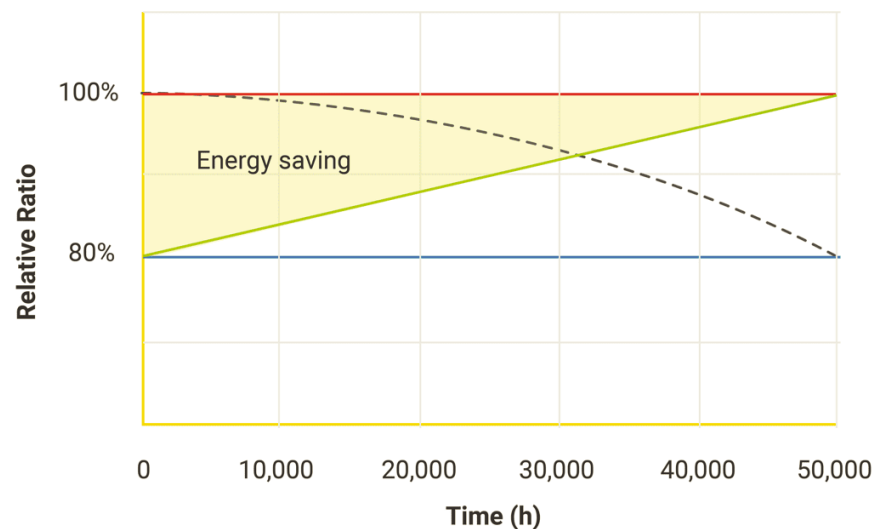


CLO (Constant Lumen Output) and Night dimming

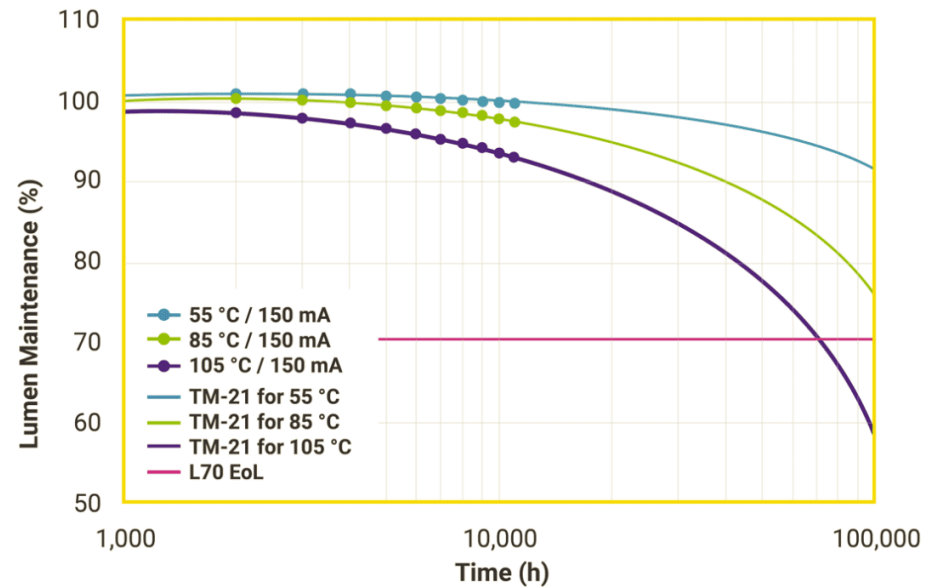
CLO (Constant Lumen Output)

The light output of an LED module naturally decreases during its lifetime, meaning that the maximum possible brightness of an LED is higher when new than after 10k or 100k hours of operation. The efficacy of the LED itself will also lower over time, because although the input current remains the same, the lumen output of the LED module will have deteriorated with time, resulting in less light for the same power.

CLO (Constant Lumen Output) overcomes this limitation by running the luminaire at a lower current initially and then increasing the current output in line with the decrease in lumen output. This not only ensures stable lighting but also saves energy and increases the lifetime of the LEDs.



