Lamp measurement report – 2 dec 2008 voor Line Lite International BV

Line Lite International BV Sharp 4W MR16 Spotlight

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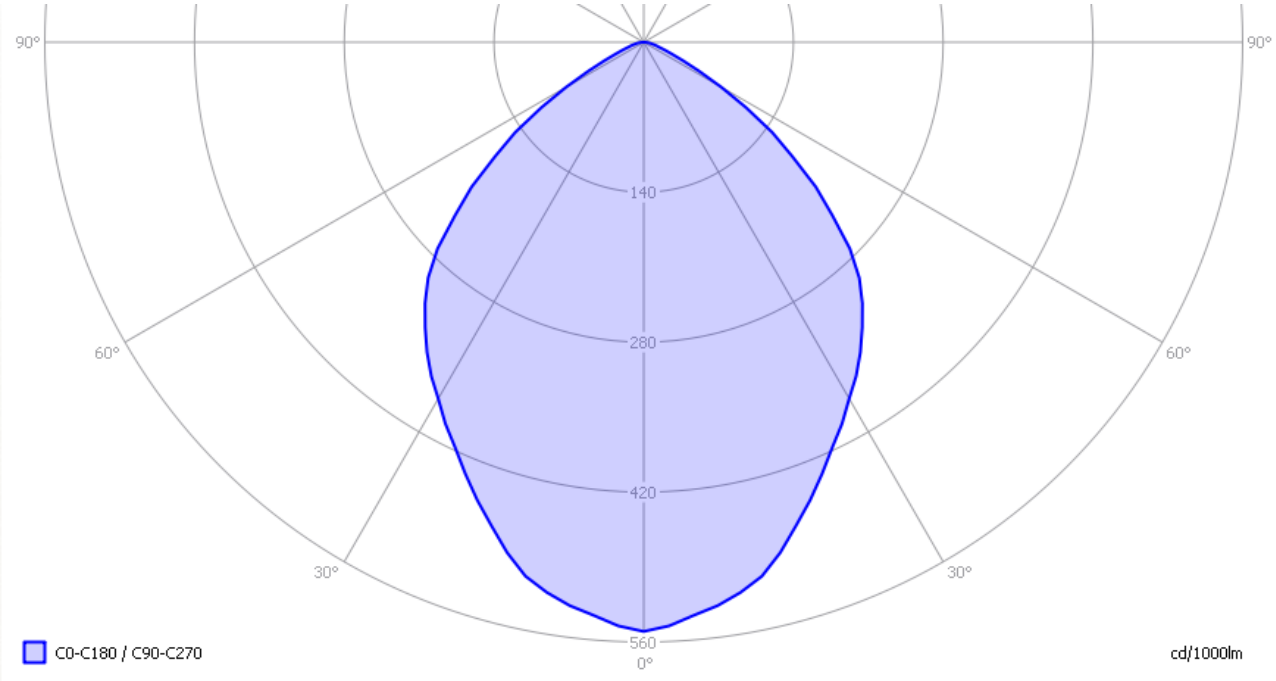
Summary measurement data

parameter	meas. result	remark
Color temperature	2988 K	Warm white
Luminous intensity I_v	75 Cd	
Beam angle	90 deg	Wide beam angle for a spot light.
Power P	4.3 W	
Power Factor	0.88	For every 1 kWh net power consumed, there has been 0.53 kVAhr for reactive power.
Luminous flux	135 lm	
Luminous efficacy	31 lm/W	
CRI_Ra	71	Color Rendering Index.
Coordinates chromaticity diagram	x=0.4531 and y=0.4083	
Screw fitting / mount	MR16	
D x H external dimensions	50 x 49 mm	External dimensions of the spot light.
Diameter luminous area	28 mm	Dimensions of the luminous area (used in Eulumdat file). This is a circular area of the size of the used reflector.
General remarks		The ambient temperature during the whole set of measurements was 18.5 deg C. Warm up effect: little effects. The parameters were stable after 30 minutes. Voltage dependency: consumed power and illuminance are dependent from the light bulb voltage.

