LED Life Time Considerations for the NucleoCounter® Family

LEDs are now widely used in many household applications. For years they have been used as indicators on electronics e.g. power indicators, car dashboard illumination, cycle lights etc. The development of intense and highly efficient white LEDs has placed the LED lamps in interior lightning applications.

LEDs are characterized as very stable light sources with excellent lifetime properties.

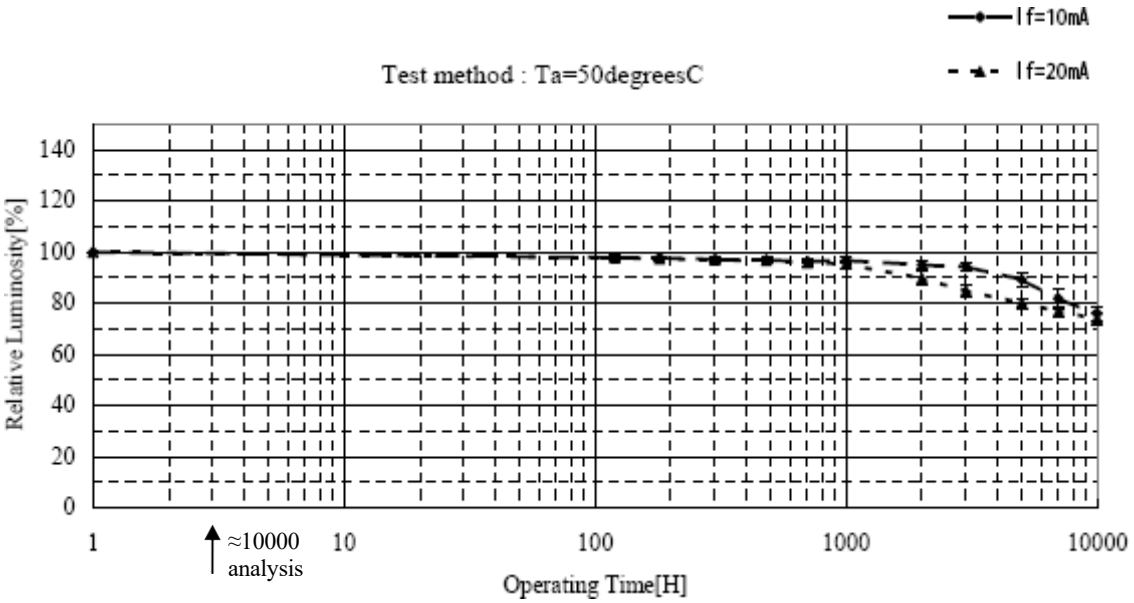

Figure 1. *Relative Luminosity versus number of Operating hours for the Nichia LED NSPE500S at two different forward current conditions (data from Nichia Cooperation).The arrow indicates the aging of the LEDs corresponding to 10000 analyses made with the NucleoCounter®.*

Figure 1 can be used to get an impression of the stability of the LEDs when the number of NucleoCounter® analysis is converted to operating time in hours using the following facts:

One NucleoCounter® analysis requires approximately 1 sec. of illumination with the LEDs. One hour is 3600 sec. A typical operation with the NucleoCounter® is considered to be 1000 analysis per year and with expected operating time of the instrument to be 10 years this equals 2.8 hours of operation of the LEDs.

Figure 1 shows aging of the NSPE500S LED from Nichia used in the NucleoCounter®. In this test the forward current is kept at 10mA and 20mA and the ambient temperature is set at 50°C. Under these conditions no significant decline in optical power is present.

The above conditions are however not applicable for the NucleoCounter®; because the forward current is 30mA and the maximum temperature is estimated to be 40°C.

When LEDs are used under conditions not tested by the manufacturer, it is therefore recommended to test LEDs at excessive conditions, in order to assure accurate performance.

Figure 2 shows a test conducted by ChemoMetec A/S showing the aging of the LEDs in a member of the NucleoCounter® Family[1] at a forward current of 100mA and a temperature of 60°C.

