



Lamp measurement report – 2 Jan 09 for Line Lite International BV

**Line Lite International BV Brilux 3W WW E27 with silicon
sleeve**





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Summary measurement data

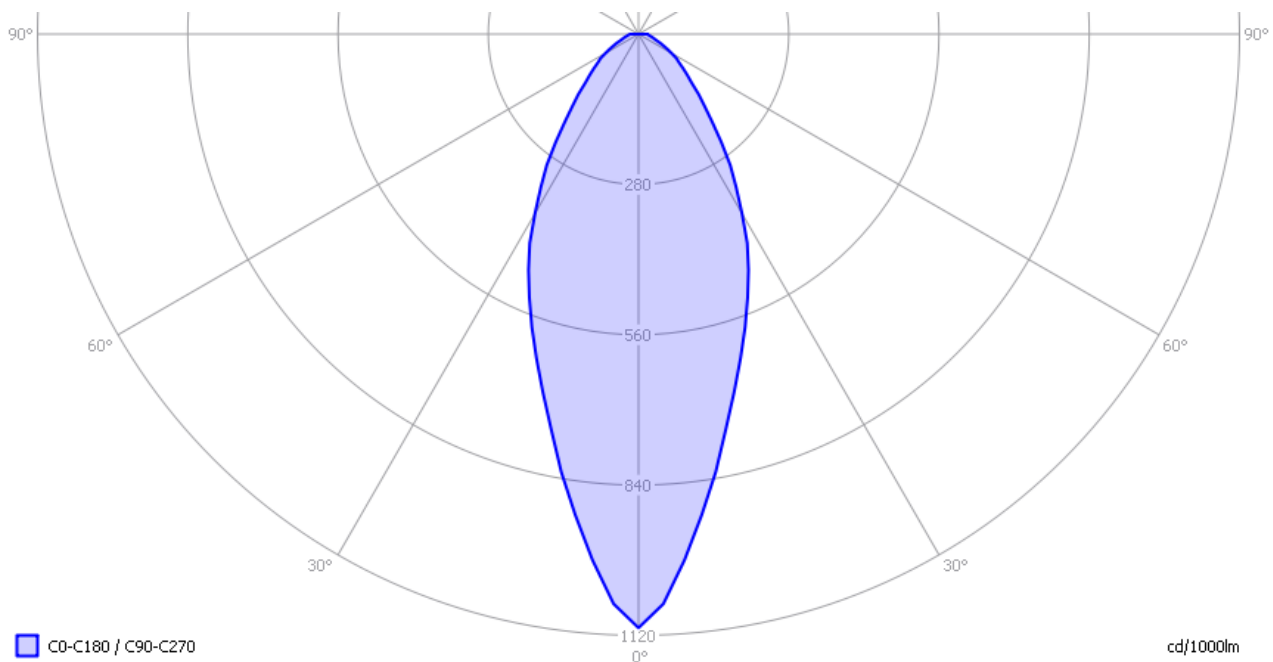
parameter	meas. result	remark
Color temperature	2588 K	Deep warm white
Luminous intensity I_v	81 Cd	
Beam angle	43 deg	
Power P	2.8 W	
Power Factor	0.41	For every 1 kWh net power consumed, there has been 2.2 kVAhr for reactive power.
Luminous flux	72 lm	
Luminous efficacy	26 lm/W	
CRI_Ra	81	Color Rendering Index.
Coordinates chromaticity diagram	x=0.4643 and y=0.4036	
Fitting	E27	
D x H external dimensions	65 x 105 mm	External dimensions of the light bulb.
Diameter luminous area	65 mm	Dimensions of the luminous area (used in Eulumdat file).
General remarks		<p>The ambient temperature during the whole set of measurements was 20.0-24.0 deg C.</p> <p>Warm up effect: the illuminance as well as the consumed power are varying slightly, less than 8 %.</p> <p>Voltage dependency: consumed power and illuminance are independent from the light bulb voltage.</p> <p>See at the end of this report a photo of the two light bulbs together; with silicon sleeve and without.</p>



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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 bulb. This light diagram is symmetrical around the z-axis.

