Technical Report
No. 5356107/2

Date of report: 12 April 2013

Manufacturer: Hella KGaA Hueck & Co.
Rixbecker Strasse 75
59552 Lippstadt

Test object: LED Runway End Light (Red)
Model description: 011.855-1x7
Version / Variant: 6,6 A
Brand name: HELLA
Light source(s): 6 LEDs (white) with red outer lens

Object of the report: Test of the photometrical and colorimetric performance of aeronautical ground light(s), markings, signs and panels

Relevant standard(s) / Specification(s):
Photometry – Figure A2-8
Chromaticity – Figure A1-1 (red)

Performed tests: Measurement of the light distribution and determination of the minimum allowable luminous intensities and the colour of the light emitted according to the mentioned standard(s) / specification(s) above.

Test instruments and measurement conditions:
Measurement system: LMT GO-H 1300
Measuring distance: 25,0 m / 4,44 m
Power supply: FUG NTN 700M-35
Multimeter (Voltage): Keithley Model 2000
Multimeter (Current): Keithley Model 2000 and calibration resistor KW-0.01
Lamp(s) adjusted to: Current 6,60 A
Ambient temperature: 25°C ± 3°C
Test procedure

The test object was mounted on the Goniometer table according to the instruction of the manufacturer and aligned that the reference axes is in the rotation centre of the Goniometer.

In accordance to the manufacturer instruction and standard(s)/specification(s) mentioned above the test object was aimed by the goniometer to the following offset angles:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal</td>
<td>0,0°</td>
</tr>
<tr>
<td>Vertical</td>
<td>-2,5°</td>
</tr>
</tbody>
</table>

The test object was stabilized at constant DC Current 6,60 A for at least 15 min before starting the measurement.

Test results

The test results refer exclusively to the allocated and in the report described sample(s) of the test object (see picture(s) of the test object in Appendix 3).

The test object does fulfil the photometrical requirements (Figure A2-8) of the mentioned standard(s)/specification(s). In Appendix 1 are shown the test results in detail.

Furthermore the test object does fulfil the colorimetric requirements (Figure A1-1 (red)) of the mentioned standard(s)/specification(s). In Appendix 2 are shown the test results in detail.

Date:
12 April 2013

Dipl.-Ing. Fabian Stahl
Head of Laboratory

Dipl.-Ing. Heiko Herzberg
Test Engineer

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The relative expanded measurement uncertainty for the illuminance values are ± 5,8 %. The reported measured values and the associated uncertainties represent the interval which contains the value of the measured quantity with a probability of at least 95 %. Reported is the measurement uncertainty that results from the standard uncertainty multiplied by the coverage factor k=2. The calculation is based on the CIE 198:2011 "Determination of measurement uncertainties in photometry. The total measurement uncertainty entails contributions of the measurement standard, the calibration method, the environmental conditions, as well as the measuring object.
**Results of the photometrical test(s)**

### Appendix 1

**LED Runway End Light (Red):**

<table>
<thead>
<tr>
<th></th>
<th>5356107.2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Main Beam</td>
<td>Middle Beam</td>
<td>Outer Beam</td>
</tr>
<tr>
<td><strong>Limit</strong></td>
<td>2500,00</td>
<td>6241,26</td>
<td>5381,12</td>
</tr>
<tr>
<td><strong>Average luminous intensity</strong></td>
<td>7422,88</td>
<td>6241,26</td>
<td>5381,12</td>
</tr>
<tr>
<td><strong>Position maximum luminous intensity</strong></td>
<td>8108,49</td>
<td>8108,49</td>
<td>8108,49</td>
</tr>
<tr>
<td>x [°]</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>y [°]</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Limit</strong></td>
<td>1250,00</td>
<td>250,00</td>
<td>125,00</td>
</tr>
<tr>
<td><strong>Position minimum luminous intensity</strong></td>
<td>5278,73</td>
<td>2387,64</td>
<td>1502,57</td>
</tr>
<tr>
<td>x [°]</td>
<td>-5</td>
<td>-7</td>
<td>-8</td>
</tr>
<tr>
<td>y [°]</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td><strong>Result Average</strong></td>
<td>i.O.</td>
<td>i.O.</td>
<td>i.O.</td>
</tr>
<tr>
<td><strong>Result minimum</strong></td>
<td>i.O.</td>
<td>i.O.</td>
<td>i.O.</td>
</tr>
</tbody>
</table>
## Results of the chromaticity test

**LED Runway End Light (Red):**

<table>
<thead>
<tr>
<th>Measuring points</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP₁ (x = 0°; y = 4,75°)</td>
<td>0,673</td>
<td>0,327</td>
</tr>
<tr>
<td>MP₂ (x = -6°; y = 2,5°)</td>
<td>0,674</td>
<td>0,326</td>
</tr>
<tr>
<td>MP₃ (x = 0°; y = 2,5°)</td>
<td>0,674</td>
<td>0,326</td>
</tr>
<tr>
<td>MP₄ (x = 6°; y = 2,5°)</td>
<td>0,672</td>
<td>0,328</td>
</tr>
<tr>
<td>MP₅ (x = 0°; y = 0,25°)</td>
<td>0,675</td>
<td>0,326</td>
</tr>
</tbody>
</table>

**CIE Colour Coordinates - ICAO-Colour "red"**

![CIE Colour Coordinates - ICAO-Colour "red"](chart.png)

- **Measuring Point 1**
- **Measuring Point 2**
- **Measuring Point 3**
- **Measuring Point 4**
- **Measuring Point 5**
LED Runway End Light (Red):