Optical Analysis

Customer:

Secto Design

Secto Design Oy
Kauppalantie 12
02700 Kauniainen, Finland

Research contract:

ref.no: ta25042013AK.pdf

Target:

Secto Design luminaire, Magnum 4202 pendant luminaire (shown in Fig. 1).

Handmade design pendant. Crafted in Finland of PEFC-certified formpressed Finnish birch by highly skilled craftsmen.

Finishes of the shade:
Natural birch
White laminated
Black laminated
Walnut veneer

Cable: 200 cm, heat-resistant, ceiling plug + ceiling cup + 3 steel wires

Manufacturer: Secto Design
Designer: Seppo Koho

Fig. 1. *Magnum 4202. The tested luminaire was with natural birch finish.*

Testing time:

The start of the test: 14th February, 2014
The end of the test: 4th March, 2014

Purpose of the test:

The goal of the measurement is to determine the light intensity distribution and total luminous flux (in lumen) of the luminaires.

Test method:

Luminous flux is measured in a goniometer. The goniometer rotates the luminaire around the horizontal axis of the luminaire (vertical angles, γ) in each C plane (= orientation around the vertical axis of the luminaire). The detector measures the illuminance at each orientation of the

luminaire. Total luminous flux is calculated from this data.

Vertical angles, γ (around the horizontal axis): 0° – 180°, measurement in 2.5-degree increments
Horizontal angles (C-planes): 0°– 90°, step: 5°

Validation of the test method:

Light intensity distribution gives information on how the light is spread around the luminaire. This information is used e.g. for modelling how the luminaire lights up a room.

Performed actions:

Light intensity distribution of Magnum 4202 with a miniature fluorescent bulb was measured.

The measurements were performed with a goniophotometer in the optical laboratory of SSL Resource Oy. The detector, which is a photometer measuring the illuminance of the light source in lux, is fixed in location. The luminaire can be rotated around the vertical and horizontal axis and so the illuminance can be measured at every direction around the luminaire. The orientation of different axes and C-planes are shown in Fig. 2 and Fig. 3, respectively.

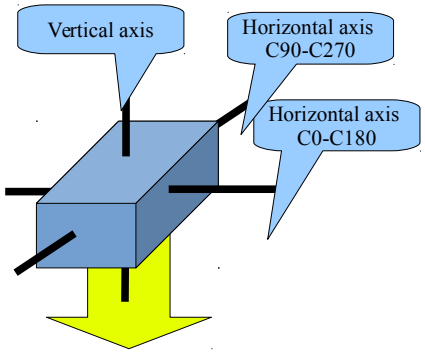


Fig. 2. *Orientation of different axes of rotation.*

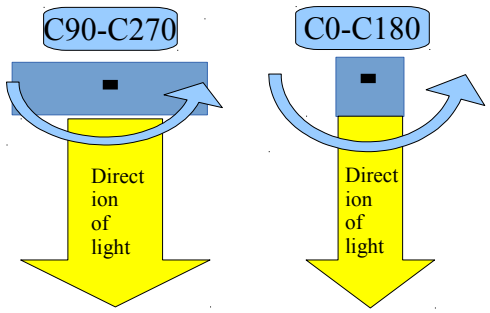


Fig. 3. *Directions of C-planes (horizontal angles) C90-C270, C0-C180.*

The intensity measurements in a C-plane were performed starting straight “below” the luminaire (vertical angle 0°) and then increasing the vertical angle with 2.5-degree increments. This measurement was repeated for horizontal angles (C-planes) from 0° to 90°. This is enough since the luminaires are symmetric around the vertical axis.

Figure 4 shows an example of a light distribution curve. The diagram represents a cut in a plane through a luminaire or lamp and shows the intensity of light emitted in each direction. The centre of the light source is at the origin. The direction 0°is the downward direction and 180°is the upward direction. The straight radial lines in Fig. 4 indicate the angle of the light emitted while the circles are intensity contours. The intensity values of the light distribution curve are scaled to correspond to 1000 lm from the light source (cd/1000 lm). The real cd-value for a specific light bulb can be calculated by multiplying by the 1/1000 of the lumen-value of the bulb. Blue and red

curves show light intensity distribution at perpendicular horizontal angles (=C-planes).