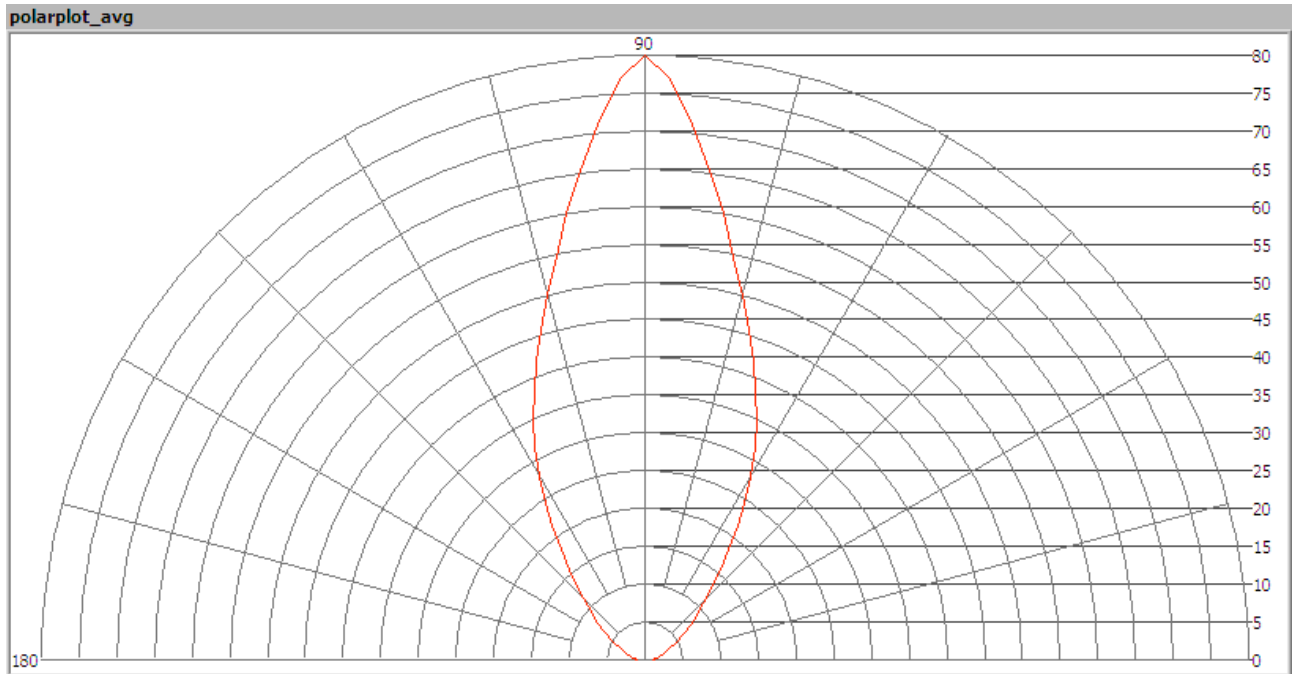
The unit is Cd/1000lm, meaning the intensity in Cd assuming there would be 1000 lumen in the measured light bulb. This enables comparing different types of light bulbs.

