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|----------------------------------|--|
| Report Number | TRN-15552 |
| Customer | LED Evolution |
| Contact | Robin Day |
| Product Type | Street Light |
| Test Purpose | UMS Energy Performance Test |
| Sales Order Ref | Q-LUX15-20173 |
| Works Order Number | WO-6183 |
| Test Item Reference | TI-10398 |
| LAB Test Method Reference | TES-20012 |
| Test Standards | LM-79-08 and Elexon UMS Charge Code process V4.0 |
| Lab Location Reference | Performance |
| Tested By | Huw Rees |
| Date of Test | 28 October 2015 |
| Analysed by | Steve Hunt |
| Number of products tested | 5 |

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Date: 30 October 2015



Roadway Double - 90W 100% - LED
Evolution

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Nomenclature

Lamp Orientation described below relates to the position in which a lamp is designed to operate for maximum performance and safety, these include:

BD - Base Down (bulb is vertically positioned with the metal base at the bottom, glass up)

BU - Base Up (bulb is vertically positioned with the metal base at the top, glass hanging down)

HBD - Horizontal $+15^\circ$ to Base Down

H45 - Horizontal to -45° only

VBU - Vertical Base Up $\pm 15^\circ$

VBD - Vertical Base Down $\pm 15^\circ$

HBU - Base Up $\pm 90^\circ$ (bulb can be operated in a base up or horizontal position)

HOR - Horizontal Burn (bulb is positioned with the metal base parallel to the ground)

H75 - Horizontal $\pm 75^\circ$ (bulb should not be operated within 15° of vertical)

U - Universal Burn (burn can be operated in any position)

Test Equipment and Description

Yokogawa WT210 Power Analyser. Kikusui PCR2000M Stable AC Power Supply with PC control and data recording



The products under test are connected to the UMS Test system which has full data control and recording using Labview software. This allows full integration of the test equipment used - Kikusui AC Stable Power Supply, Yokogawa Power Analyser, Pico Temperature Logger and a LUX-TSI distribution control panel

| | |
|------------------------------|---|
| Product Name | Roadway Double - 90W 100% - LED Evolution |
| Part/Serial Number | See (Identifier) below |
| Type of Product | Street Light |
| Manufacturer | LED Evolution |
| Date of Manufacturer | Unknown |
| Base Type | Tile |
| Driver Type | Mains |
| Driver Model | Lumotech L05176 |
| Light Engine Model | LED Evolution 48LED & 44LED |
| Operating Orientation | Base Up |
| Test Orientation | Base Up |
| Ambient Temperature | 24.2°C |
| Humidity | <65% RH |
| Thermal Management | Passive |
| Dimmable | Yes |
| Product Summary | The product is of a street lantern design with a Metal enclosure. The driver is situated within the enclosure and the Light engine fitted on underside of the product |

| Dimension | Sample | Luminous Opening |
|----------------|--------|------------------|
| Diameter/Width | 220 mm | 150 mm |
| Length | 950 mm | 460 mm |
| Height/Depth | 130 mm | 0 mm |

| Test Item | Identifier |
|-----------|------------|
| 10398A | 1 |
| 10398B | 2 |
| 10398C | 3 |
| 10398D | 4 |
| 10398E | 5 |

