

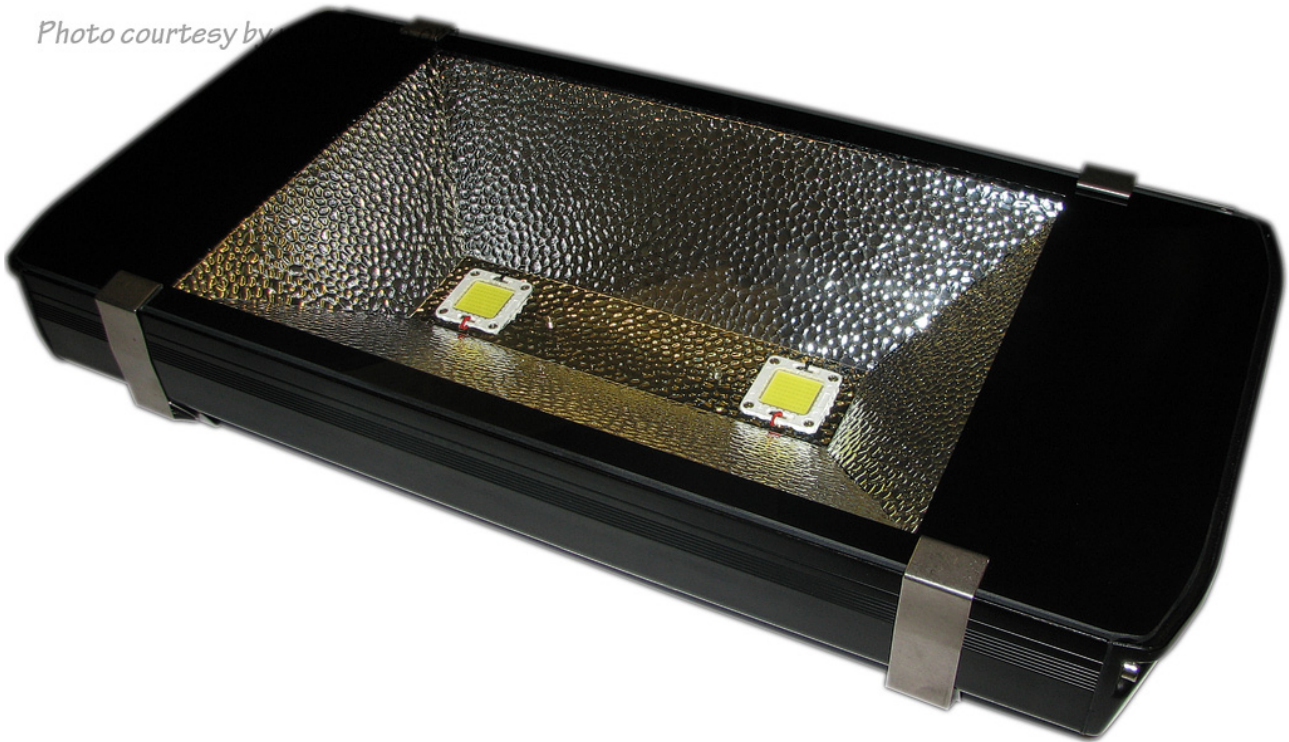
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Flood Light Led Lamp 140W CW

by

Ledverlichting Soest

Photo courtesy by



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Summary measurement data


parameter	meas. result	remark
Color temperature	8285 K	cold white
Luminous intensity I_v	2603 Cd	Measured straight underneath the lamp.
Illuminance modulation index	0 %	Measured straight underneath the lamp. Is a measure for the amount of flickering.
Beam angle	117 deg	117° for the C0-C180-plane (crossing the length direction of the lamp). In the C90-C270 plane (along the length direction of the lamp) the angle is 115°.
Power P	146 W	
Power Factor	0.96	For every 1 kWh net power consumed, there has been 0.3 kVAhr for reactive power.
THD	19 %	Total Harmonic Distortion
Luminous flux	7606 Lm	
Luminous efficacy	52 Lm/W	
CRI_Ra	76	Color Rendering Index.
Coordinates chromaticity diagram	x=0.2948 and y=0.2956	
Fitting	230V	This lamp is connected to the 230 V grid voltage.
PAR-value	25.8 $\mu\text{Mol/s/m}^2$	The number of photons seen by an average plant when it is lit by the light of this light bulb. Value valid at 1 m distance from light bulb.
PAR-photon efficacy	0.5 $\mu\text{Mol/s/W}_e$	The total emitted number of photons by this light, divided by its consumption in W. It indicates a kind of efficacy in generating photons.

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S/P ratio	2.2	This factor indicates the amount of times more efficient the light of this light bulb is perceived under scotopic circumstances (low environmental light level).
L x W x H external dimensions	602 x 290 x 111 mm	External dimensions of the lamp.
L x W luminous area	378 x 240 mm	Dimensions of the luminous area (used in Eulumdat file). This is the surface of the reflector at the front of the lamp.
General remarks		<p>The ambient temperature during the whole set of measurements was 23-24.5 deg C. The temperature of the lam between the fins of the heatsink gets about 41 degrees hotter.</p> <p>Warm up effect: during the warm up time the illuminance decreases with 8 % and the consumed power with 5 %.</p> <p>Voltage dependency: the power consumption and illuminance do not vary considerably when the power voltage varies between 200-250 V.</p> <p>An additional photo at the end of the article.</p>

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Overview table

m.	Ø 50%		C0-180: 117° C90-270: 115° 	E (lux)	Luminaire Efficacy
	C0-180	C90-270			52 (lumens per Watt)
0.25	0.81	0.79		41653	Half-peak diam C0-180
0.5	1.63	1.58		10413	3.26 x diameter(m)
1	3.26	3.15		2603	Half-peak diam C90-270
1.5	4.89	4.73		1157	3.15 x diameter(m)
3	9.78	9.46		289	Illuminance
4	13.04	12.62		163	2603 / distance² (lux)
5	16.3	15.77		104	Total Output
					7606 (lumens)

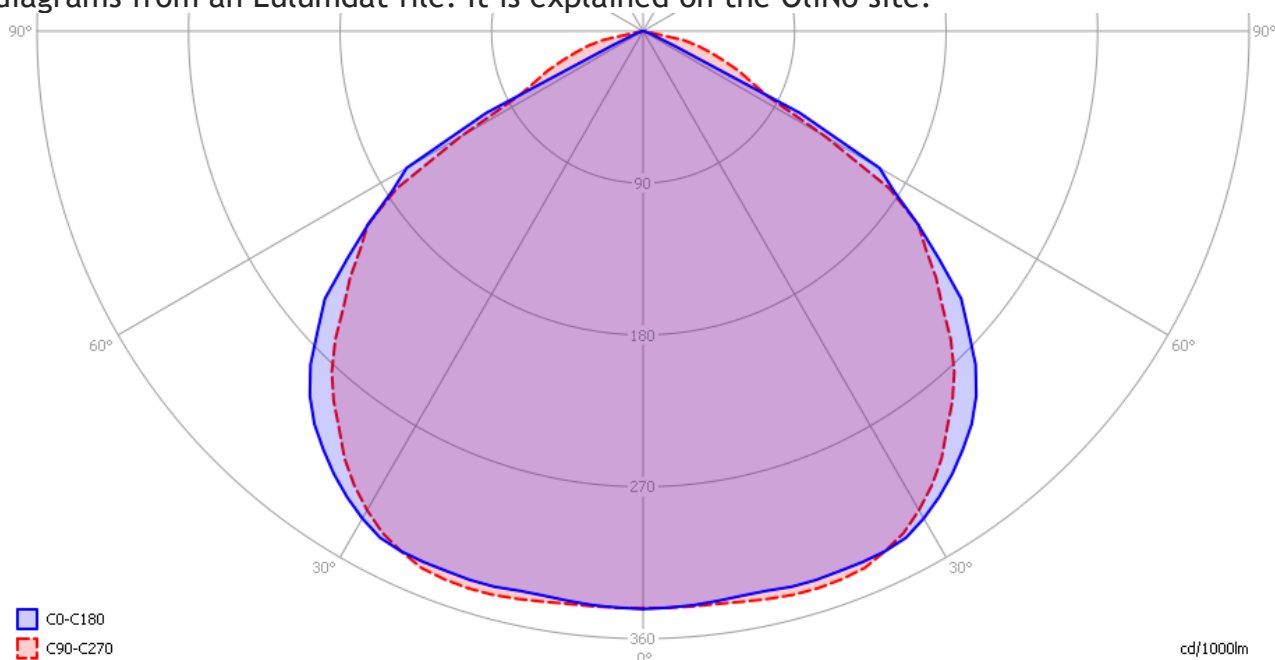
The overview table is explained on the OLiNo website.

Please note that this overview table makes use of calculations, use this data with care as explained on the OLiNo site. E (lux) values are not accurate, when within 5 x 448 mm (diagonal length) ≈ 2250 mm. Within this distance from the lamp, the measured lux values will be less than the computed values in this overview as the measurements are then within the near field of the lamp.

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Eulumdat light diagram

This light diagram below comes from the program Qlumedit, that extracts these diagrams from an Eulumdat file. It is explained on the OliNo site.