Illuminance E_v at 1 m distance, or luminous intensity I_v

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



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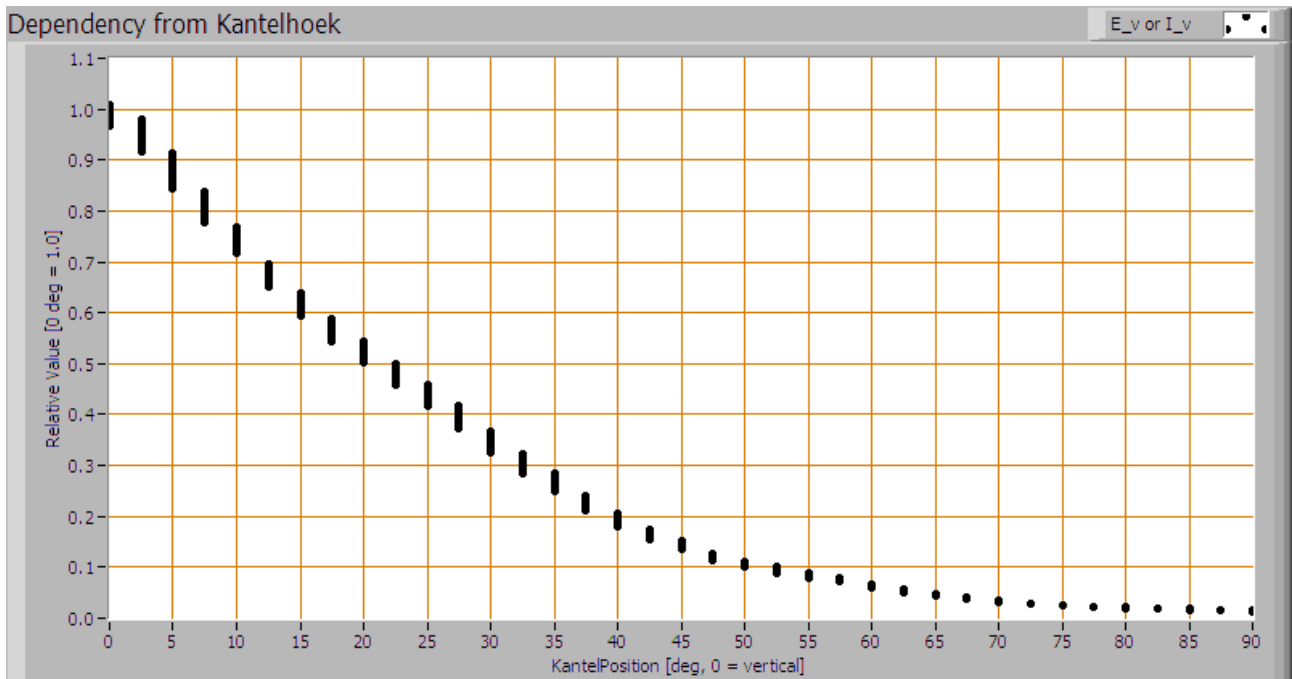
The radiation pattern of the light bulb.

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.



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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. So at 20 degrees inclination angle, all the measurement results of illuminance for all measured turn angles are in the range of 50-55 % of the illuminance value at 0 degrees inclination angle.

When using the average values per inclination angle, the beam angle can be computed, being 43 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 72 lm.



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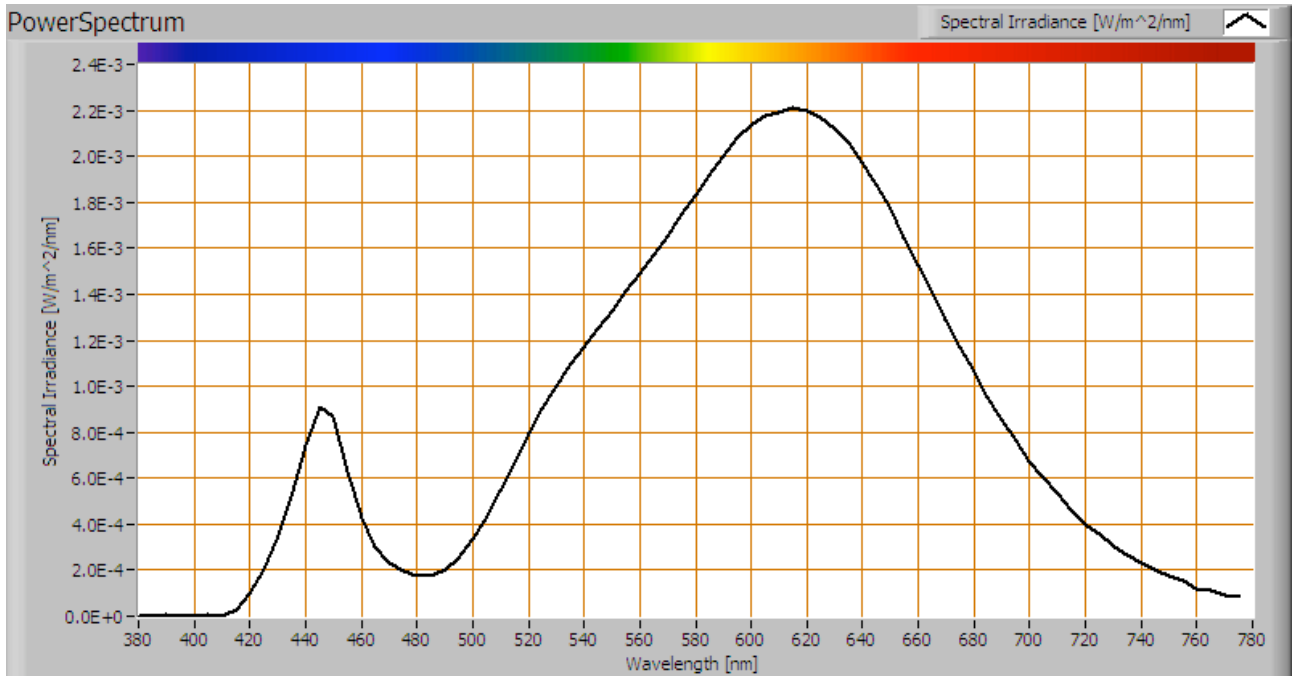
Luminous efficacy