Test Conditions

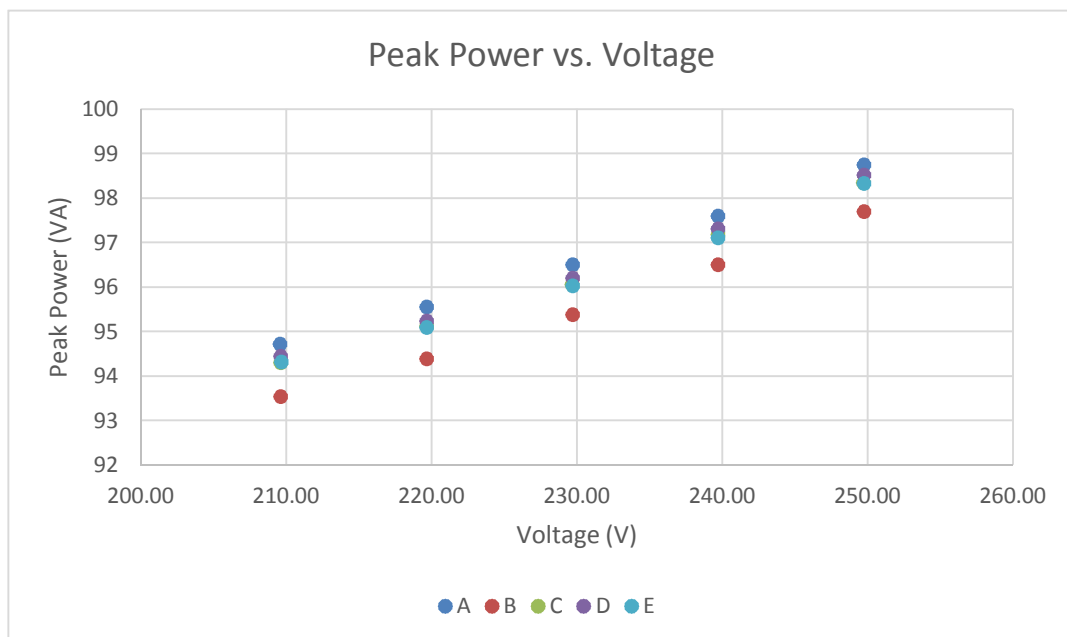
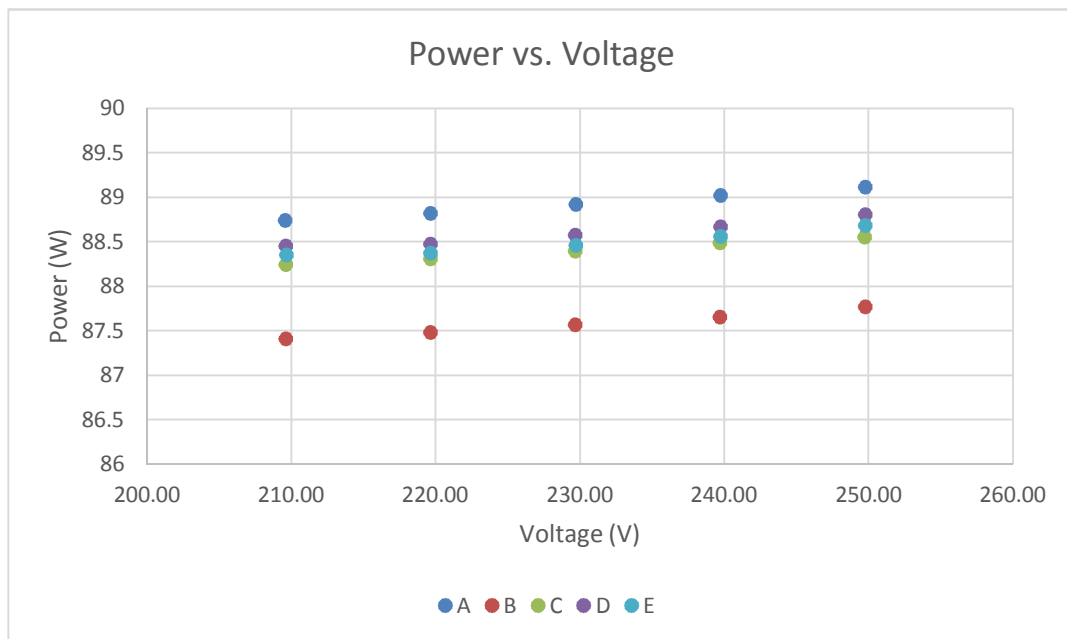
| | Before Test | After Test |
|--|-------------|------------|
| AC Supply Voltage (V) | 249.74V | 249.74V |
| AC Supply Frequency (Hz) | 50Hz | 50Hz |
| Voltage RMS Summation of the Harmonic Components (THD) | 0.1% | 0.08% |