Lamp measurement report – 2 dec 2008 voor Line Lite International BV

Eulumdat lichtdiagram

An interesting graph is the light diagram, indicating the intensity in the C0-C180 and the C90-C270 plane. This light diagram below comes from the program Qlumedit, that extracts these diagrams from an Eulumdat file.



The light diagram giving the radiation pattern.

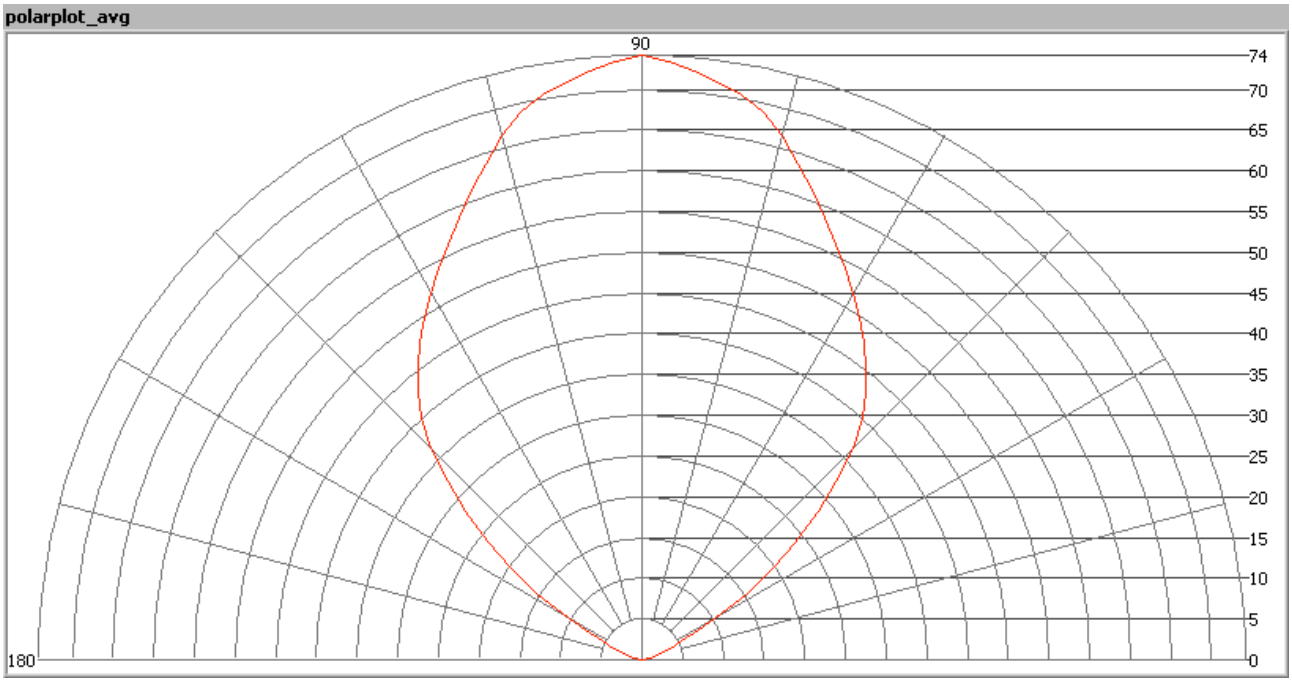
It indicates the luminous intensity around the light spot. All light beyond 60 degrees is effectively blocked by the used reflectors.

The unit is Cd/1000lm, meaning the intensity in Cd assuming there would be 1000 lumen in the measured light bulb. This enables comparing different types of light bulbs.

Illuminance Ev at 1 m distance, or luminous intensity Iv

Herewith the plot of the *averaged* luminous intensity Iv as a function of the inclination angle with the light bulb.