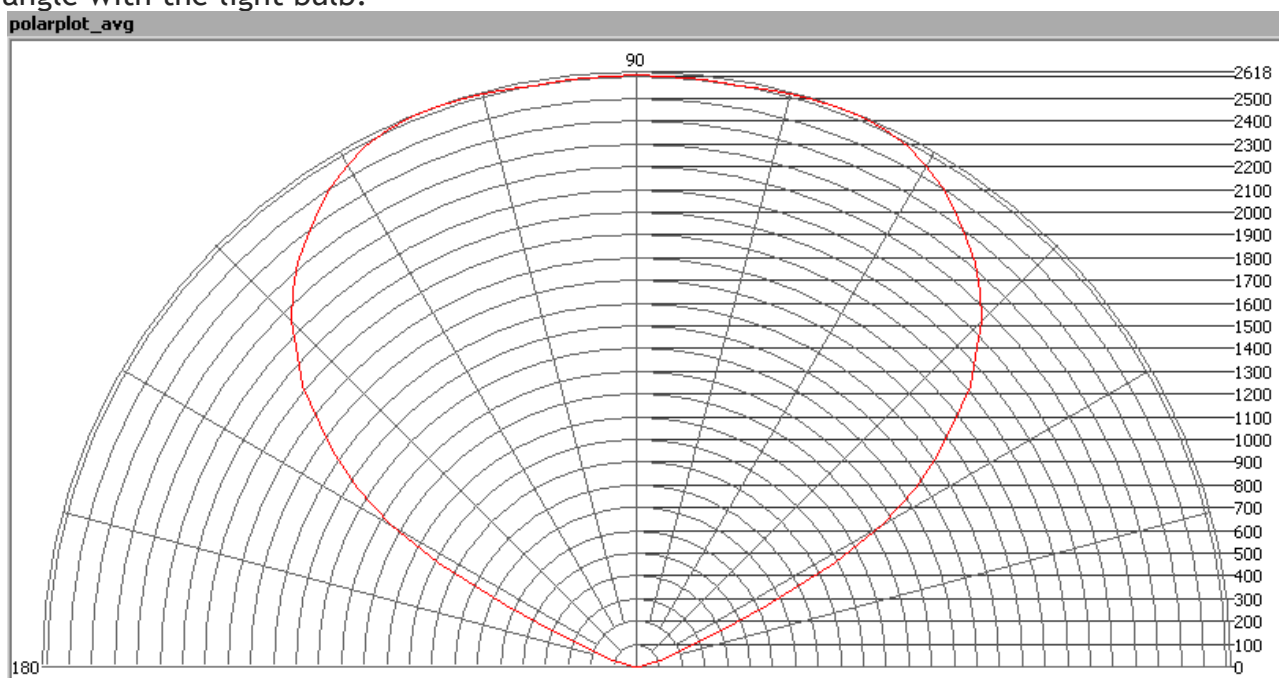
The light diagram giving the radiation pattern.

It indicates the luminous intensity around the light bulb. All the planes give the same results as the lamp is symmetrical along its 1st axis.

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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.

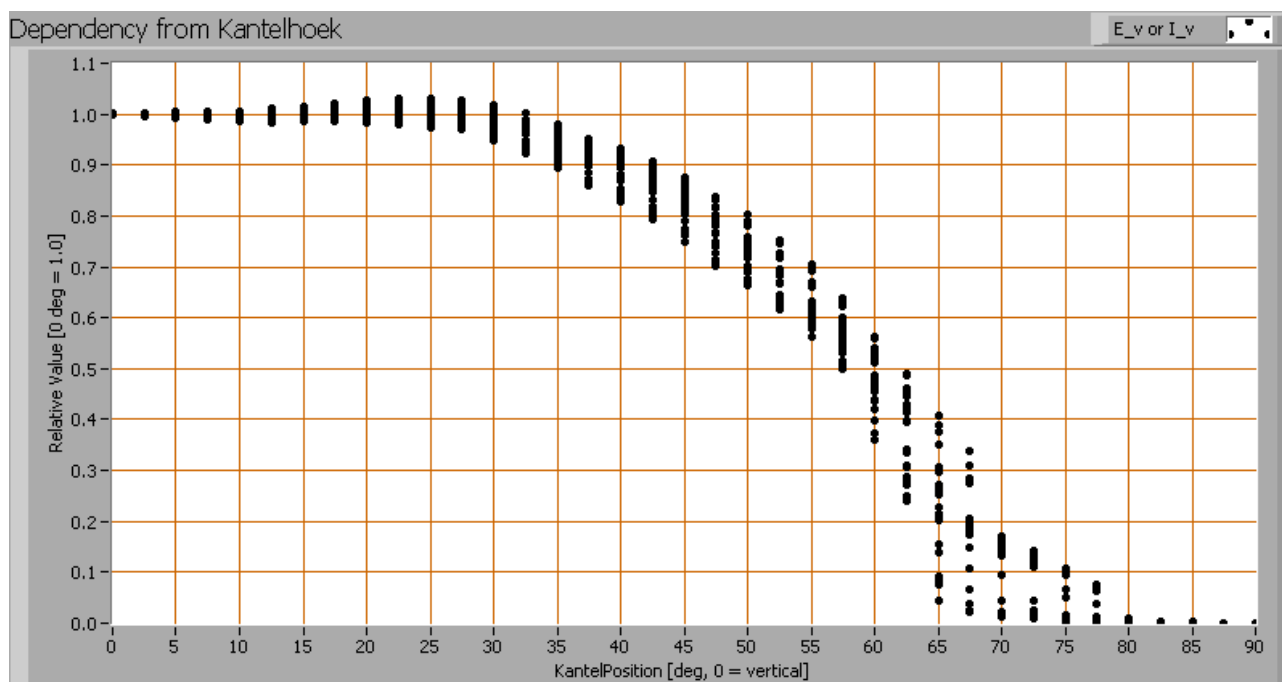


The radiation pattern of the light bulb.

This radiation pattern is the average of the light output of the light diagram given earlier. Also, in this graph the luminous intensity is given in Cd.

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. There normally are differences in illuminance values for different turn angles. However for further calculations the averaged values will be used. When using the average values per inclination angle, the beam angle can be computed, being 115°-117° depending on the C-plane looked at.

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 7606 Lm.

Luminous efficacy

The luminous flux being 7606 Lm, and the power of the light bulb being 146 W, yields a luminous efficacy of 52 Lm/W.

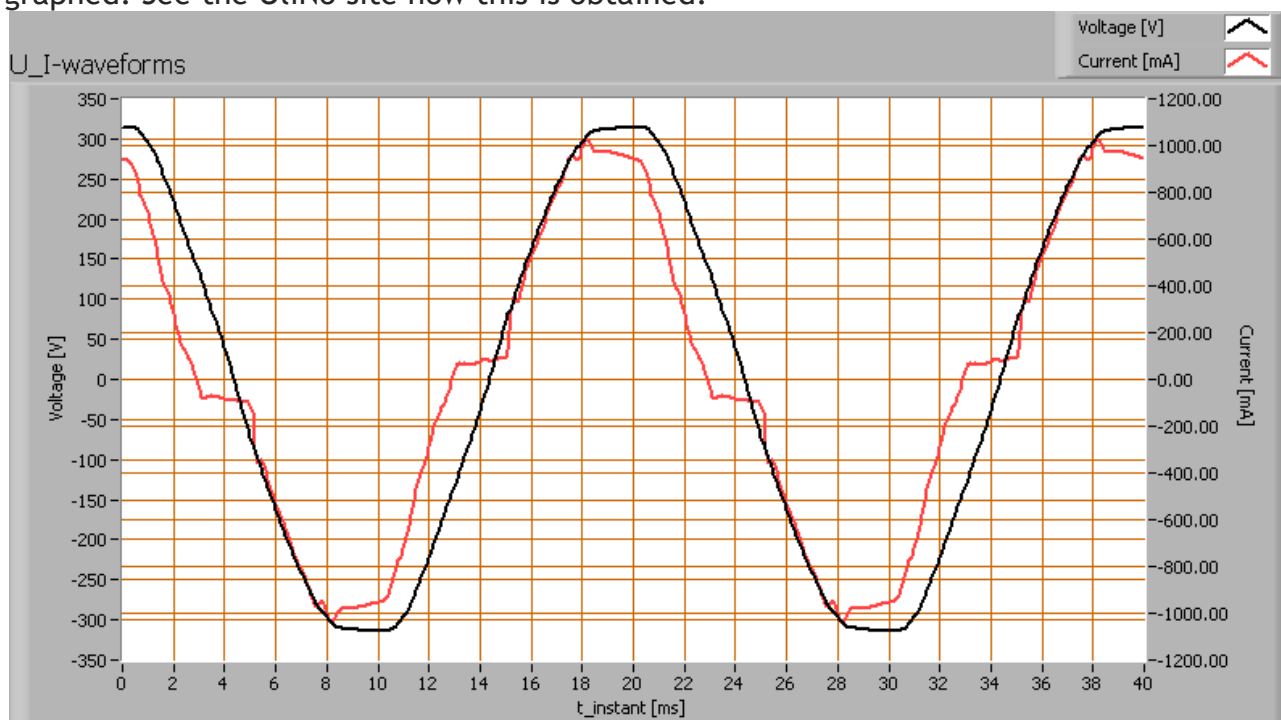
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Electrical properties

A power factor of 0.96 means that for every 1 kWh net power consumed, a reactive component of 0.3 kVAr was needed.