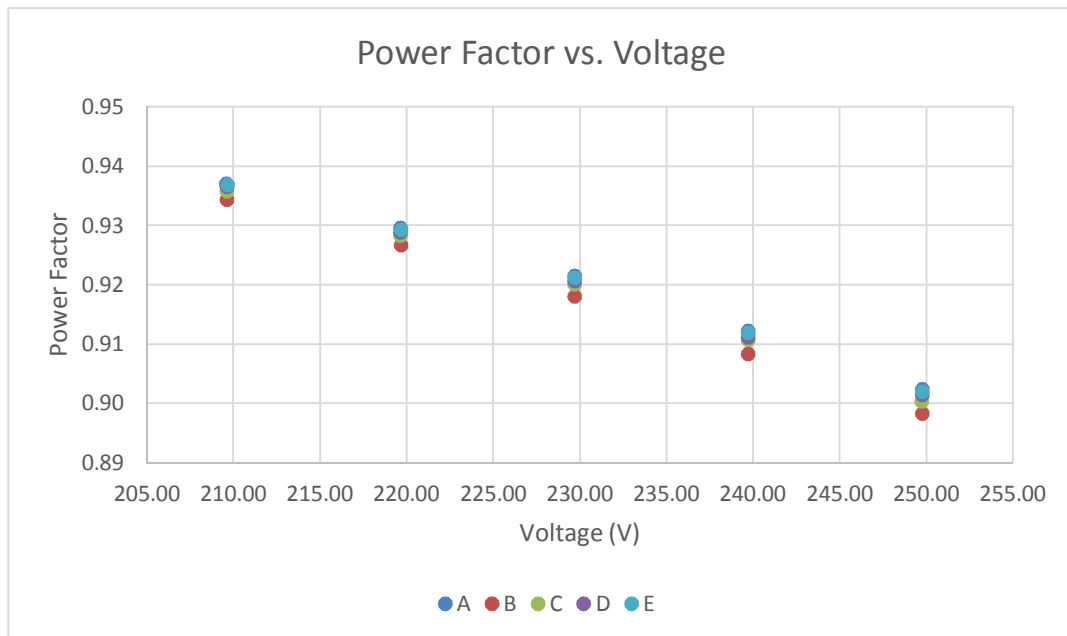
The test items were stabilised according to the electrical power stability of LM79-08. Stabilization is achieved when the difference in electrical power measurement is less than 0.5%. Each test item was stabilised at 250V.

Measurements were made with an ambient temperature of 25°C +/- 2°C. Measurements were taken only after sufficient time for thermal stabilisation has been allowed.

Test Results Summary

These are the summary graphs of the test results for all products tested. The raw results are on page 6 of this test report.





Power factors measured have a Leading phase angle and therefore the driver has capacitive properties.

Measurement Uncertainty

| Parameter | Uncertainty |
|---------------------------------|-----------------------|
| Voltage (300 V, 50/60 Hz) | $\pm 0.061 V_{rms}$ |
| Current (200 mA, 50/60Hz) | $\pm 0.07 mA_{rms}$ |
| Current (0.5 A, 50/60Hz) | $\pm 0.16 mA_{rms}$ |
| Current (5 A, 50/60Hz) | $\pm 0.0016 A_{rms}$ |
| Power (300 V, 200 mA, 50/60 Hz) | $\pm 0.032 W_{rms}$ |
| Power (300 V, 0.5 A, 50/60 Hz) | $\pm 0.09 W_{rms}$ |
| Power (300 V, 5 A, 50/60 Hz) | $\pm 0.0009 kW_{rms}$ |
| Frequency (50/60 Hz) | $\pm 0.001 Hz$ |
| Power Factor | $\pm 0.0006 PF$ |

Measurements of power of 0.50W or greater are made with an uncertainty of less than or equal to 2% at the 95% confidence level. Measurements of power less than 0.50W are made with an uncertainty of less than or equal to 0.01W at the 95% confidence level.