Lamp measurement report – 2 dec 2008 voor Line Lite International BV

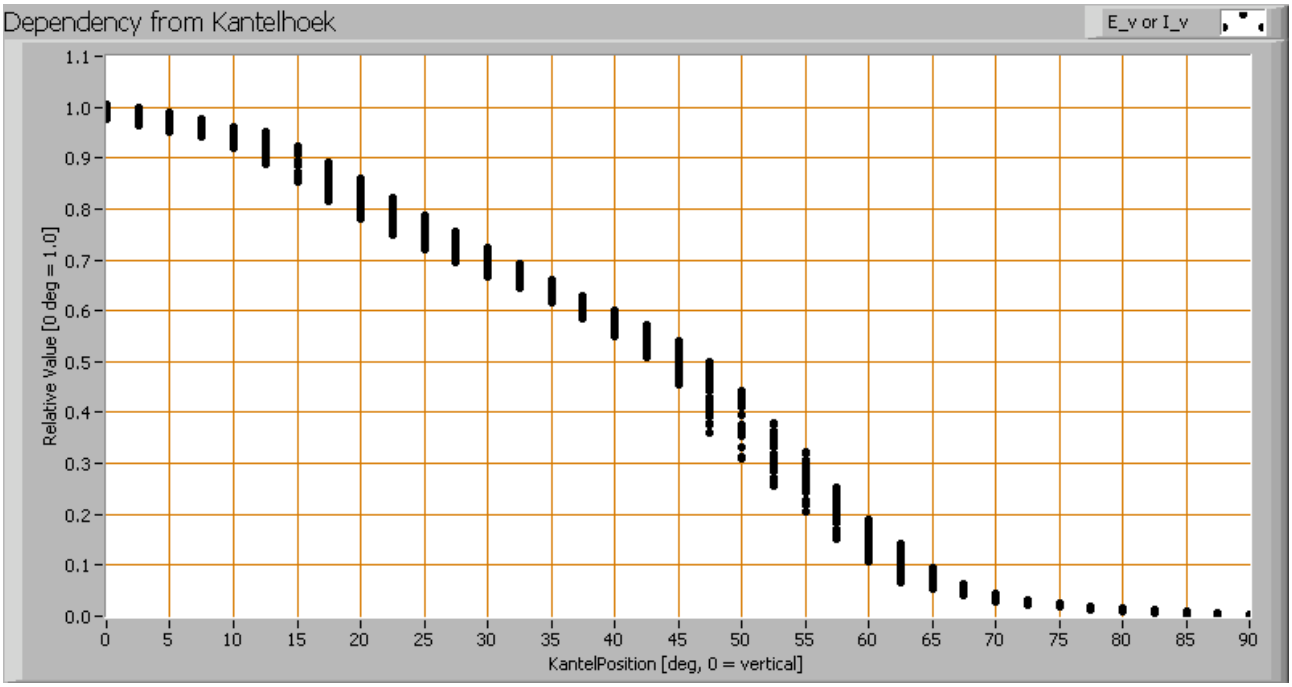


The radiation pattern of the light bulb.

This radiation pattern is the same as the one given earlier. This is because in this light spot's case, the radiation pattern is symmetric around the z-axis, meaning that the averaged pattern given here is the same as the extraction of the Eulumdat file.

These averaged values are used (later) to compute the lumen output.

Lamp measurement report – 2 dec 2008 voor Line Lite International BV



Intensity data of every measured turn angle at each inclination angle.

This plot shows per inclination angle the intensity measurement results for each turn angle at that inclination angle.

When using the average values per inclination angle, the beam angle can be computed, being 90 degrees.

Luminous flux

With the averaged illuminance data at 1 m distance, taken from the graph showing the averaged radiation pattern,it is possible to compute the luminous flux.

The result of this computation for this light spot is a luminous flux of 135 lm.