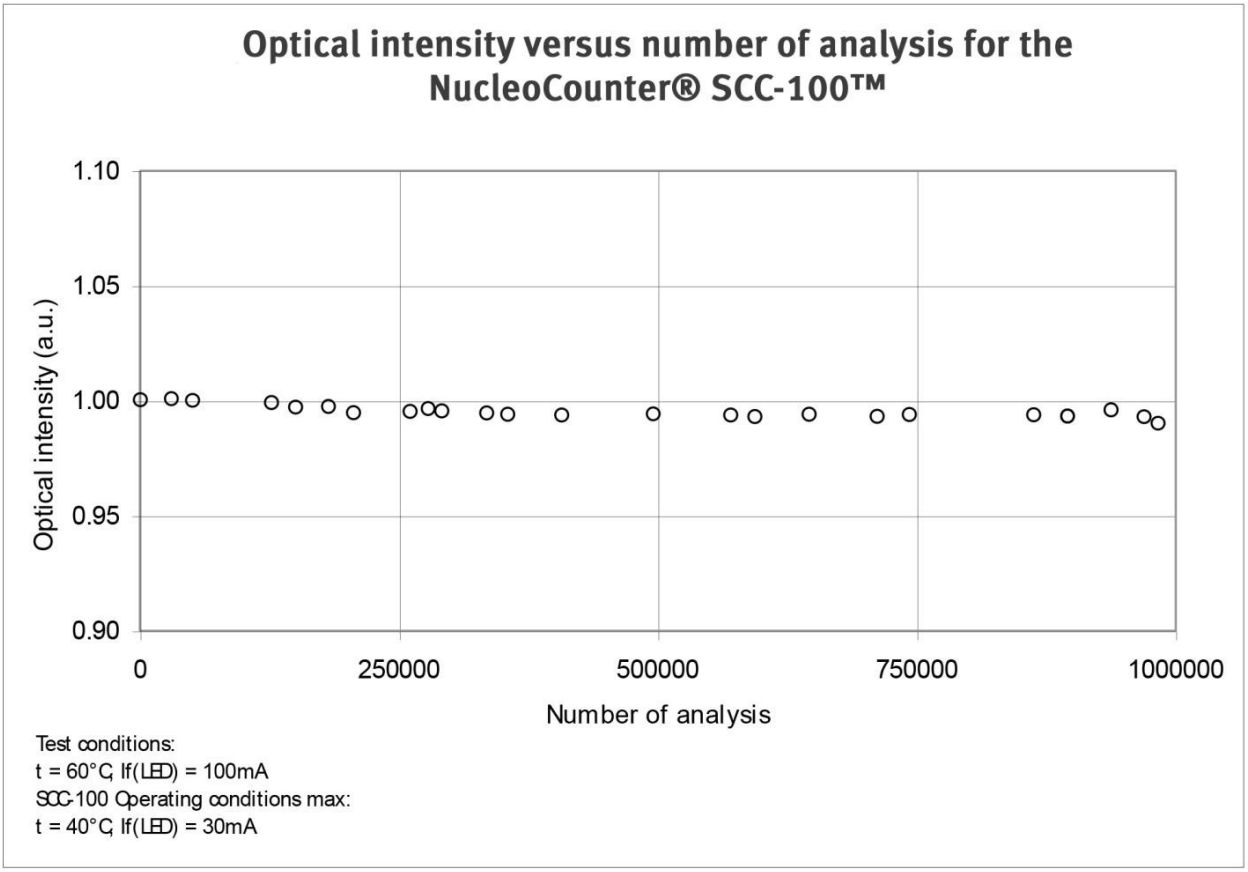

Figure 2. *Aging of the LEDs in the NucleoCounter SCC-100 at a forward current of 100mA and a temperature of 60°C.*

The decline in light intensity after 1 million samples is approx. 2%. A 5% change of the light intensity is estimated to reduce the count by <1%.

With respect to thermal drift the instrument can vary 25 degrees Celsius before a 5% change of the LED intensity occurs.

Therefore the NucleoCounter® is considered insensitive to both the aging and the temperature of the LED.

[1] NucleoCounter® SCC-100™ which is applicable to all NucleoCounters®.