colour Characteristics of SSL Products | | P |
| | Measurements | See table 1 | P |
| 13.0 | Uncertainty statement | | N/A |
| 14.0 | Test report | | -- |

| Table 1 | | Test data | |
|--|--------------------|---------------------------------|------------------|
| Model: | EF125-18W-840 | | |
| Rated Voltage (V): | 220-240V~ | Rated Power (W): | 22 |
| Rated luminous flux (lm): | 1600 | Ambient temperature 25 ±1 (°C): | 25.1 |
| Test item | Measured Value | | |
| | Integrating Sphere | | Goniophotometer |
| Key Photometric Results | | | |
| Luminous Efficacy (Lumens/Watt) | -- | | 86.2 |
| Total Luminous Flux (Lumens) | -- | | 1738 |
| Correlated Color Temperature (CCT:K) | 4031 | | -- |
| Color Rendering Index (CRI) | 82.2 | | -- |
| Chromaticity (Chroma x / Chroma y) | 0.3803 / 0.3804 | | -- |
| Chromaticity (Chroma u / Chroma v) | -- | | -- |
| Chromaticity (Chroma u' / Chroma v') | 0.2236 / 0.5032 | | -- |
| Duv Value | 0.0017 | | -- |
| Colour Angular Uniformity (Max,du'v') | -- | | -- |
| Stabilization Time (Light and Power) | -- | | 90Minutes |
| Total Run Time – (Minutes) | -- | | 150Minutes |
| Zonal flux (0-60°) | -- | | 97.9% |
| Spacing Criteria (0-180°) | -- | | -- |
| Spacing Criteria (90-270°) | -- | | -- |
| Spacing Criteria (C/γ) | -- | | C:15.0° / γ:1.0° |
| Electrical Input Results | | | |
| Input Power (Watts) | -- | | 20.2 |
| Input Voltage (Volts AC) | -- | | 230 |
| Input Current (Amps) | -- | | 0.09 |
| Input Frequency (Hertz) | -- | | 50 |
| Power Factor | -- | | 0.9416 |
| A-THD (Current – Total Harmonic Distortion) | -- | | 7.94% |
| Additional Information | | | |
| Ambient Temperature (°C): | 25.0 | | 25.1 |
| ISTMT (In-Situ Temperature Measurement) (°C): | -- | | |
| Photometric measurement condition | -- | | -- |
| Supplementary Information: | | | |
| <ul style="list-style-type: none"> - Absorbtion Correction used: Yes - Stabilization was considered reached by: the variation (maximum-minimum) of at least 3 readings of the light output and electrical power over a period of 30 minutes is less than 0,5%. | | | |

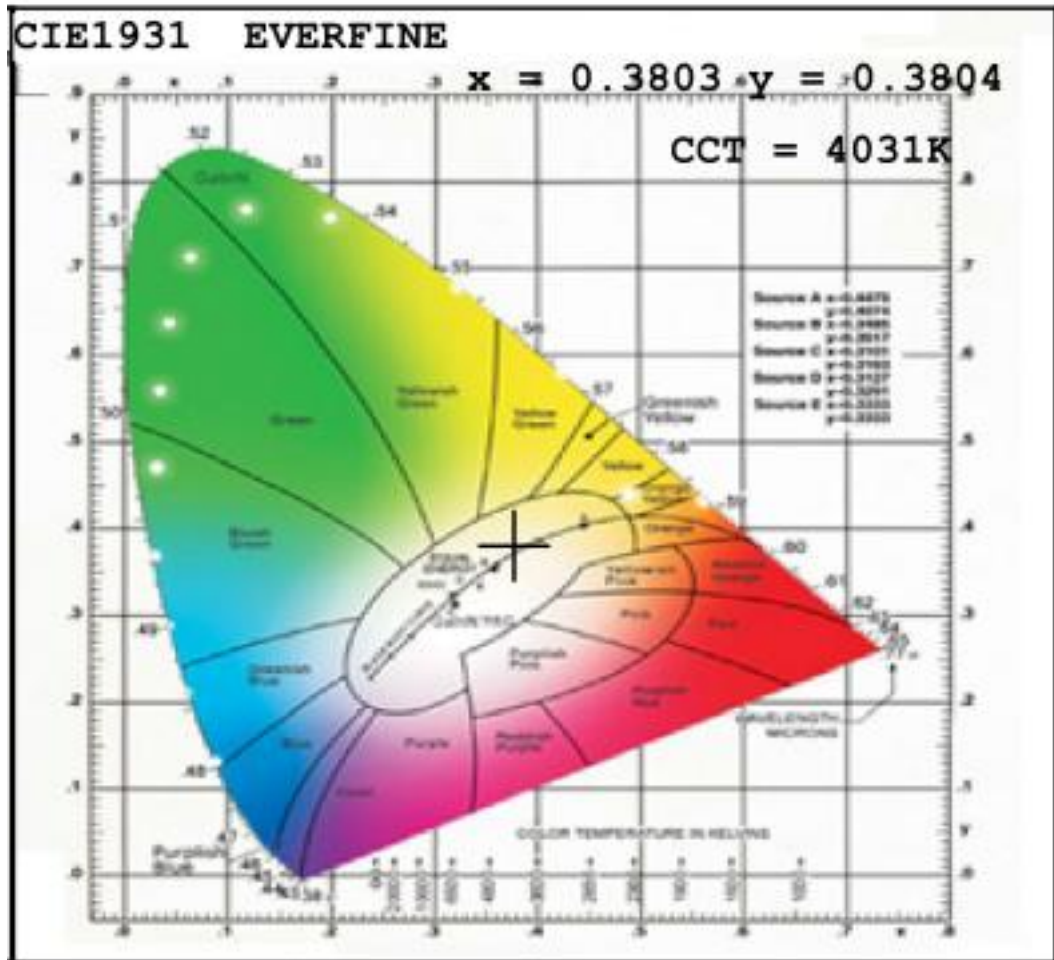
| | |
|----------------|----------------------------|
| Table 2 | Spectral Flux Graph |
| Model: | EF125-18W-840 |