Luminous efficacy

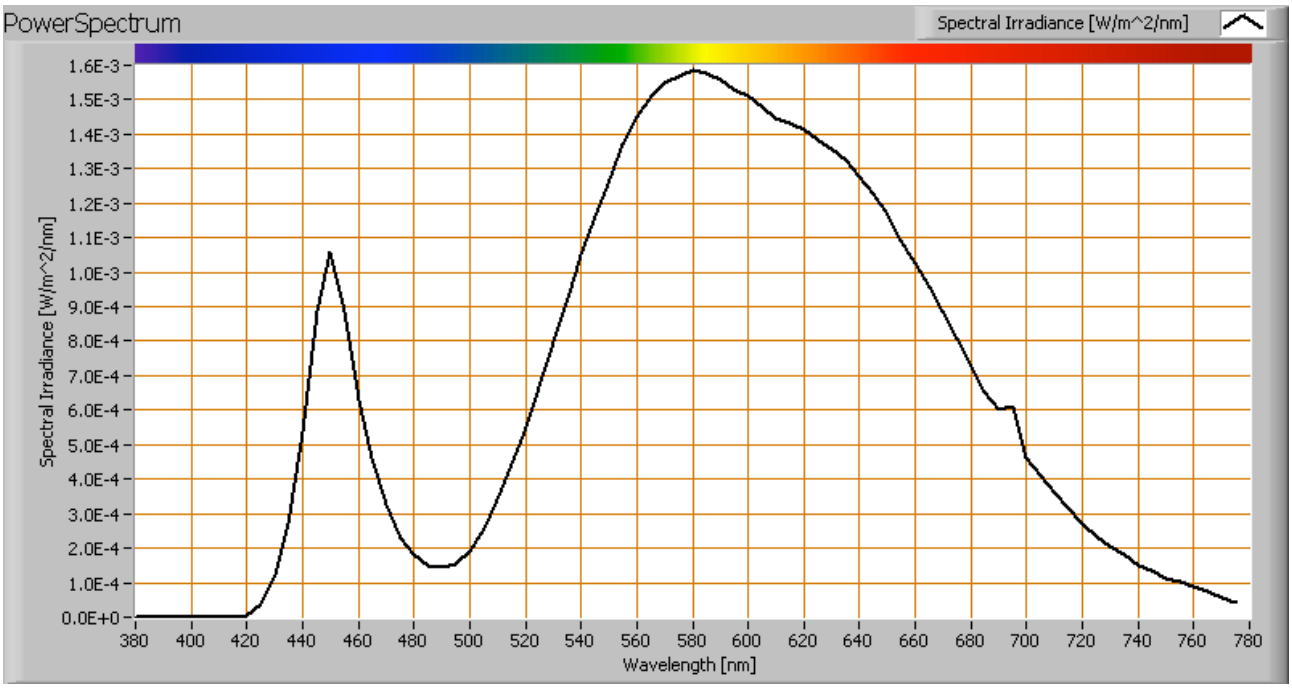
The luminous flux being 135 lm, and the power of the lightbulb being 4.3 W, yields a luminous efficacy of 31 lm/W.

A power factor of 0.88 means that for every 1 kWh net power consumed, a reactive component of 0.53 kVAr was needed.

Lamp measurement report – 2 dec 2008 voor Line Lite International BV

Light bulb voltage	12.0 V
Light bulb current	408 mA
Power P	4.3 W
Apparent power S	4.9 VA
Power factor	0.88