Lamp voltage	230 VAC
Lamp current	664 mA
Power P	146 W
Apparent power S	153 VA
Power factor	0.93

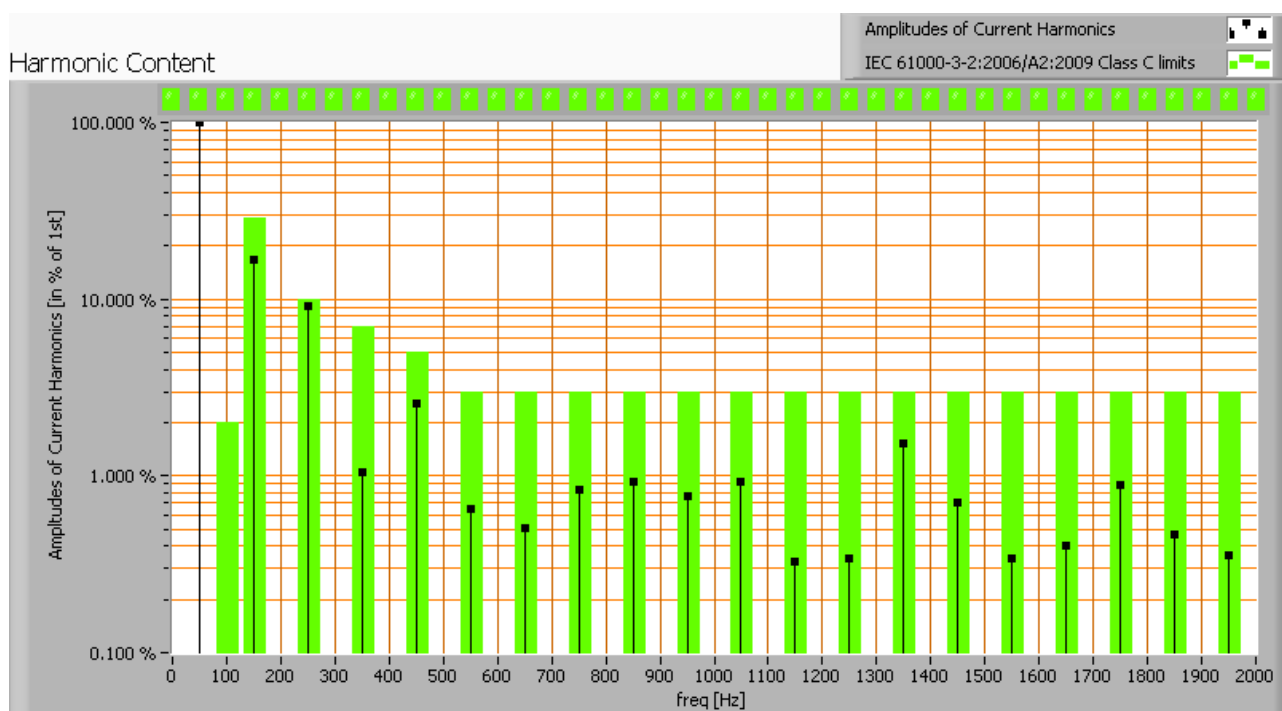
Of this light bulb the voltage across and the resulting current through it are measured and graphed. See the OLiNo site how this is obtained.



Voltage across and current through the lightbulb

This waveforms have been checked on requirements posed by the norm IEC 61000-3-2:2006 (including up to A2:2009). See also the explanation on the OLiNo website.

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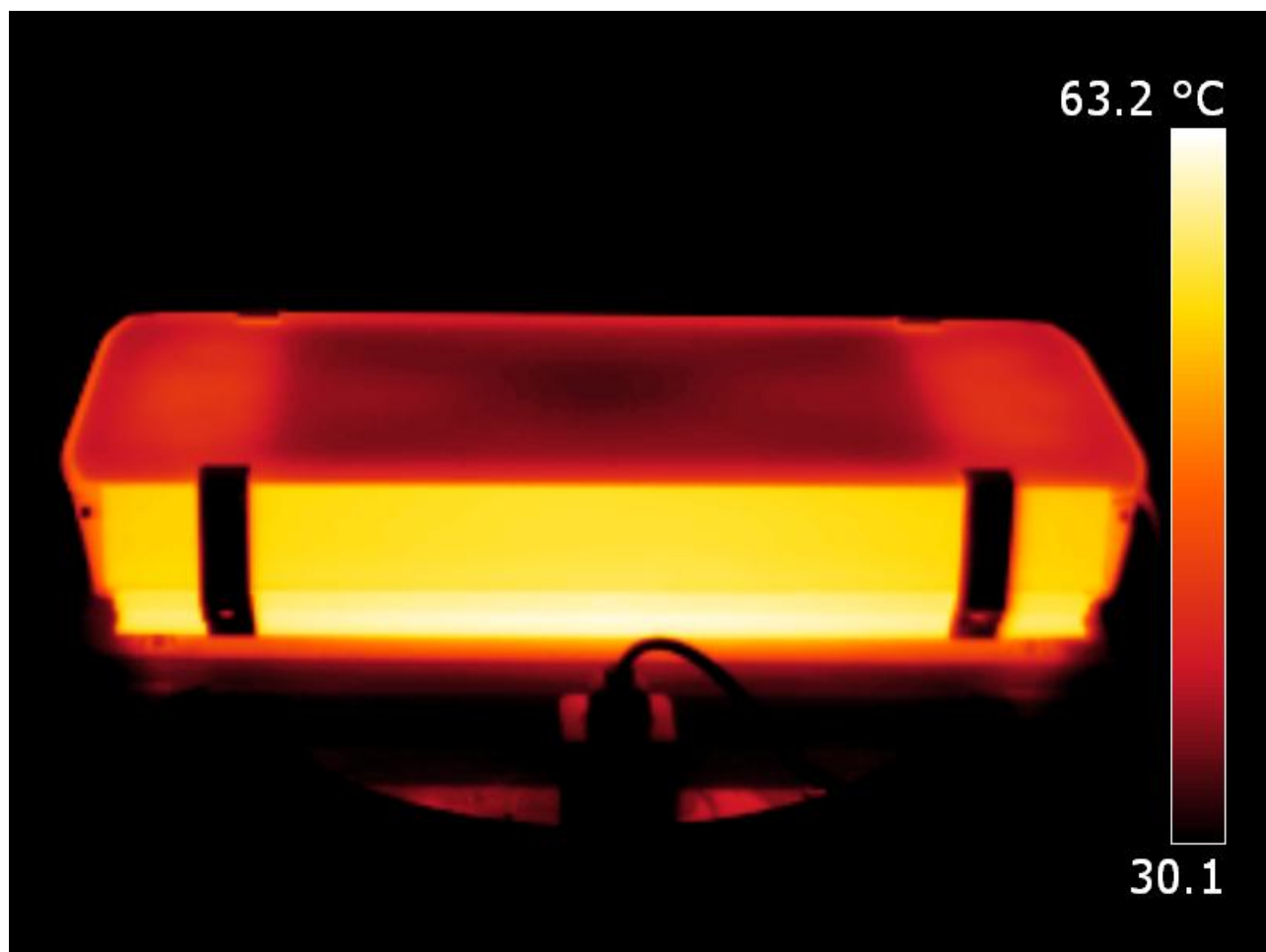


Harmonics in the current waveform and checked against IEC61000-3-2:2006

There are limits for the harmonics for lighting equipment > 25 W which are fulfilled.
The Total Harmonic Distortion of the current is computed as 19 %.

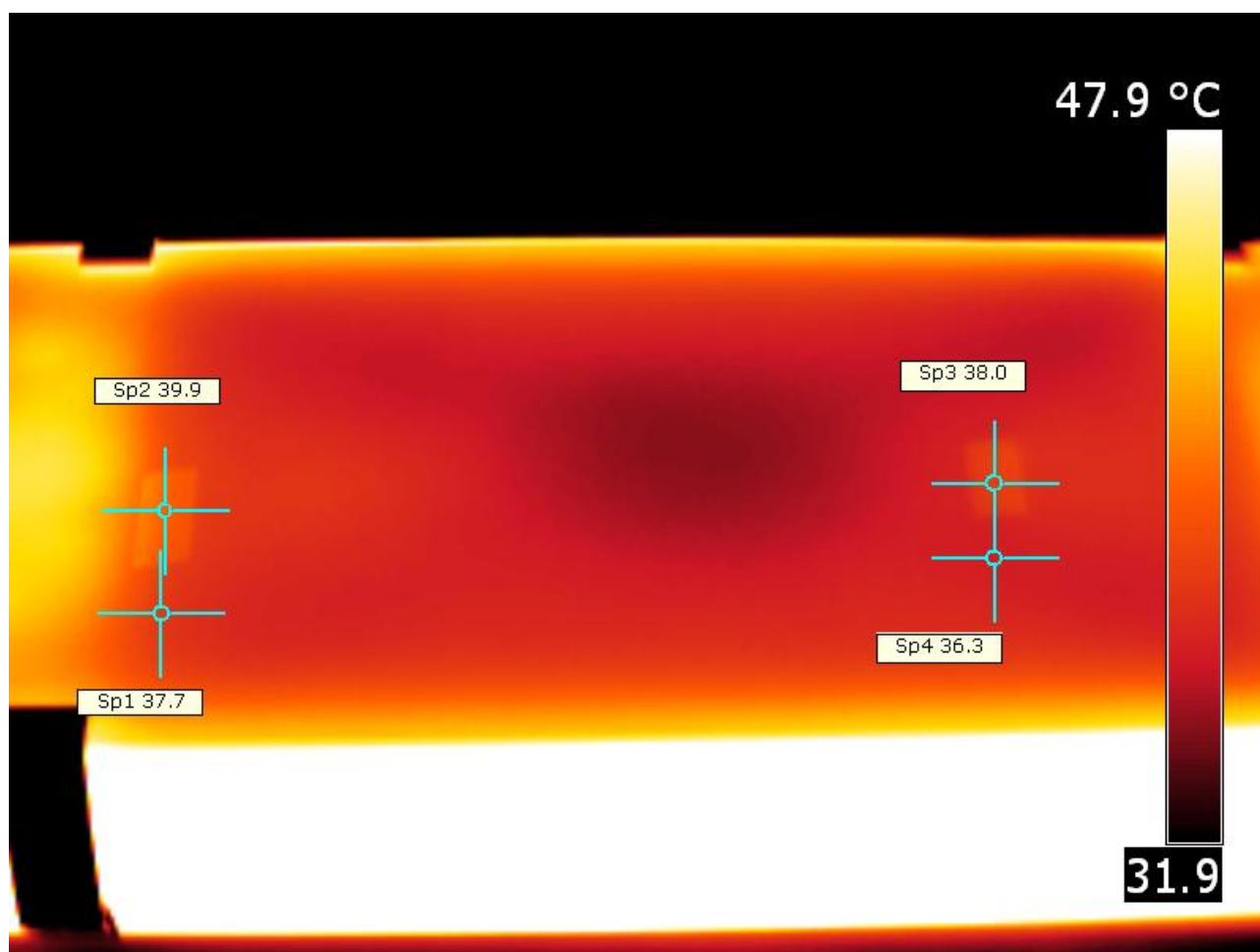
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Temperature measurements lamp