The following graph shows the spectral response curve of the radiant flux for the sample:



Spectral response of the Radiant Flux
(380nm to 780nm – calibrated range of the Spectroradiometer)

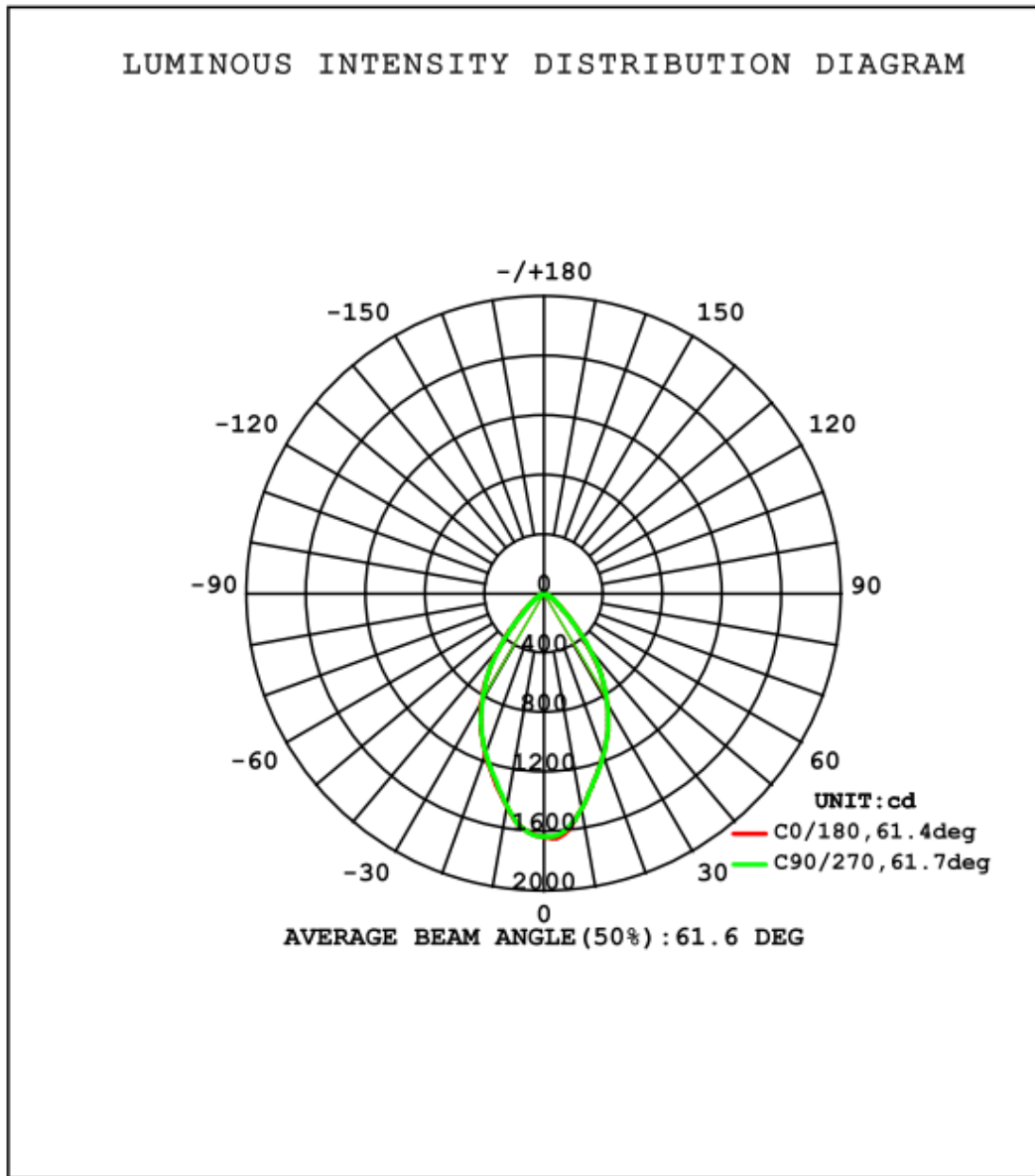
| | |
|----------------|-----------------------------|
| Table 3 | Chromaticity Diagram |
| Model: | Model: EF125-18W-840 |