Color temperature and Spectral power distribution

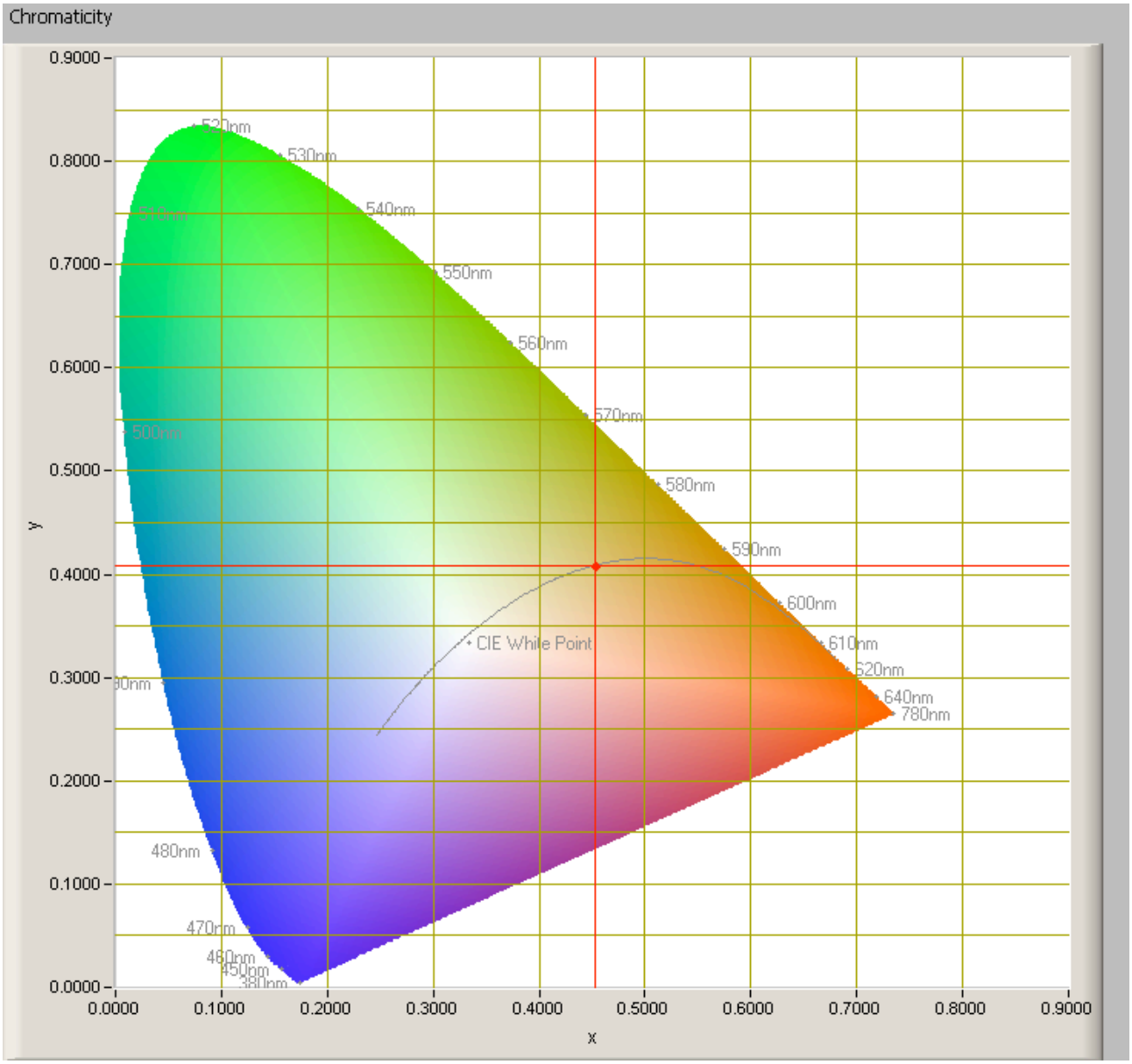


The spectral power distribution of this light bulb.

The measured color temperature is about 3000 K, close to warm white.

Lamp measurement report – 2 dec 2008 voor Line Lite International BV

Chromaticity diagram



The chromaticity space and the position of the lamp's color coordinates in it.

The light coming from this lamp is on the Planckian Locus (the black path in the graph).

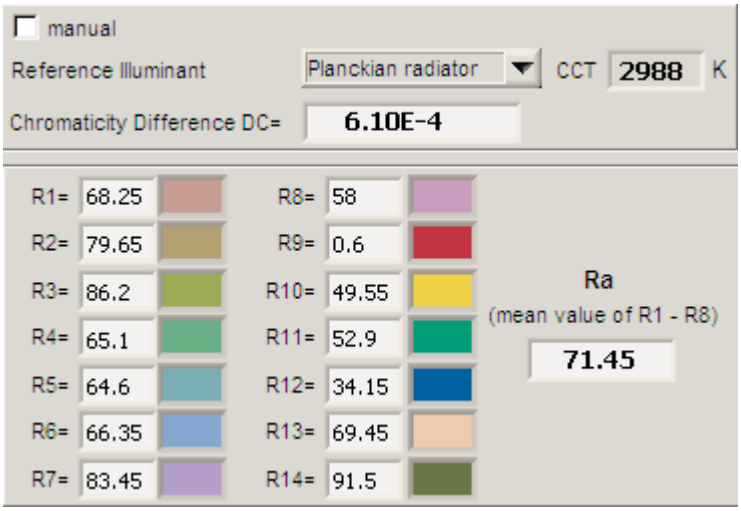
Its coordinates are x=0.4531 and y=0.4083.