The luminous flux being 72 lm, and the power of the lightbulb being 2.8 W, yields a luminous efficacy of 26 lm/W.

A power factor of 0.41 means that for every 1 kWh net power consumed, a reactive component of 2.2 kVAr was needed.

Light bulb voltage	230 V
Light bulb current	29 mA
Power P	2.8 W
Apparent power S	6.7 VA
Power factor	0.41

Color temperature and Spectral power distribution



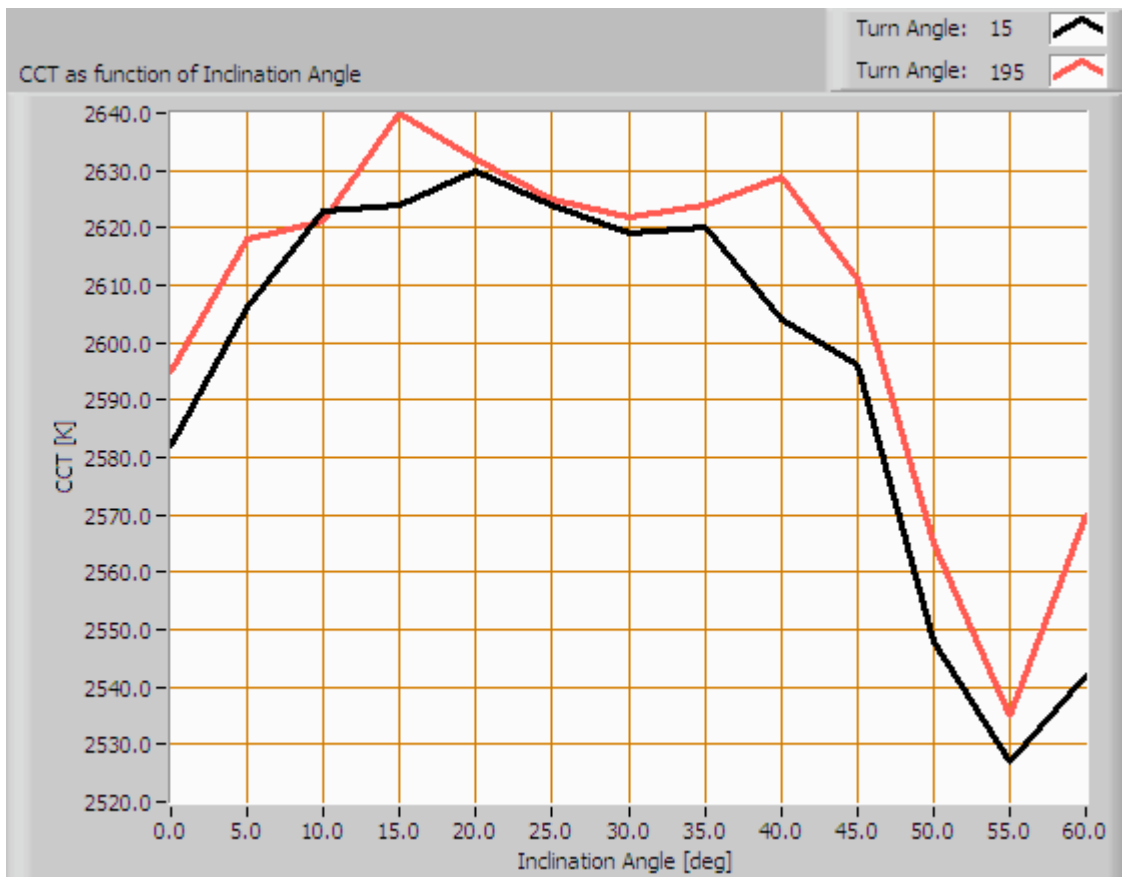
The spectral power distribution of this light bulb.