Tristimulus values:
 $x / y = 0.3803 / 0.3804$
Location is indicated by: The black cross

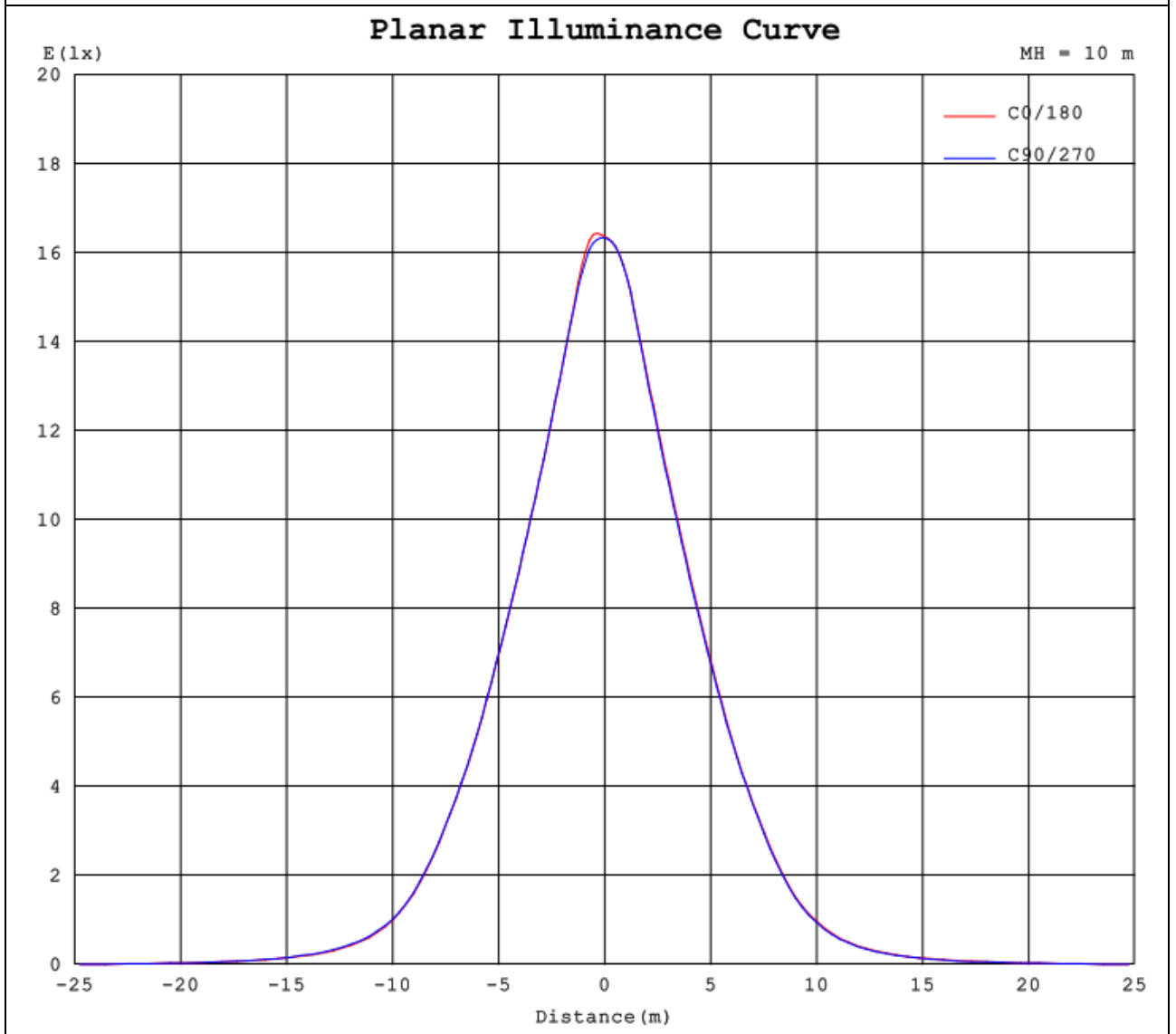
| | |
|----------------|--|
| Table 4 | Luminous Intensity distribution diagram |
| Model: | EF125-18W-840 |