- Constant lumen output (CLO)
- Power with CLO
- Power consumption without CLO
- - - Lumen output decline without CLO



To achieve a constant light output of the module, the LED driver stores the operating hours of the LED module, powers the LED below its maximum rated lumen output, then over time increases the output current in response to the natural reduction in lumen output over the lifetime of the fitting.

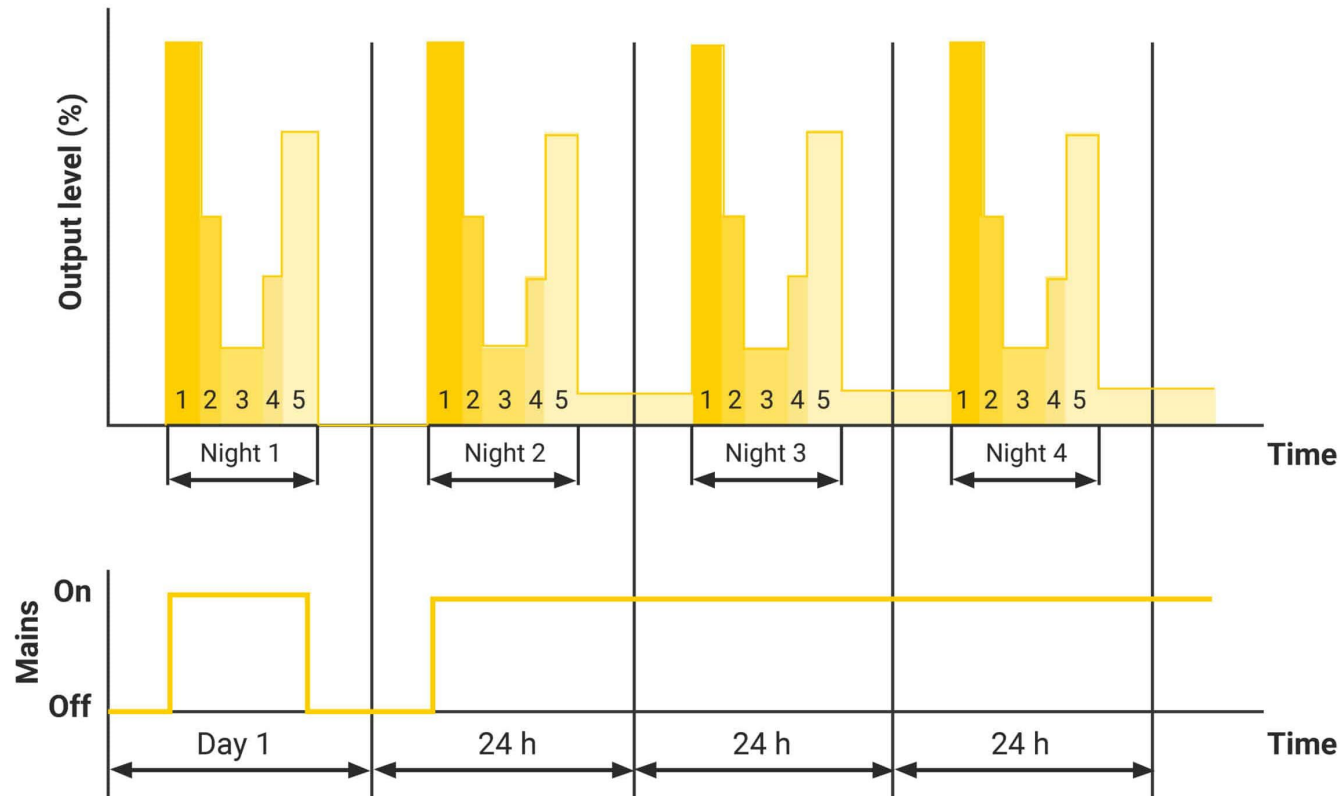
The benefits of CLO include:

- Energy and cost savings.
- Increased lifetime of the LED module.
- Constant lumen levels and colour temperature over the lifetime of the luminaire.
- Improved maintenance intervals due to better management of LED modules.