The measured color temperature is about 2600 K which is deep warm white.



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This color temperature is measured straight underneath the light bulb. Below a graph showing the color temperature for different inclination angles.



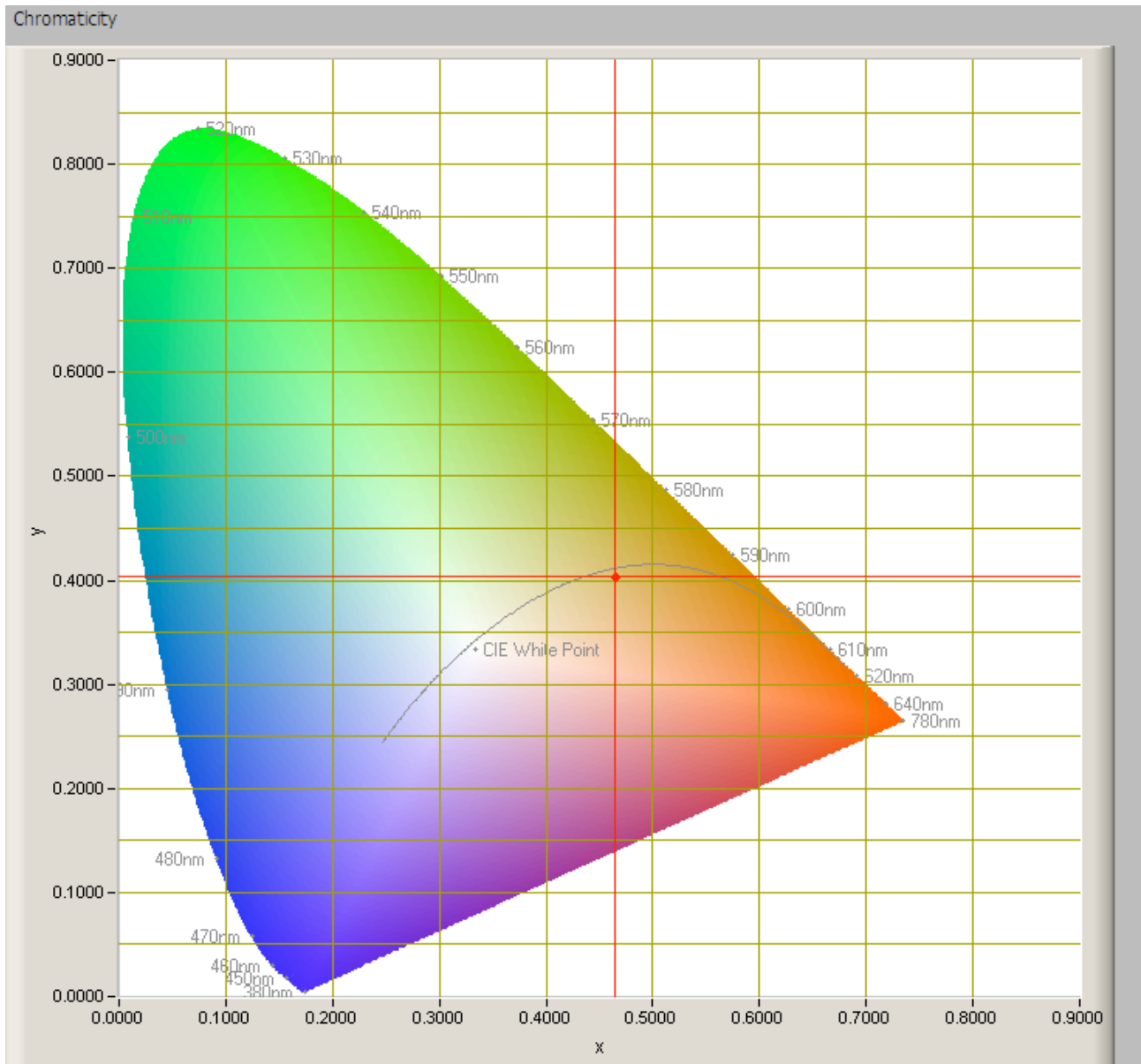
Color temperature as a function of inclination angle.