Luminous Intensity distribution diagram(Unit: cd)



| | |
|----------------|---------------------------------|
| Table 5 | Planar Illuminance Curve |
| Model: | EF125-18W-840 |

Planar Illuminance Curve (Unit: lx)



| Table 6 | | Zonal flux diagram | | | | | | | | | | |
|----------|-----------------------|--------------------|--------|--------|--------|--------|--------|--------|----------|-------------|--------------|------|
| Model: | | EF125-18W-840 | | | | | | | | | | |
| γ | C0 | C45 | C90 | C135 | C180 | C225 | C270 | C315 | γ | Φ zone | Φ total | %lum |
| 10 | 1468 | 1471 | 1469 | 1463 | 1454 | 1447 | 1450 | 1451 | 0- 10 | 148.0 | 148.0 | 8.52 |
| 20 | 1164 | 1171 | 1166 | 1163 | 1156 | 1147 | 1145 | 1146 | 10- 20 | 364.6 | 512.6 | 29.5 |
| 30 | 855.3 | 863.9 | 858.8 | 854.6 | 842.0 | 833.8 | 835.0 | 836.9 | 20- 30 | 462.5 | 975.2 | 56.1 |
| 40 | 471.1 | 481.8 | 476.9 | 475.2 | 456.0 | 445.7 | 448.9 | 453.2 | 30- 40 | 412.8 | 1388 | 79.9 |
| 50 | 165.2 | 172.3 | 172.1 | 170.9 | 160.8 | 154.3 | 155.7 | 157.1 | 40- 50 | 221.9 | 1610 | 92.7 |
| 60 | 59.94 | 62.64 | 63.59 | 62.87 | 58.53 | 56.04 | 56.25 | 56.94 | 50- 60 | 91.77 | 1702 | 97.9 |
| 70 | 9.195 | 9.288 | 9.591 | 8.801 | 7.221 | 7.446 | 7.168 | 7.819 | 60- 70 | 31.24 | 1733 | 99.7 |
| 80 | 0.0706 | 0.0760 | 0.0822 | 0.0864 | 0.0880 | 0.0841 | 0.0771 | 0.0680 | 70- 80 | 1.614 | 1735 | 99.8 |
| 90 | 0.0149 | 0.0175 | 0.0147 | 0.0175 | 0.0172 | 0.0183 | 0.0140 | 0.0170 | 80- 90 | 0.0525 | 1735 | 99.8 |
| 100 | 0.0252 | 0.0263 | 0.0241 | 0.0264 | 0.0343 | 0.0361 | 0.0322 | 0.0352 | 90-100 | 0.0232 | 1735 | 99.8 |
| 110 | 0.0786 | 0.0776 | 0.0769 | 0.0789 | 0.0791 | 0.0813 | 0.0782 | 0.0806 | 100-110 | 0.0523 | 1735 | 99.8 |
| 120 | 0.2511 | 0.2470 | 0.2483 | 0.2503 | 0.1759 | 0.1796 | 0.1768 | 0.1782 | 110-120 | 0.1362 | 1735 | 99.8 |
| 130 | 0.5833 | 0.5748 | 0.5787 | 0.5797 | 0.3419 | 0.3463 | 0.3440 | 0.3448 | 120-130 | 0.2892 | 1735 | 99.9 |
| 140 | 1.111 | 1.102 | 1.105 | 1.108 | 0.5874 | 0.5925 | 0.5904 | 0.5902 | 130-140 | 0.4975 | 1736 | 99.9 |
| 150 | 1.650 | 1.643 | 1.646 | 1.651 | 0.8976 | 0.8991 | 0.9003 | 0.8997 | 140-150 | 0.6607 | 1736 | 99.9 |
| 160 | 2.042 | 2.039 | 2.042 | 2.046 | 1.158 | 1.176 | 1.179 | 1.177 | 150-160 | 0.6730 | 1737 | 100 |
| 170 | 2.026 | 2.031 | 2.030 | 2.031 | 1.113 | 1.107 | 1.109 | 1.107 | 160-170 | 0.4615 | 1737 | 100 |
| 180 | 1.154 | 1.156 | 1.154 | 1.151 | 1.155 | 1.156 | 1.154 | 1.150 | 170-180 | 0.1352 | 1738 | 100 |
| DEG | LUMINOUS INTENSITY:cd | | | | | | | | UNIT:lm | | | |