Night dimming

Night dimming of luminaires is a simple and practical way of saving energy and increasing the lifetime of a lighting installation, without the need for a sophisticated control system or compromising the safety and security that outdoor illumination provides by switching it off completely.

The automated dimming takes place via an integrated timer (no real-time clock). There are **maximum** five independent dimming levels that can operate on a cycle (**Operation time**) which can be adjusted according to the seasons. Once they have been calibrated there is no further intervention required by the client or manufacturer.



Example

Example: Client needs to turn on and off for 1 Day (If possible 3 consecutive days) to set the operation time and Midpoint. And the dimming scene which was set at the factory will take place automatically the next day with this calibration.

**The limitation is 5 independent dimming levels.*

There are a number of Night dimming options available, including standard offerings and custom solutions on project specific basis.

LIGMAN Standard options

- ▶ **DA1** – CLO with DALI
- ▶ **DA2** – CLO with Night dimming 1 [100% for 6 hours (till Midpoint) – 50% for 6 hours (till the end of operation time)]*
- ▶ **DA3** – CLO with Night dimming 2 [100% for 4 hours (till Midpoint) – 50% for 8 hours (till the end of operation time)]*

Night dimming calculation of 12 hours operation time and definition of “Midpoint” :

Operation time

- In order to set operation time as 12 hours, client needs to turn on the light and keep it 12 hours at operation for 3 consecutive nights.
- The driver will remember the total operation time of 12 hours.
- There isn't any internal clock inside the driver. It will count the time from turning on and off.
- Some models can work after 1 cycle of turning on and off, some models need to store up to 3 days of data to work.
- LIGMAN will share this information with the client.

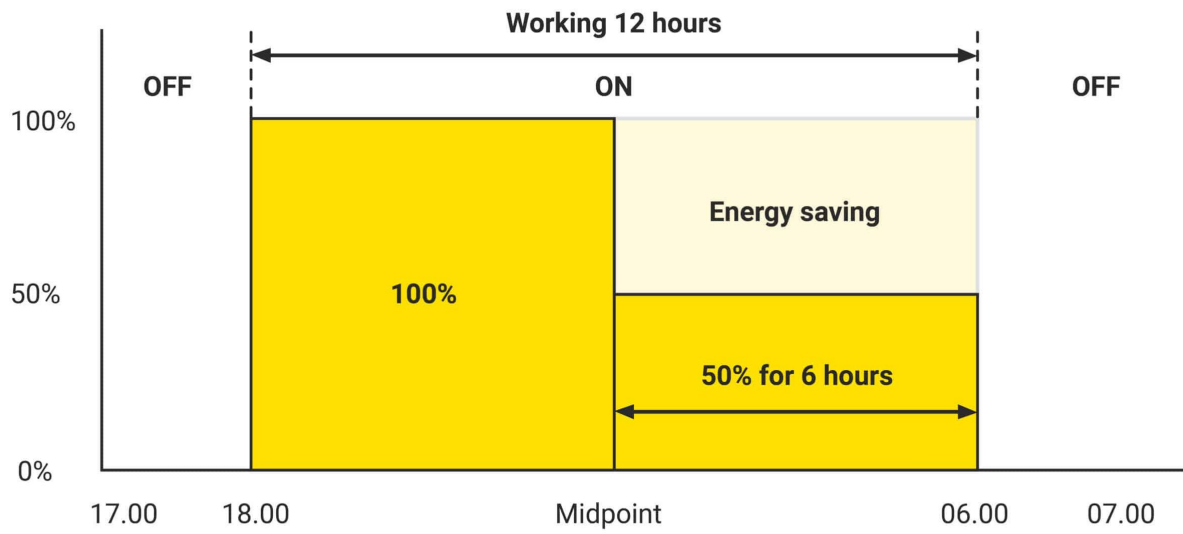
Midpoint

- Then, the driver will divide the operation hours in half and define the Midpoint. Dimming program will run before and after the Midpoint.
- The graphics shared below has been prepared with 12 hours operation time from 18:00 to 6:00.
- In the examples below the Midpoint is equal to midnight (00:00).