The maximum value of inclination angle is 60 degrees. Beyond that value there is virtually no intensity anymore. The color temperature remains relatively constant, and then decreases to about 3 % less than its value at 0 degrees.



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Chromaticity diagram



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

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

Its coordinates are $x=0.4643$ and $y=0.4036$.



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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 R_x , and the first 8 indexes ($R_1 \dots R_8$) are averaged to compute the R_a which is equivalent to the CRI.

☐ manual

Reference Illuminant: Planckian radiator CCT: 2588 K

Chromaticity Difference DC= 2.90E-3

R1= 80		R8= 65.35		Ra (mean value of R1 - R8) 80.64
R2= 87		R9= 23.6		
R3= 91.1		R10= 67.9		
R4= 78.45		R11= 74.15		
R5= 77.5		R12= 60.45		
R6= 80.75		R13= 80.9		
R7= 85		R14= 94		

CRI of the light of this lightbulb.

The value of 81 is higher than 80 which is considered a minimum value for indoor usage.

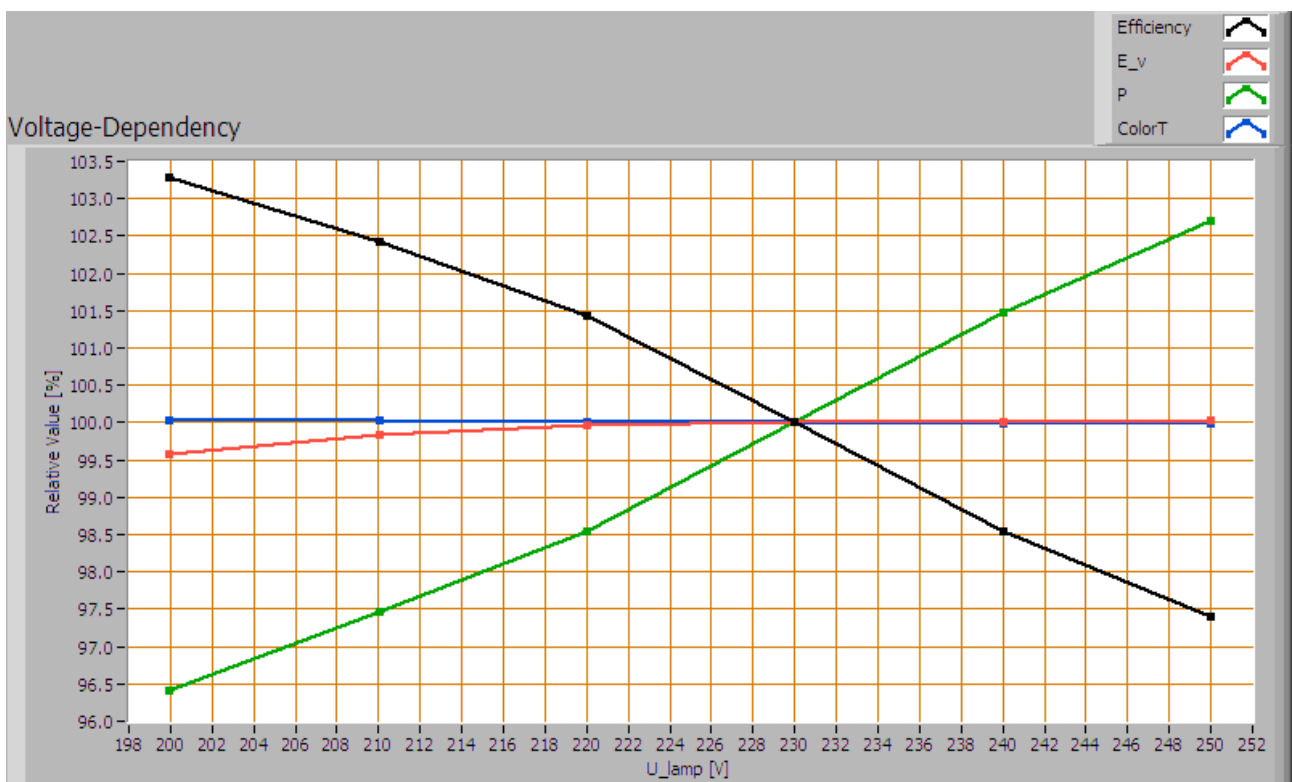
Note: the chromaticity difference is 0.0029 indicates the distance to the Planckian Locus. Its value is lower than 0.0054, which means that the calculated CRI result is meaningful.