Lamp measurement report – 2 dec 2008 voor Line Lite International BV

Color Rendering Index (CRI) or also Ra

Herewith the image showing the CRI as well as how well different colors are represented (rendered). The higher the number, the better the resemblance with the color when a black body radiator would have been used (the sun, or an incandescent lamp).

Each color has an index Rx, and the first 8 indexes (R1 .. R8) are averaged to compute the Ra which is equivalent to the CRI.



CRI of the light of this lightbulb.

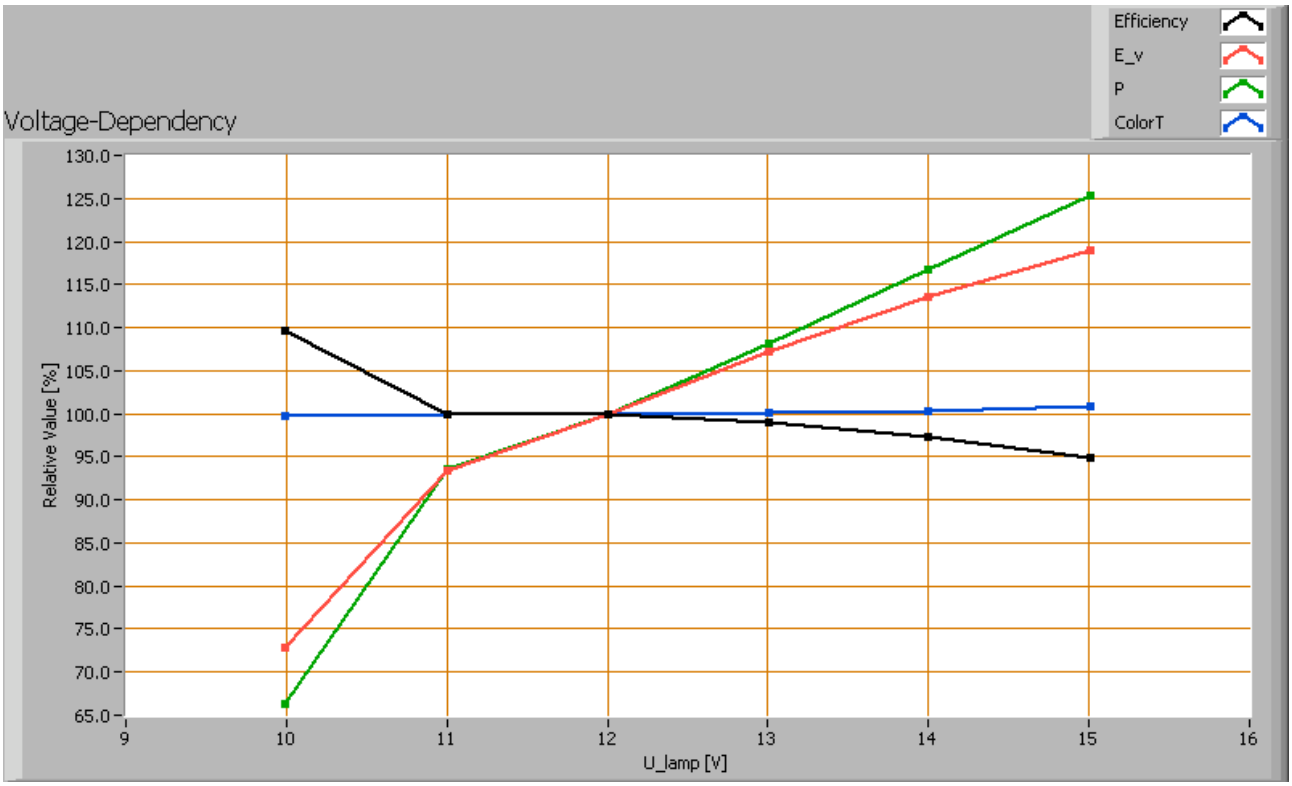
The value of 71 is lower than 80 which is considered a minimum value for indoor usage.