Overview image

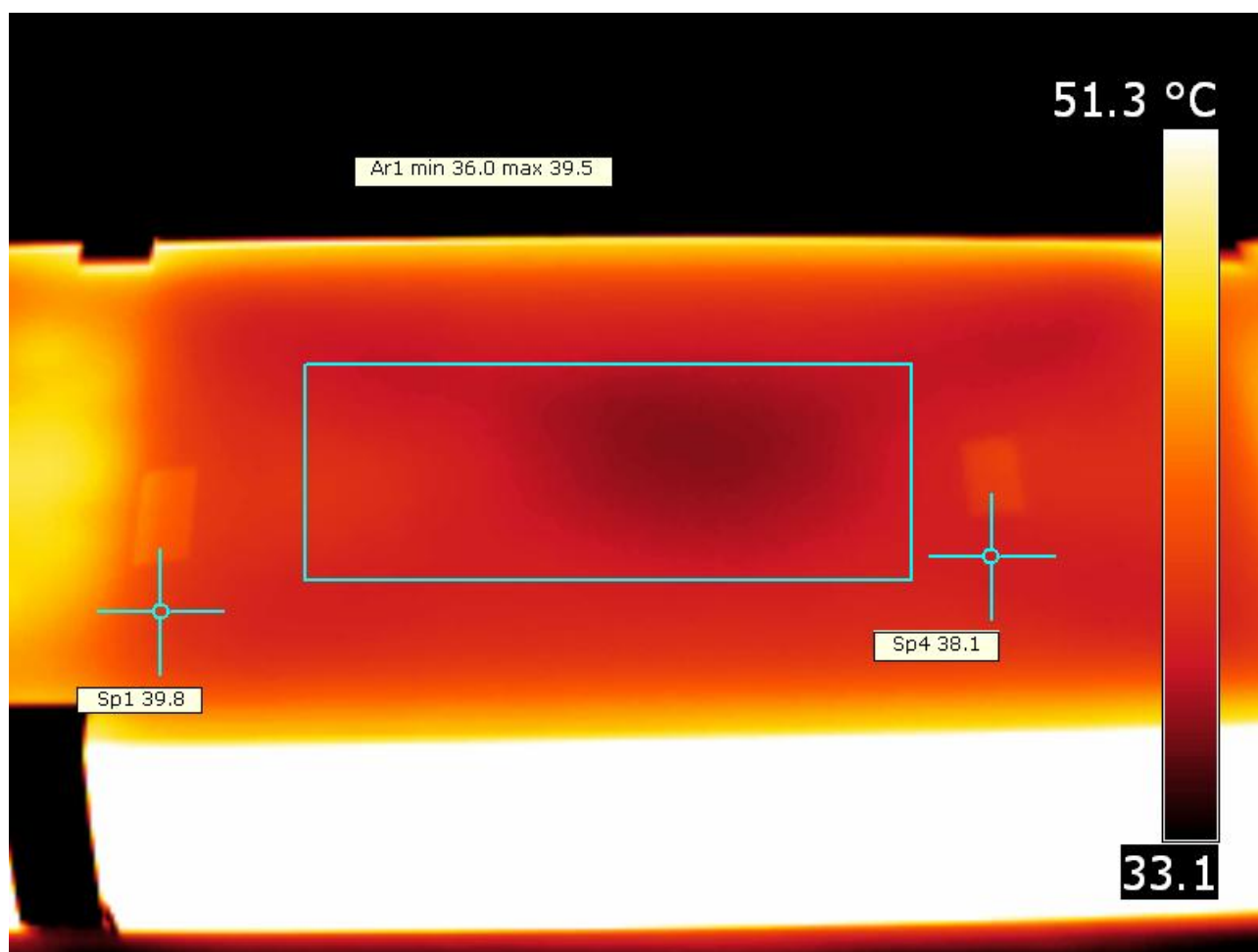
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Temperature measurement at the front, on the tape and directly on the glassplate.

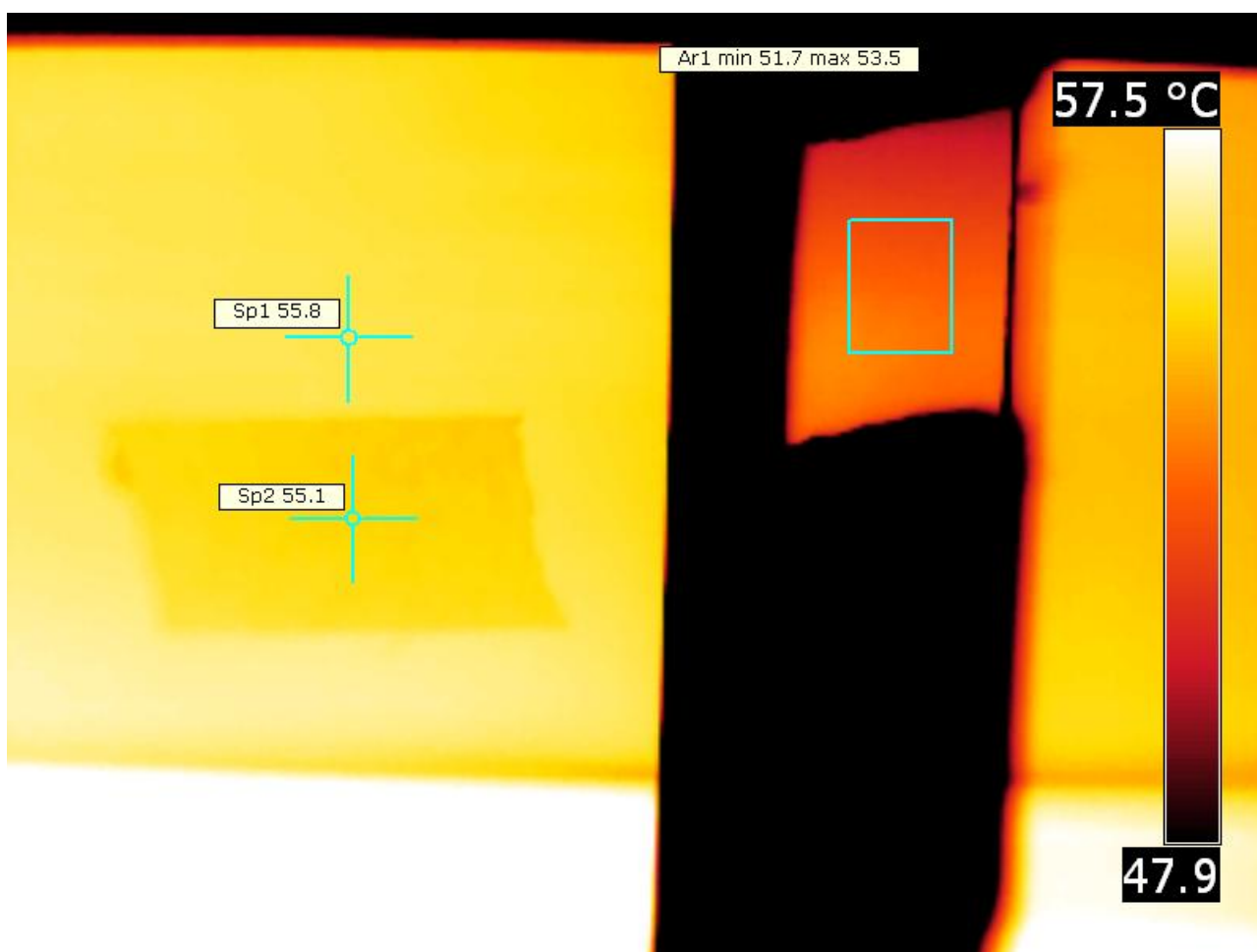
With an emissivity setting of 0.82 the temperature measured on the glassplate is the same as the temperature measured on the tape.