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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 lamp power P [W] and the luminous efficacy [lm/W].



Lamp voltage dependencies of certain light bulb parameters, where the value at 230 V is taken as 100 %.

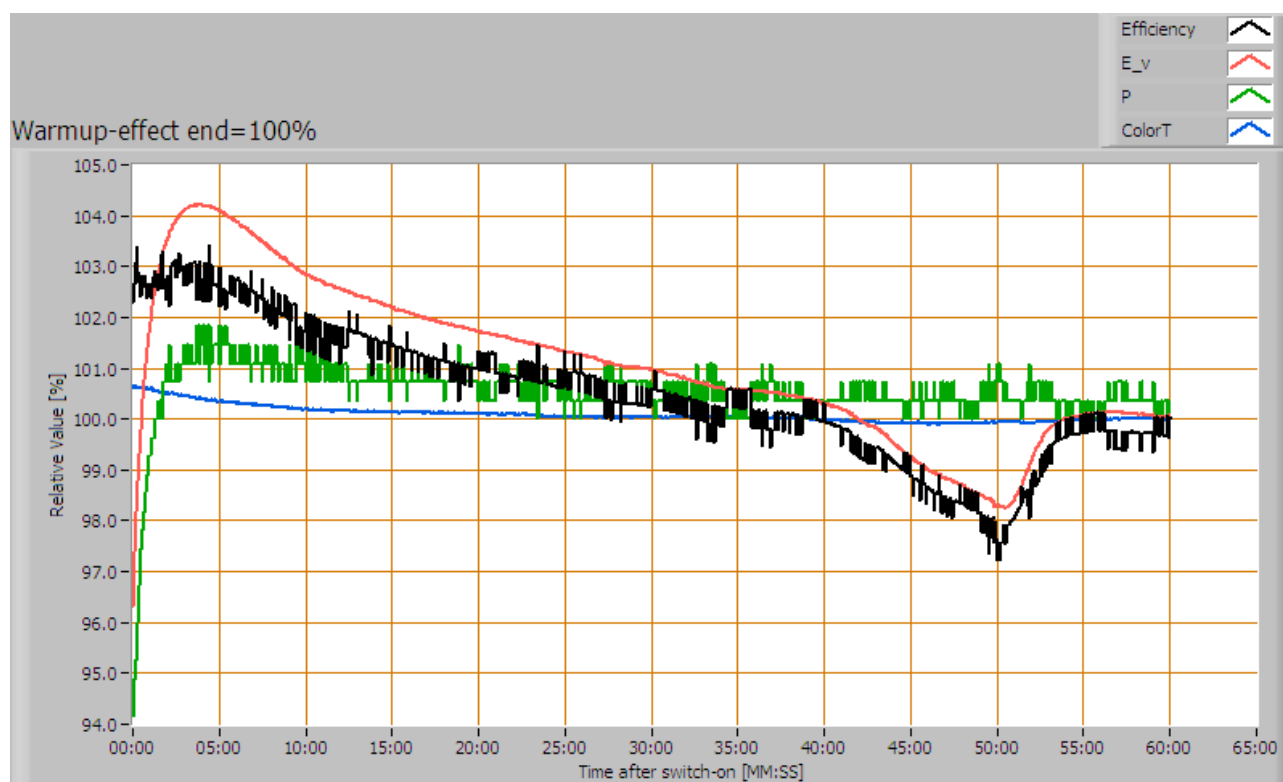
The consumed power depends little on the light bulb voltage. The illuminance not at all.