DA1 – CLO with DALI

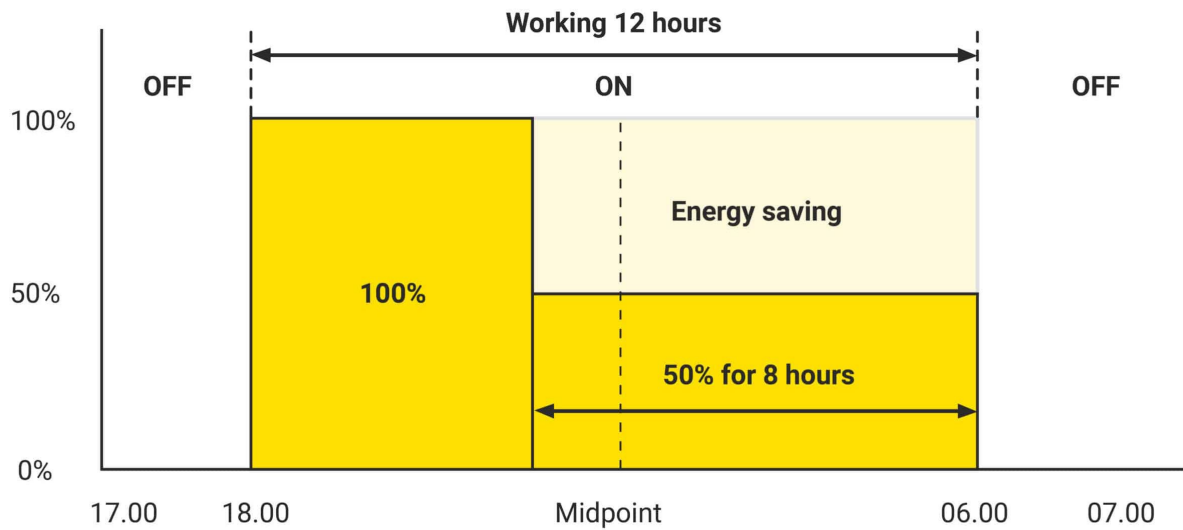
This option enables a lighting system controlled via DALI to benefit from the energy savings and lifetime extension provided by CLO. As this option does not include automatic Night dimming, any dimming will need to be handled by the DALI controller system.

DA2 – CLO with Night dimming 1 [100% for 6 hours (till Midpoint) – 50% for 6 hours (till the end of operation time)]*



Standard Option DA2

DA3 – CLO with Night dimming 2 [100% for 4 hours (till Midpoint) – 50% for 8 hours (till the end of operation time)]*



Custom Setting Options

- ▶ Set from factory by choosing a standard option (DA1 / DA2 / DA3).
- ▶ Set from factory upon a custom request by the customer.
- ▶ Limitation here is to have 5 independent dimming levels.
- ▶ User can re-setting at site by using an “Interface” which can connect to the “Driver”.
- ▶ LIGMAN do NOT sell this interface. Clients can buy them. LIGMAN will provide which driver is used on the specific model.

“Interface” examples: (depends on the driver brand)



BILLUND now with CLO and Night dimming

BILLUND street and area lighting luminaires from LIGMAN are a robust and reliable family of fixtures that provide both high-performance and sustainable operation through the latest in lighting innovations.

Existing benefits of BILLUND include the use of LIGMAN MicroVOS technology for specifically tailored optics, glare control certified by the International Dark Sky Association, and Internet of Things (IoT) incorporation through LIGMAN LIGHTCONNECT for future proof approaches to lighting control and optimisation.

The latest advantage that BILLUND now offers is CLO and Night dimming. These unique technologies both reduce the energy consumption and increase the lifetime of a lighting installation.