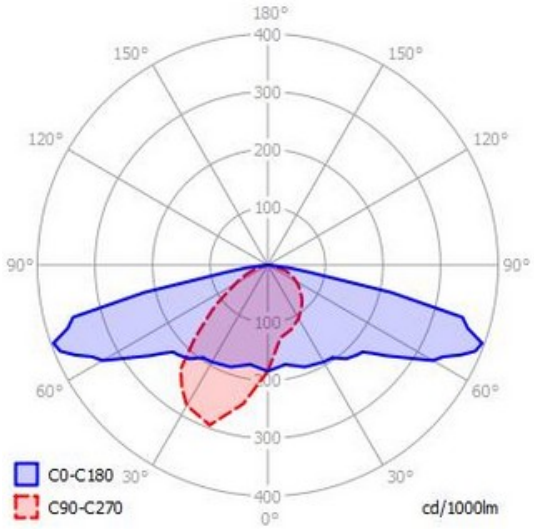


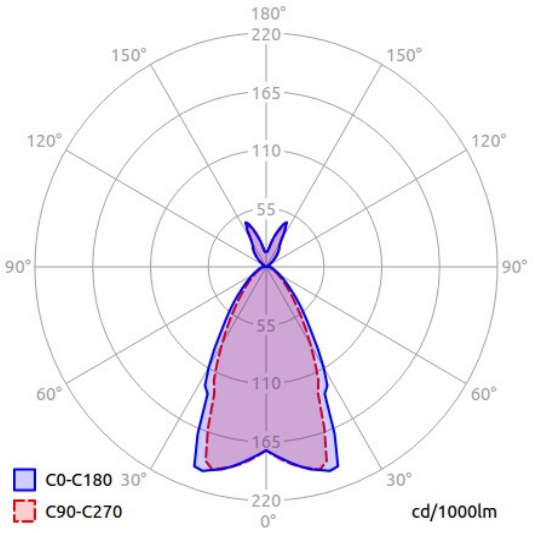
Fig. 4. *Light intensity distribution curve. From ref. http://sourceforge.net/projects/qlumedit/ (14.4.2013)*

Light distribution curve of the Magnum 4202 luminaire is shown in Fig. 5(a). The curve was determined using QLumEdit program. The cumulative luminous flux of the luminaire can be seen in Fig. 5(b).

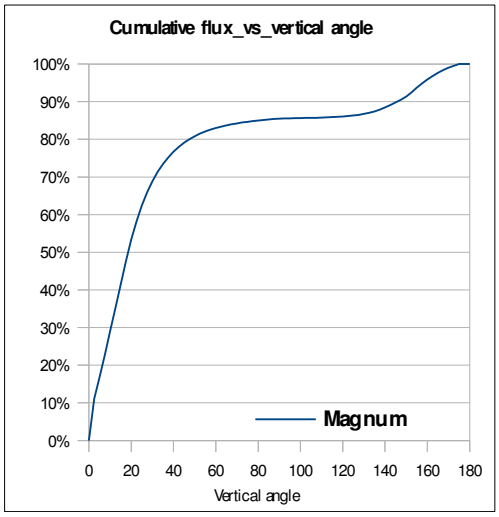
The measurements give also values for total luminous flux (Φ_v) outside the luminaire, Input power (P_{in}), efficacy (η_v) and downward flux fraction (DWFF), which are shown in Table 1 for the measured luminaire .

Table 1: The performance characteristics of the measured luminaire. Note: total luminous flux (Φ_v) is the total flux **outside** the luminaire.

Luminaire	Φv [lm]	Pin [W]	ηv [lm/W]	DWFF
Magnum 4202	1200	62.7	19.1	81%



(a)



(b)

Fig. 5. *(a) Light distribution curve of Magnum 4202. Light distribution is shown in two perpendicular vertical planes (C-planes). (b) Cumulative light flux (%) vs. vertical angle.*

Used equipment:
Illuminance: Goniophotometer with PRC Krochmann Luxmeter 110, calibrated 4th September, 2012. Accuracy of the Luminous flux measurement is ±3.4 % (k = 2)
Input power: HP104 AC, calibrated 8th September, 2012. Accuracy of the input power measurement is ±1.3 % (k = 2)

Analysis/Recommendations:

N/A

Conclusions:

The light intensity curve and performance characteristics of the luminaire under test were determined (see **Fig. 5** and **Table 1**, respectively).

Remarks:

Actions, operations and reporting are in accordance with IEC/ISO 17025 'General requirements for the competence of testing laboratories'.

This review report is based on research report SectoDesignJuselius__tr260214AK.pdf

Signatures:

Riitta Perälä
Littoinen 11th June, 2014

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