Note: the chromaticity difference is 0.0006 indicates the distance to the Planckian Locus. Its value is lower than 0.0054, which means that the calculated CRI result is meaningful.

Lamp measurement report – 2 dec 2008 voor Line Lite International BV

Voltage dependency

The dependency of a number of lamp parameters on the lamp voltage is determined. For this, the lamp voltage has been varied and its effect on the following lamp parameters measured: illuminance E_v [lx], color temperature CT or correlated color temperature CCT [K], the lamppower P [W] and the luminous efficacy [lm/W].



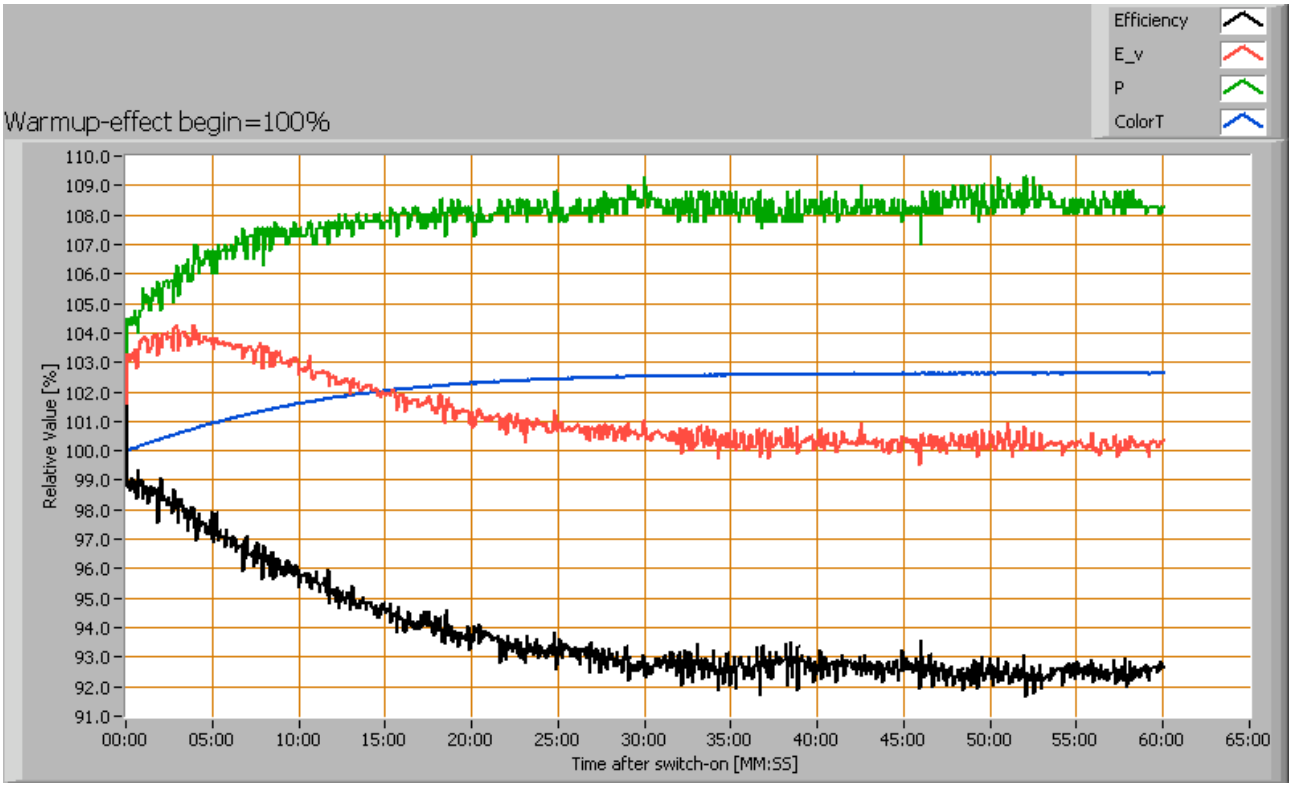
Lamp voltage dependencies of certain light bulb parameters, where the value at 12 V is taken as 100 %.