Full Test Results

| Test Item | Voltage (V) | Current (mA) | Electrical Power (W) | Ambient Temp (°C) | Peak Power (VA) | Power Factor | Leading / Lagging |
|-----------|-------------|--------------|----------------------|-------------------|-----------------|--------------|-------------------|
| A | 249.74 | 395.40 | 89.11 | 24.16 | 98.75 | 0.902 | Leading |
| B | 249.75 | 391.20 | 87.77 | 24.21 | 97.70 | 0.898 | Leading |
| C | 249.71 | 393.80 | 88.55 | 24.15 | 98.34 | 0.900 | Leading |
| D | 249.75 | 394.40 | 88.80 | 24.15 | 98.51 | 0.901 | Leading |
| E | 249.76 | 393.70 | 88.68 | 24.17 | 98.32 | 0.902 | Leading |
| A | 239.72 | 407.10 | 89.02 | 23.97 | 97.59 | 0.912 | Lagging |
| B | 239.71 | 402.60 | 87.65 | 23.92 | 96.50 | 0.908 | Leading |
| C | 239.71 | 405.30 | 88.49 | 24.02 | 97.17 | 0.911 | Leading |
| D | 239.72 | 405.90 | 88.67 | 23.96 | 97.31 | 0.911 | Leading |
| E | 239.72 | 405.10 | 88.56 | 24.04 | 97.11 | 0.912 | Leading |
| A | 229.69 | 420.10 | 88.92 | 23.59 | 96.50 | 0.922 | Lagging |
| B | 229.68 | 415.30 | 87.57 | 23.87 | 95.38 | 0.918 | Leading |
| C | 229.67 | 418.30 | 88.39 | 24.09 | 96.06 | 0.920 | Leading |
| D | 229.68 | 418.90 | 88.57 | 23.85 | 96.20 | 0.921 | Leading |
| E | 229.69 | 418.10 | 88.46 | 23.81 | 96.02 | 0.921 | Leading |
| A | 219.64 | 435.00 | 88.82 | 24.00 | 95.55 | 0.930 | Lagging |
| B | 219.65 | 429.80 | 87.48 | 23.92 | 94.39 | 0.927 | Leading |
| C | 219.64 | 433.10 | 88.31 | 23.88 | 95.12 | 0.928 | Leading |
| D | 219.64 | 433.60 | 88.47 | 23.94 | 95.24 | 0.929 | Leading |
| E | 219.66 | 432.90 | 88.37 | 24.06 | 95.09 | 0.929 | Leading |
| A | 209.59 | 451.90 | 88.74 | 23.86 | 94.72 | 0.937 | Lagging |
| B | 209.61 | 446.30 | 87.41 | 23.82 | 93.54 | 0.934 | Leading |
| C | 209.61 | 449.90 | 88.24 | 23.99 | 94.30 | 0.936 | Leading |
| D | 209.63 | 450.50 | 88.45 | 24.00 | 94.44 | 0.937 | Leading |
| E | 209.64 | 449.90 | 88.35 | 23.85 | 94.31 | 0.937 | Leading |

Test Item Photographs

TI-10398

Images of Product(s) under test includes (where possible) labelling, Driver and Light engine details