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 lamp power P [W] and the luminous efficacy [lm/W].



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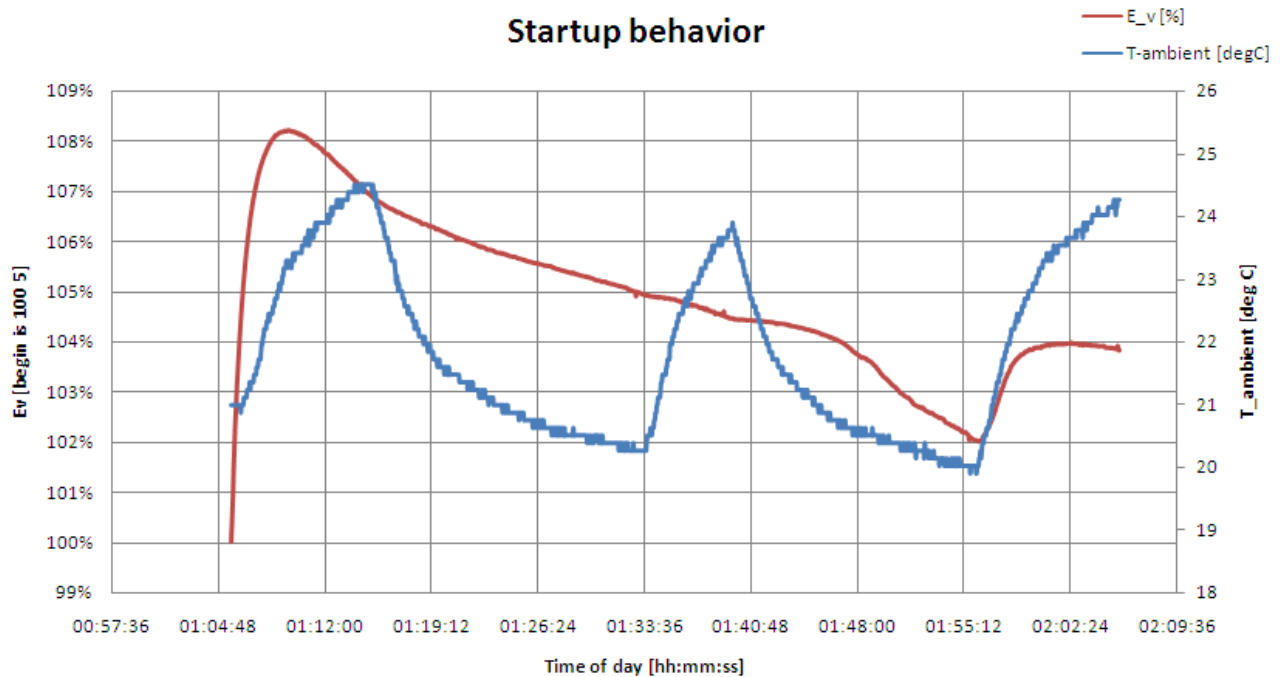




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Effect of warming up on different light bulb parameters. At top the 100 % level is put at begin, and at bottom at the end.

The consumed power increases due to the warm up up to 107 %. The illuminance decreases after a while, and would remain at 102 %. There it shows a strange variation of about 2 % (which is small). This seems to be related to the ambient temperature which is plotted in the graph below.



The ambient temperature cycles.

The light bulb first warms up which makes the light output increase (to 108 %) and then decrease (to 102 %). The variations of ambient temperature are then having a small impact on the illuminance output.



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With silicon sleeve and without



Left with the silicon sleeve and right without

There is not a mentionable difference. Only the feel of the “glass” is different.

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