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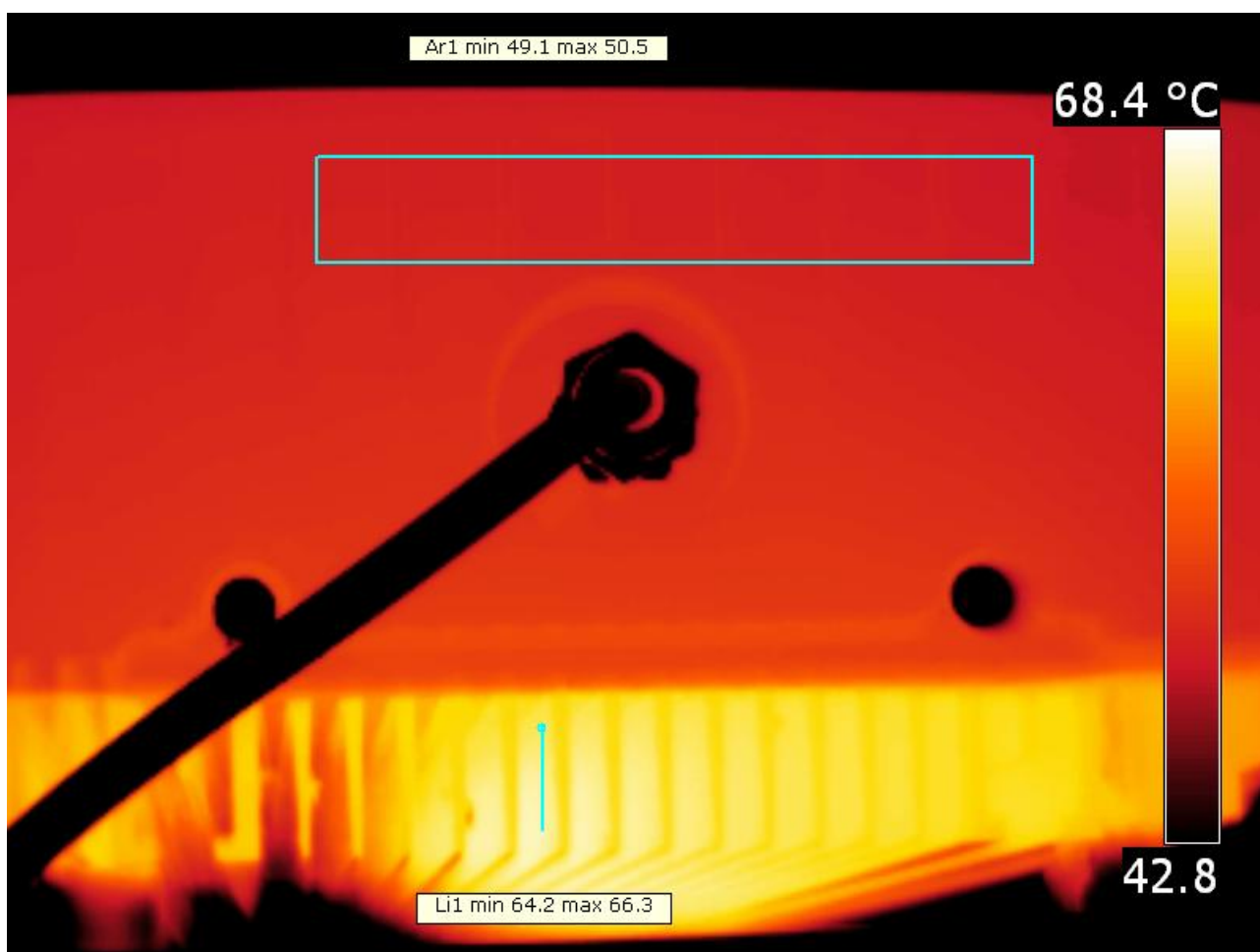
Frontview with emissivity at 0.82.

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Sideview. The sideview has an emissivity equal to the tape. Except for the metal strip which has a very low emissivity and therefore only the measurement value on the tape is used.

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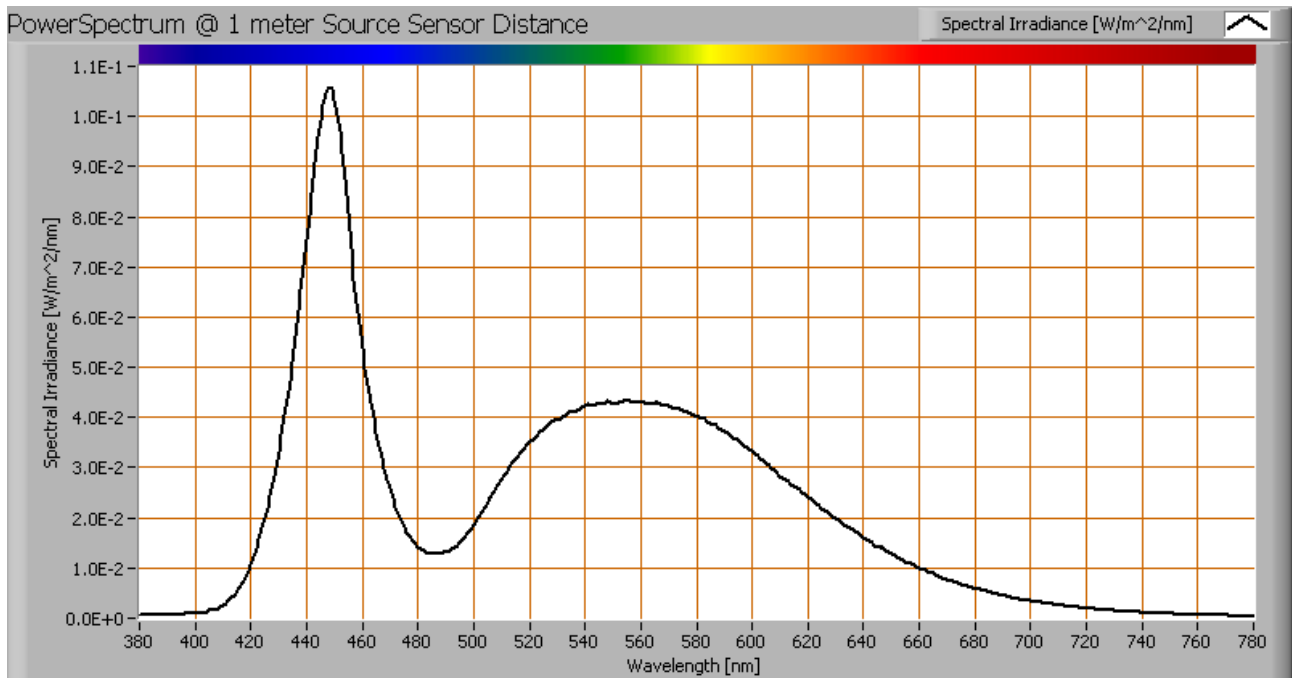
At the bottom between the fins the highest temperature is found.

status lamp	> 2 hours on
ambient temperature	24 deg C
reflected background temperature	24 deg C
camera	Flir T335
emissivity	0.82, 0.95 ⁽¹⁾
measurement distance	zoom is at 0.2 m
IFOV _{geometric}	0.3 mm
NETD (thermal sensitivity)	50 mK

⁽¹⁾ See the text for expansion.

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Color temperature and Spectral power distribution

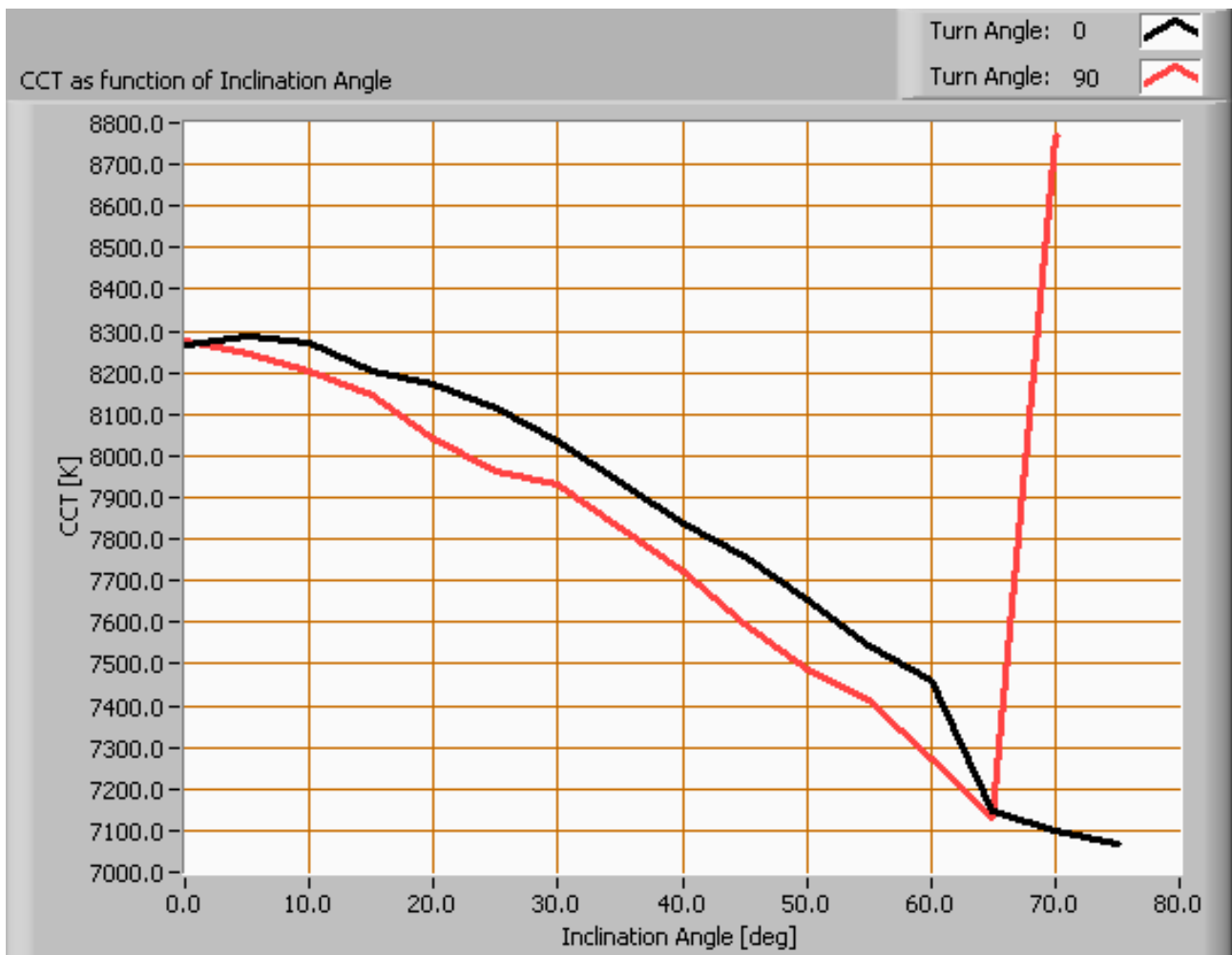


The spectral power distribution of this light bulb, energies on y-axis valid at 1 m distance.