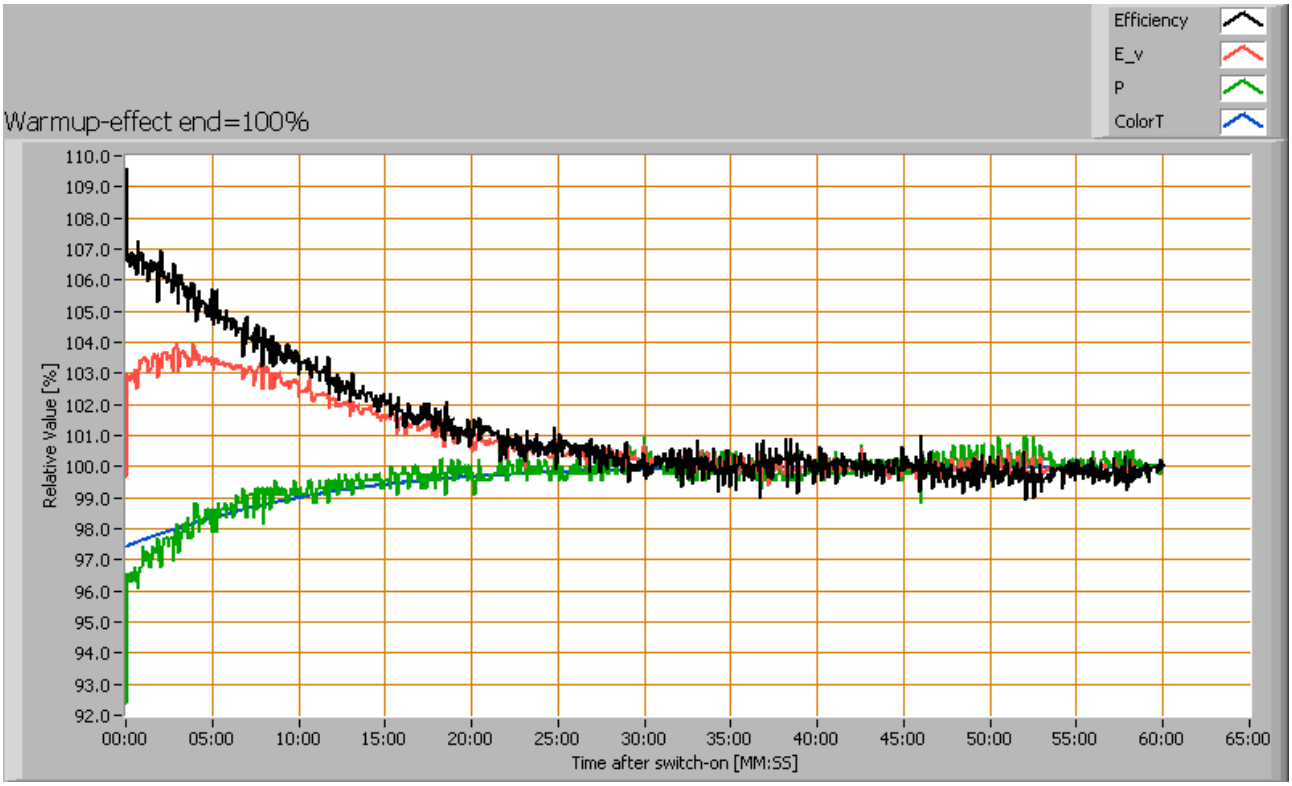
The consumed power as well as the illuminance do depend on the light bulb voltage. For voltages below 11 V the dependency is bigger.

Warm up effects

After switch on of a cold lamp, the effect of heating up of the lamp is measured on illuminance E_v [lx], color temperature CT or correlated color temperature CCT [K], the lamppower P [W] and the luminous efficacy [lm/W].

Lamp measurement report – 2 dec 2008 voor Line Lite International BV





Lamp measurement report – 2 dec 2008 voor Line Lite International BV

Effect of warming up on different light bulb parameters. At top the 100 % level is put at begin, and at bottom at the end.

The effect of warming up results in an increase of consumed power of about 8 %. The warm up period takes about 30 minutes.

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