Attachment 1: Equipment List

| Equipment | ID No. | Model | Brand/Manufacturer | Calibration due date |
|--------------------------------|---------------|--------------|---------------------------|-----------------------------|
| Digital Power Meter | 13217 | WT210 | YOKOGAWA | 2016-08-19 |
| Anemometer | 13117 | 471-1 | Dwyer | 2016-01-03 |
| Temperature and Humidity meter | 13397 | SK-L200TH | SATO | 2016-01-11 |
| Goniophotometer system | 13345 | GO-R5000-SML | Everfine | 2016-03-11 |
| Integrating sphere test system | 13342 | CSLMS-7621 | Labsphere | 2016-03-11 |

Attachment 2

U,S, Department of Energy

Lighting Facts^{cm} Uniform LM-79 Reporting Template



Laboratory Information

| | |
|-------------------------------|---|
| Name of test lab | TÜV SÜD Certification and Testing (China) Co., Ltd, Shenzhen Branch |
| Date of test report | 2015-09-15 |
| Test report number | 68.184.15.290.01 |
| Laboratory contact name | Daniel Chen |
| Laboratory contact signature* | <i>Daniel Chen</i> |

* By signing this form, the signatory is attesting that the information on the form is correct and the same as on the original, complete test report(s),
The signatory also attests that all of the results on this form were measured entirely in accordance with IES LM-79-08,

Product Information

| | | | |
|--|-------------------|------------------------------|--|
| Manufacturer | NEKO LIGHTING LTD | | |
| Brand name | NEKO | | |
| Model number | EF125-18W-840 | | |
| SKU (if available) | -- | | |
| Type of luminaire (for integral lamps, list base type and lamp type) | LED Downlight | | |
| Luminaire aperture (downlights) | 10 | <input type="checkbox"/> in, | <input checked="" type="checkbox"/> cm |
| Luminaire length | -- | <input type="checkbox"/> in, | <input type="checkbox"/> cm |
| Luminaire width | -- | <input type="checkbox"/> in, | <input type="checkbox"/> cm |
| Number of units (modular products) | -- | | |

Electrical Measurements

Integrating sphere output

Goniophotometer output

| Electrical Measurements | Integrating sphere output | Goniophotometer output | |
|-------------------------|---------------------------|------------------------|---|
| Input wattage | -- | 20.2 | W |
| Input current | -- | 0.09 | A |
| Input voltage (AC) | -- | 230 | V |
| Power factor | -- | 0.9416 | |
| Off-state power | -- | -- | W |

Photometric Characteristics

| | Integrating sphere output | Goniophotometer output | |
|------------------------------------|---------------------------|------------------------|------|
| Total initial lumen output | -- | 1738 | lm |
| Initial luminaire efficacy | -- | 86.2 | lm/W |
| Correlated color temperature / CCT | 4031 | -- | K |
| Color rendering index / CRI | 82.2 | -- | |
| R ₉ value | 13 | -- | |
| Duv | 0.0017 | -- | |

Luminous Intensity Distribution

Goniophotometer output

| | Integrating sphere output | Goniophotometer output | |
|---|---------------------------|------------------------|----|
| Centre beam candlepower (if applicable) | -- | 1648 | cd |
| Beam angle (if applicable) | -- | 61.6 | ° |
| Zonal lumens in the 0°-60° zone | -- | 97.9 | % |
| Zonal lumens in the 60°-90° zone | -- | 1.9 | % |
| Zonal lumens in the 90°-120° zone | -- | 0 | % |
| Zonal lumens in the 120°-180° zone | -- | 0.2 | % |

END OF TEST REPORT