The measured color temperature is about 8300 K which is cold white.

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

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Color temperature as a function of inclination angle.

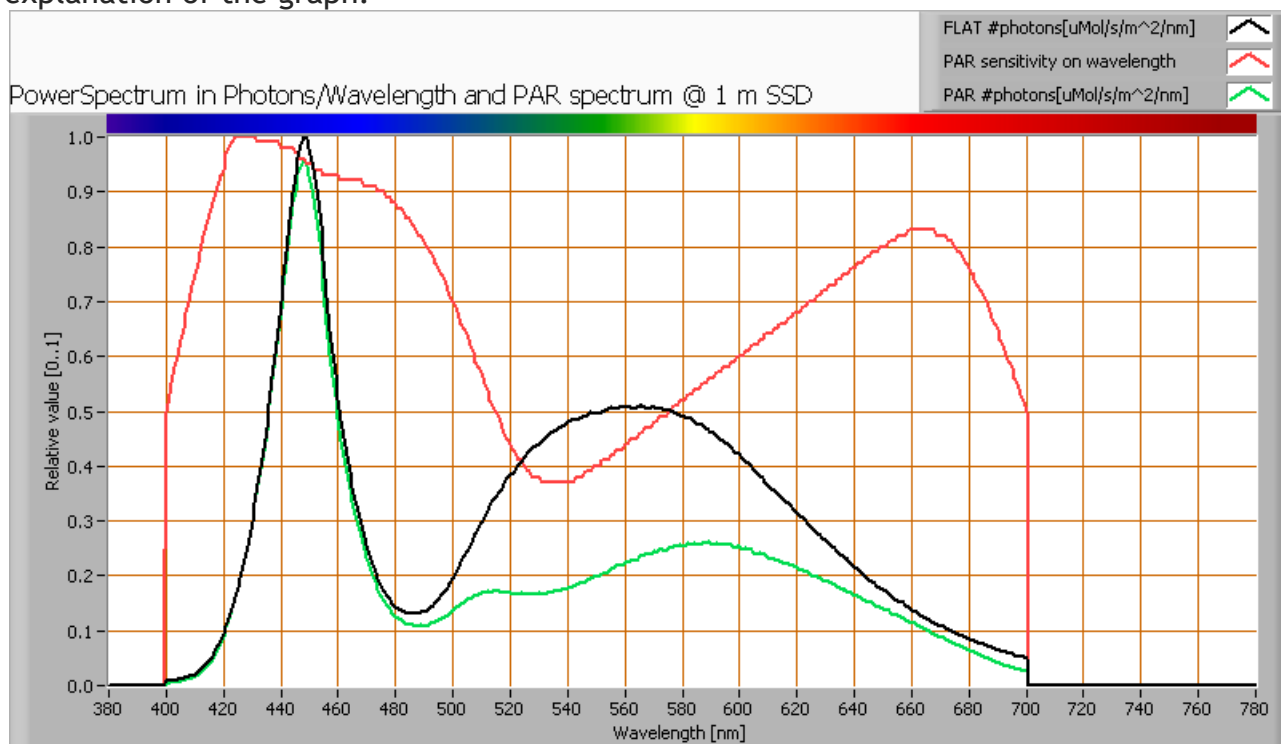
The measurement of CCT is measured for inclination angles up to 70°.

The maximum beam angle is 117°, meaning a 58.5° inclination angle. In this area most of the light is present. The variation in correlated color temperature in this area is about 10 %.

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PAR value and PAR spectrum

To make a statement how well the light of this light bulb is for growing plants, the PAR-area needs to be determined. See the OLiNo website how this all is determined and the explanation of the graph.



The photon spectrum, then the sensitivity curve and as result the final PAR spectrum of the light of this light bulb

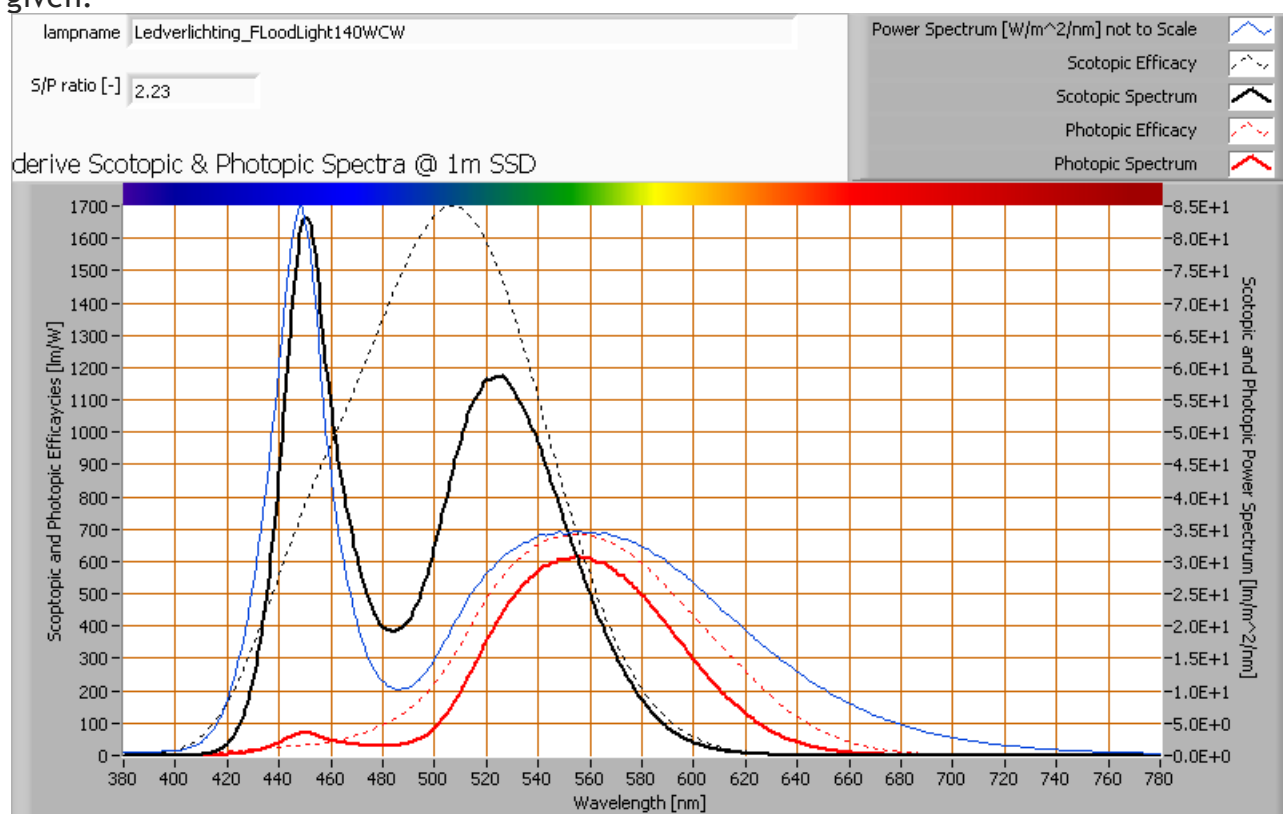
parameter	value	unit
PAR-number	25.8	$\mu\text{Mol/s/m}^2$
PAR-photon current	75.3	$\mu\text{Mol/s}$
PAR-photon efficacy	0.5	$\mu\text{Mol/s/W}$

The PAR efficiency is 68 % (valid for the PAR wave length range of 400 - 700 nm). So maximally 68 % of the total of photons in the light is effectively used by the average plant (since the plant might not take 100 % of the photons at the frequency where its relative sensitivity is 100 %).

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S/P ratio

The S/P ratio and measurement is explained on the OliNo website. Here the results are given.



