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AN EFFICIENT, POLLUTION FREE AND DIMMABLE DESK LUMINAIRE WITH INNOVATIVE HIGH VOLTAGE AC LIGHT EMITTING DIODES (ACRICHE-LEDS)

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The constant progress of the light emitting diode development opens new horizons in lighting systems.

Conventional LEDs are operated with constant or pulsed direct current (e.g. with PWM modulation) and therefore need a special suitable electronic circuit for operating the LED-equipment, with a nontrivial control, since the LED forward current must be kept constant - regarding the negative temperature coefficient of the LED.

In the presented desk luminaire six innovative white ACRICHE power LEDs are used. They are operated directly at supply voltage 230 VAC (110 VAC) and 50/60 Hz via pre-resistors, hence no transformer, no electric rectifiers or constant current and/or constant voltage control electronics are needed.

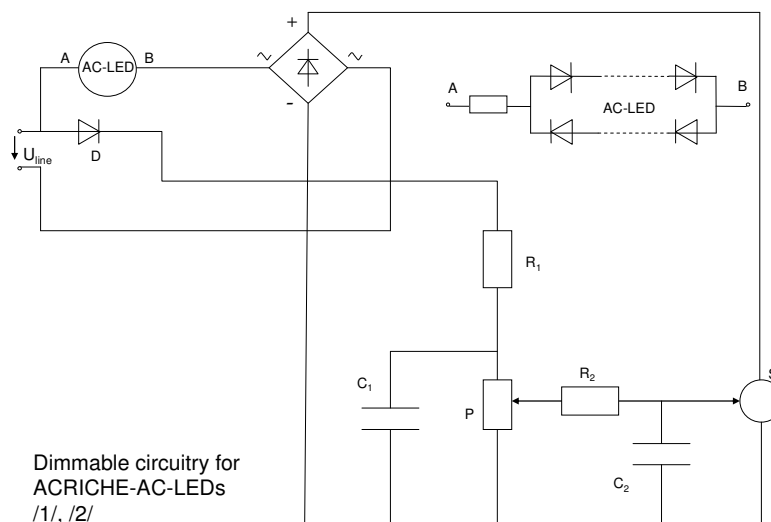
The 6 applied pure white 2 W-LEDs with 80 lm/W consume 12 W and the 6 pre-resistors consume $6 \times 0.4 \text{ W} = 2.6 \text{ W}$.

The system consumption amounts to 14.6 W. With a total luminous flux of 960 lm results a system luminous efficiency of $\eta = 65,75 \text{ lm/W}$ with a life span of 35,000 hours.

CCT= 6300 K, CRI = 70. LEDs with a warm-white light color with CCT = 3000 K, CRI = 85 and 60 lm/W are available.

The dimming process takes place with a new, simple and low-cost electronic circuit, announced to the patent pending.

The drawing of the electronic circuit shows the principle of the two anti-parallel connected ACRICHE-LED-chains (A-B) and the dimmable circuitry. Dependent on the height of the mains voltage, the number of the LEDs, integrated on the chip, varies between approximately 2 x 60 LEDs (230 V) and about 2 x 30 LEDs (110 V).





The forward voltage of an individual LED is approximately 3.5 V. The pre-resistor (within the $k\Omega$ -range) for the necessary current limit, in accordance to the desired LED-current, is adjustable. Usual LED current values are: 20 mA to 40 mA.

The current through the AC LEDs can be controlled e.g. by means of a MOS-FET-Transistor S, which is connected over a bidirectional rectifier in row with the AC LED.

Dimming is possible by changing the gate-voltage by means of a voltage divider, consisting of the resistance R 1 and the potentiometer P.

References

- /1/ Marx, P.: Circuits to dim light emitting diodes.
Patent application AZ 10 2008 039 409,2, German Patent Office
Registration day: 22.8.2008
- /2/ Marx, P.: Anti-parallel LED-Circuit, which can be operated with alternatin current or alternating voltage. Patent Application DE 19950388.5
German Patent Office, Registration day: 10. November 1999

Remark: This new dimmable desk luminaire will be demonstrated at the poster-show.