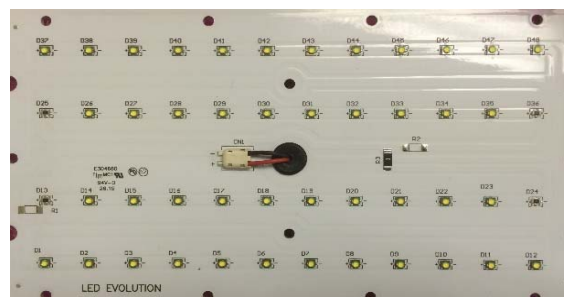
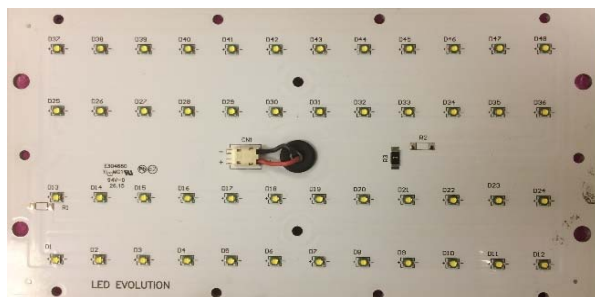
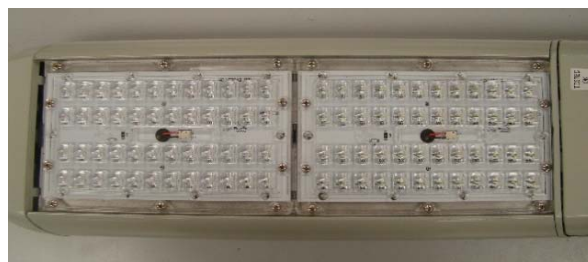
Top of Test Item



Front Face of Test Item



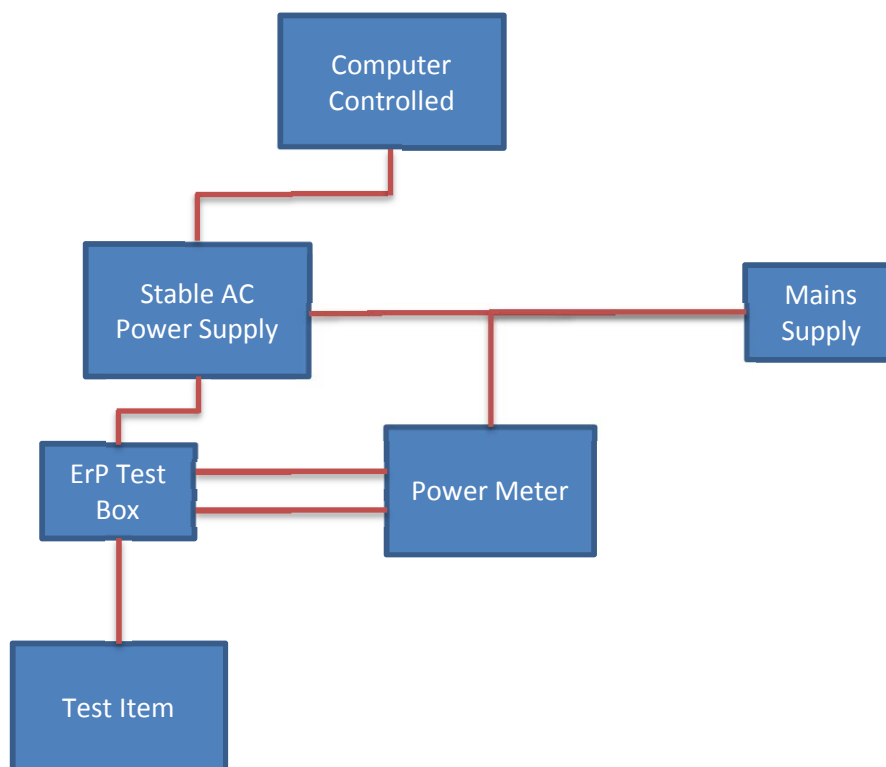
Inside Driver Compartment including driver



Light Engine Serial Numbers

Light Engine

Appendix 1: Test item set-up



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