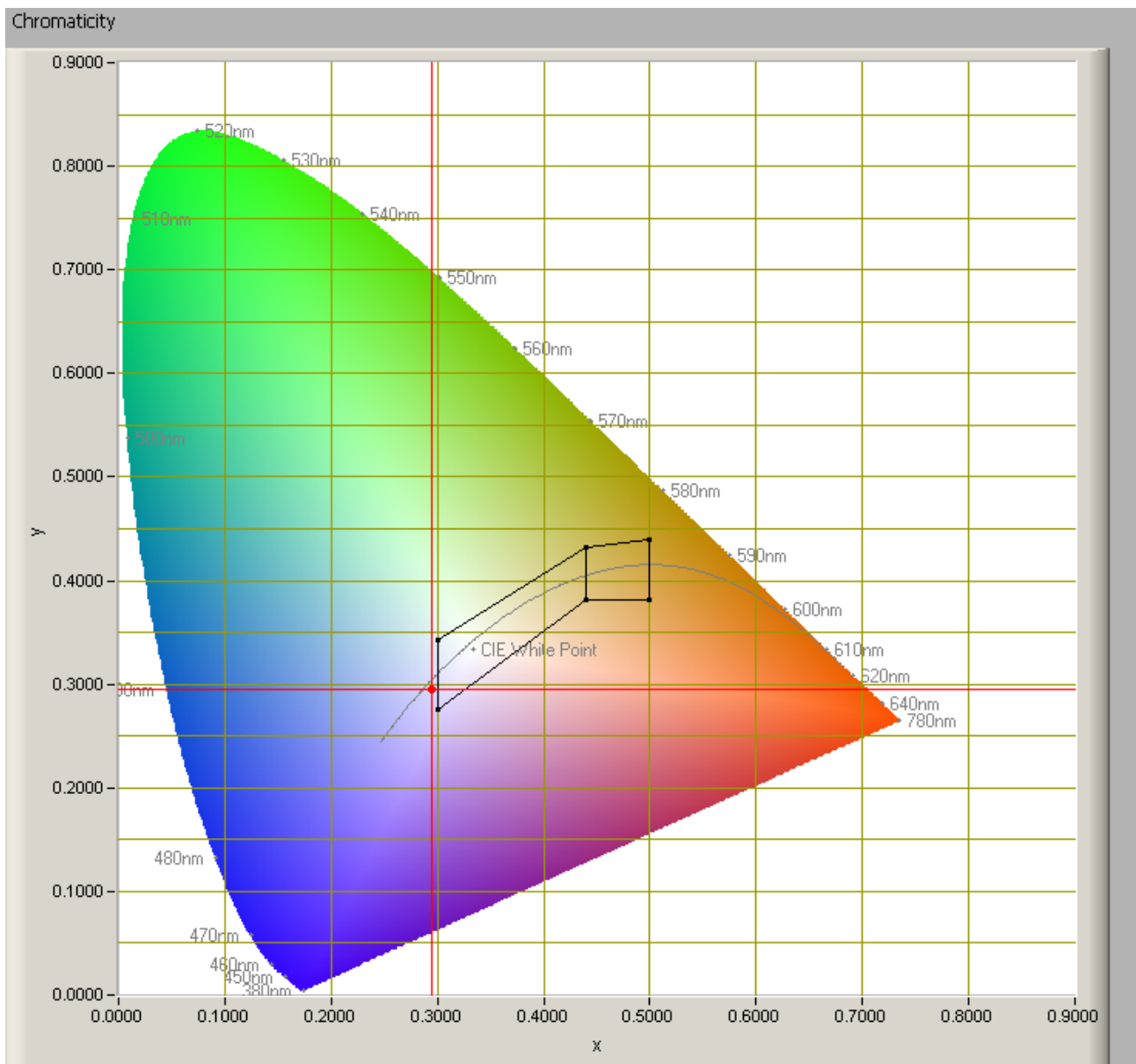
The power spectrum, sensitivity curves and resulting scotopic and photopic spectra (spectra energy content defined at 1 m distance).

The S/P ratio is 2.2.

More info on S/P ratio can be found on the OliNo website.

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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 just outside the area (to the blue side) designated with class A. This class A is an area that is defined for signal lamps, see also the OLiNo website.

Its coordinates are $x=0.2948$ and $y=0.2956$.

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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). Practical information and also some critics about the CRI can be found on the OliNo website. 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: 8285 K

Chromaticity Difference DC= 7.8E-3

R1= 76.6		R8= 69.8	
R2= 77.6		R9= -4.7	
R3= 74		R10= 42.7	
R4= 79		R11= 77.7	
R5= 77.3		R12= 46.3	
R6= 68.1		R13= 75.9	
R7= 82		R14= 85.1	

Ra
(mean value of $R_1 - R_8$)
75.6

CRI of the light of this lightbulb.

The value of 76 is (a little) lower than 80 which is considered a minimum value for indoor usage.

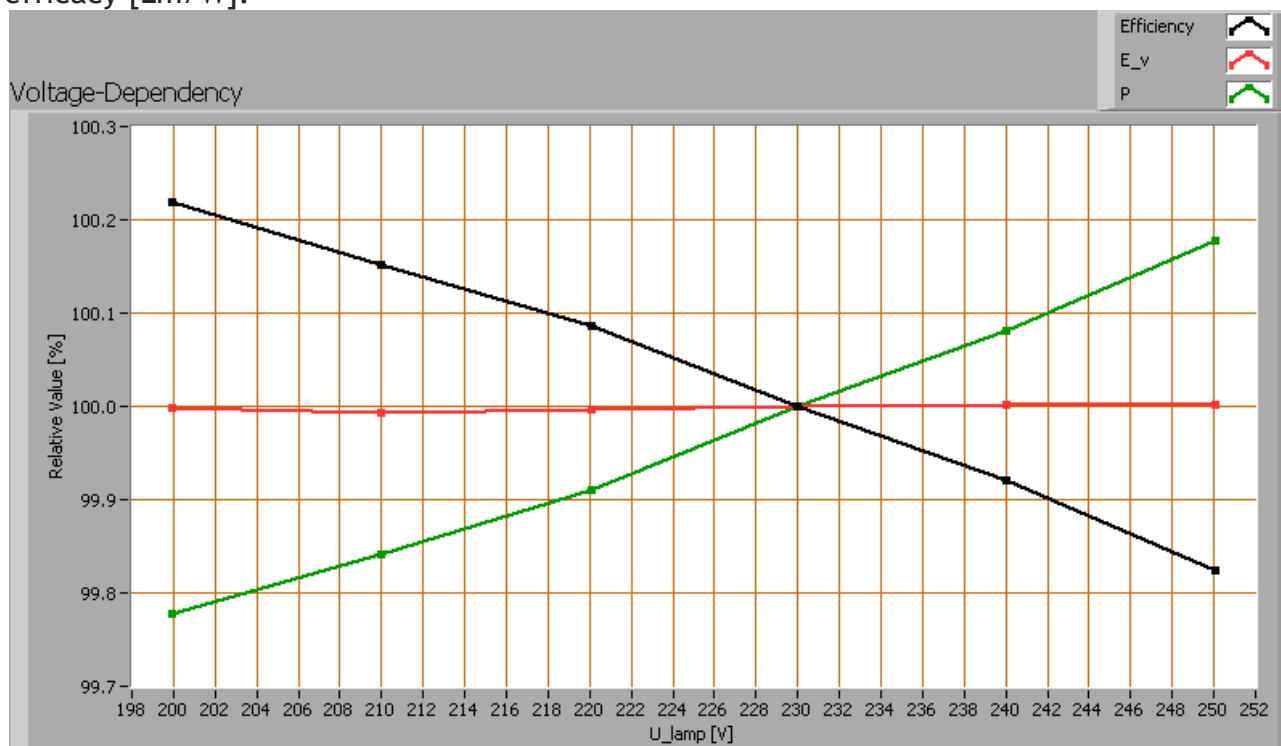
Note: the chromaticity difference is 0.0078 indicates the distance to the Planckian Locus. There is no norm yet that states what the max deviation from white light is allowed to be. A reference with signal lights as a reference is given in the chromaticity diagram.

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 light bulb

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parameters measured: illuminance E_v [lx], 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 %.

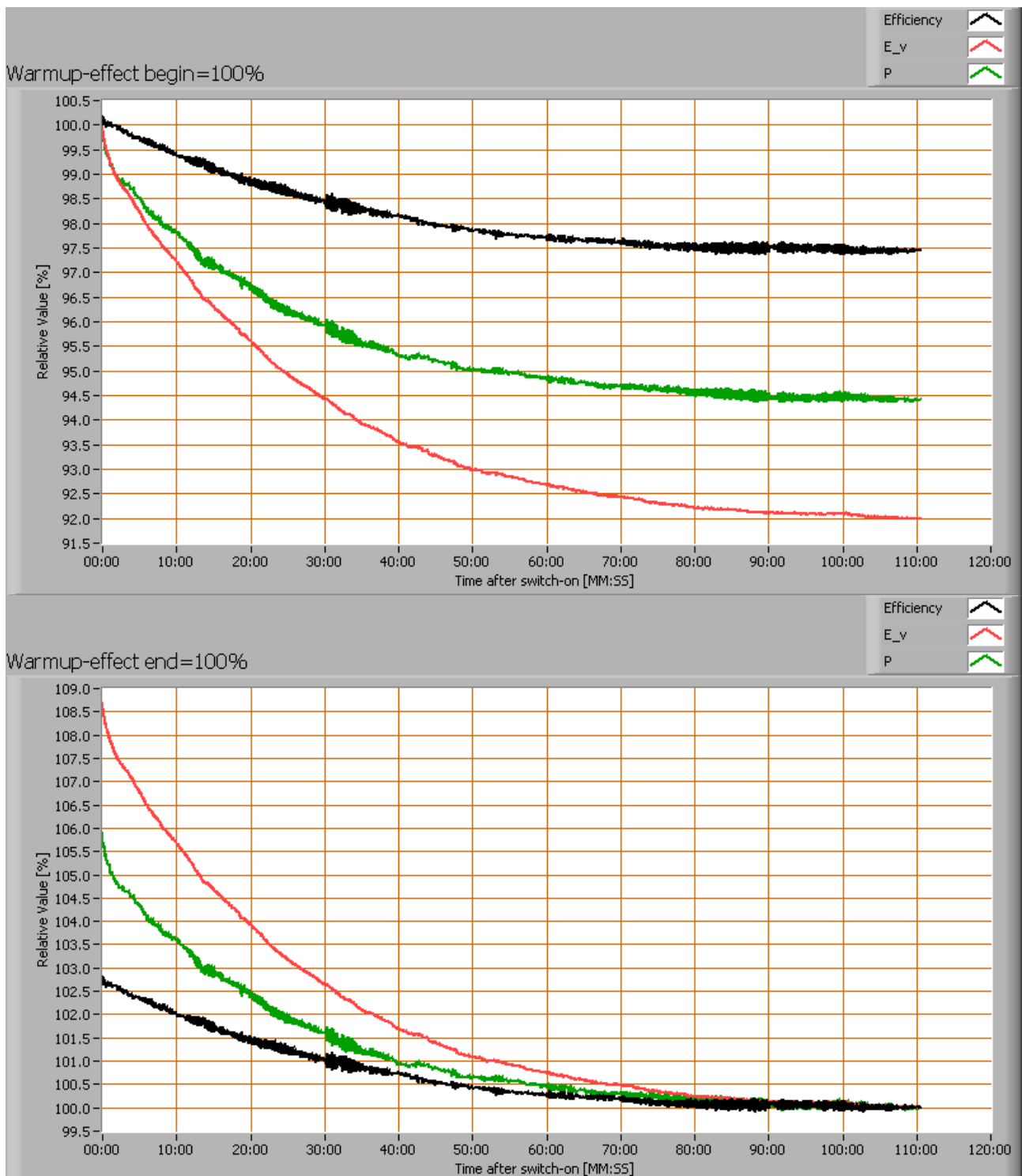
The illuminance and consumed power do not vary significantly when the voltage is varied.

When the voltage at 230 V varies with + and - 5 V, then the illuminance varies < 0.1 %, so when abrupt voltage changes occur this effect is not visible in the illuminance output.

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

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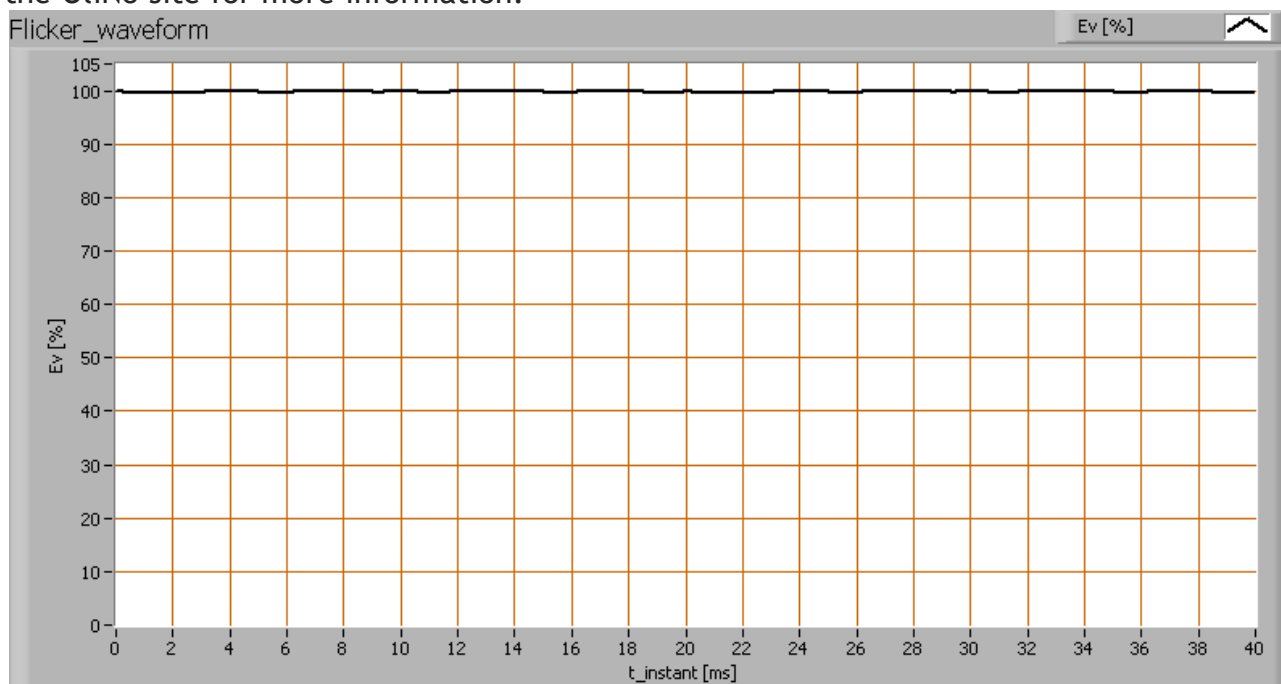
Effect of warming up on different light bulb parameters. At top the 100 % level is put at begin, and at bottom at the end.

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The warm up time is about 100 minutes. During that time the illuminance decreases with 8 % and the consumed power with about 5 %.

Measure of flickering

An analysis is done on the measure of flickering of the light output by this light bulb. See the OliNo site for more information.



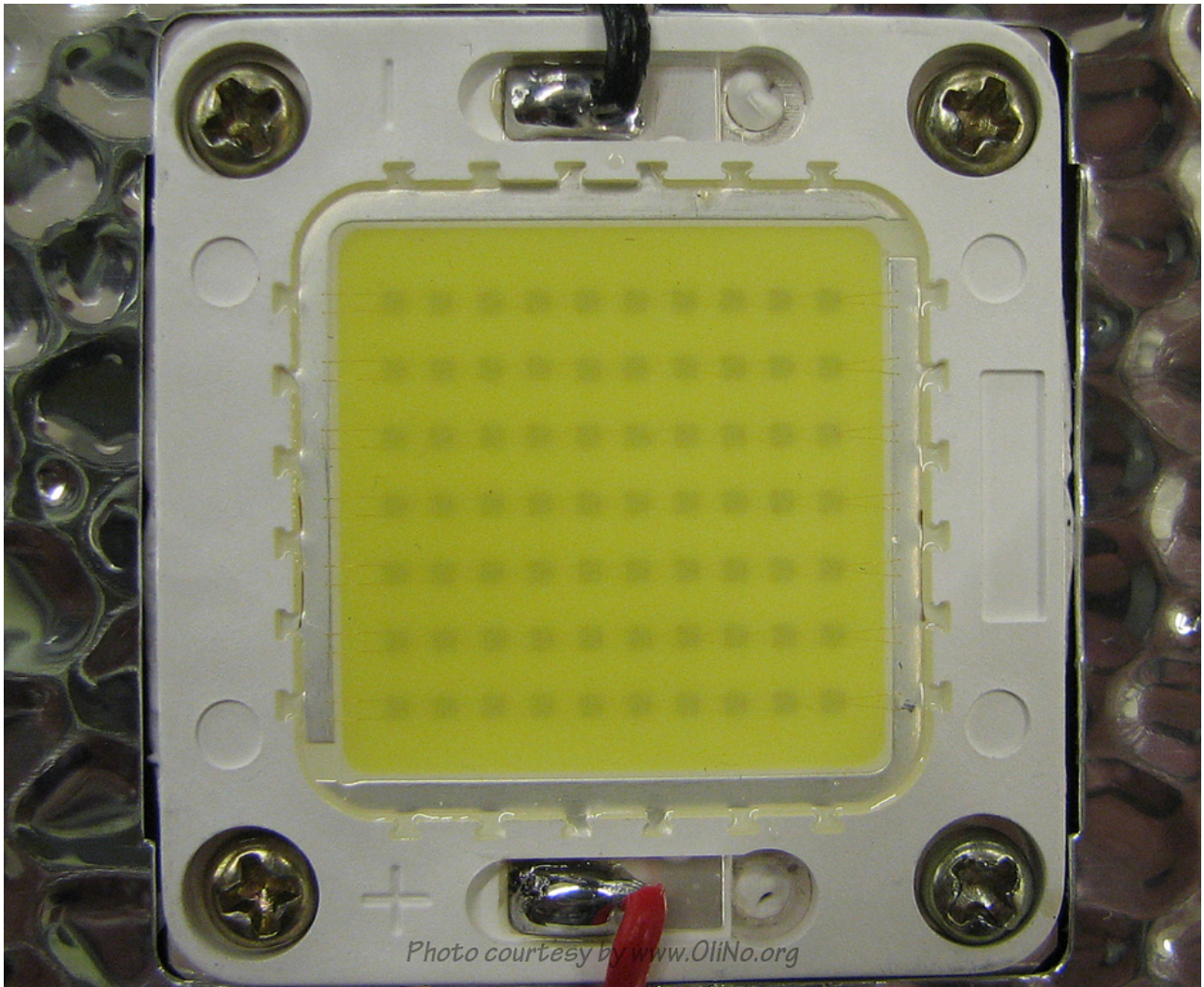
The measure of fast illuminance variation of the light of the light bulb

parameter	waarde	eenheid
Flicker frequency	n.a.	Hz
Illuminance modulation index	0	%

The illuminance modulation index is computed as: $(\max_Ev - \min_Ev) / (\max_Ev + \min_Ev)$.

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Photo



Zoomed in on on of the two used led-chips

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