

## Intelligent thermal management with power reduction: Operation in a wide range of temperature



### Features

- **Considerable increase of the light output (lm/W) in hot luminaires**
- **Nearly no losses in luminous flux (lm) versus unregulated operation**
- No reduction of ECG lifetime within the scope of the regulation
- Simplifies the approbation of hot luminaires
- Conserves luminaire components

### **Note:**

- Limitation of the t<sub>c</sub>-temperature to values < 80 °C (depending on the mounting location), but the ECG never shuts off due to over temperature
- Thermally problematic luminaires can not be changed to norm conformal units, even with these ECGs
- Power reduction down to 50 % of the full load

### Functionality

The ballast measures its temperature once a minute. Reaching the set limit value, the ECG begins to reduce the system power in order to decrease the temperature in the luminaire and to stop ECG temperature raising.

The t<sub>c</sub>-temperature stabilizes between 75 °C and 80 °C, depending on the mounting location (for example thermal coupling into the ECG from top or bottom).

At 25 °C ambient temperature, a reduction of the system power of 10 % - 20 % is enough in hot luminaires to stabilize the t<sub>c</sub>-temperature. The light output decreases only of 1 % - 2 %, as the efficiency of the system raises.

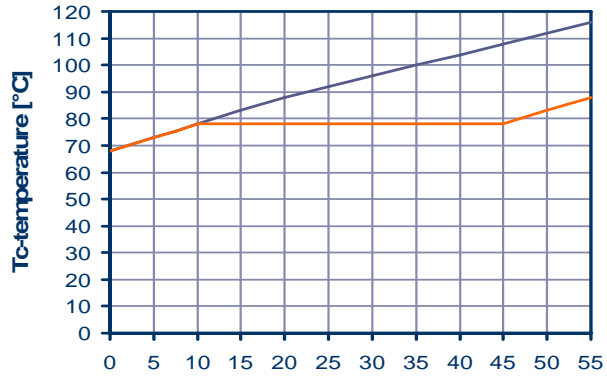
**Dimming is always possible**, the temperature regulation may affect the upper dimming level only insignificantly.

**!** **The regulation of the lamp power compensates loss of light output in hot luminaires.**

# Intelligent thermal management

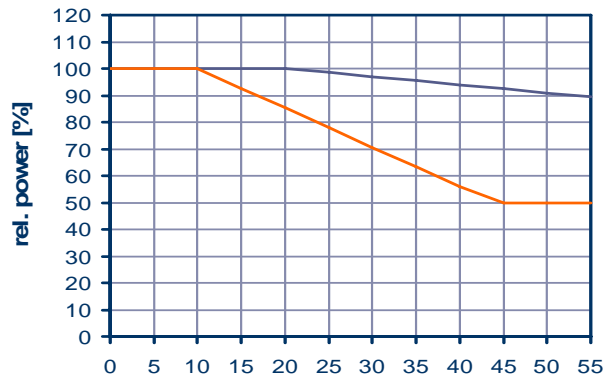
**Figure 1**

Dimmable OSRAM QT<sub>i</sub>-ECGs fix their  $t_c$ -temperature constant in a wide range of ambient temperature. This helps to control also the temperature of the luminaire. The ECGs and the components in the luminaire will be conserved.



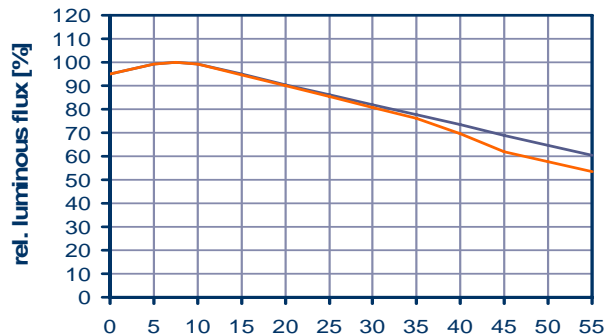
**Figure 2:**

This can be realized by reducing the system power.



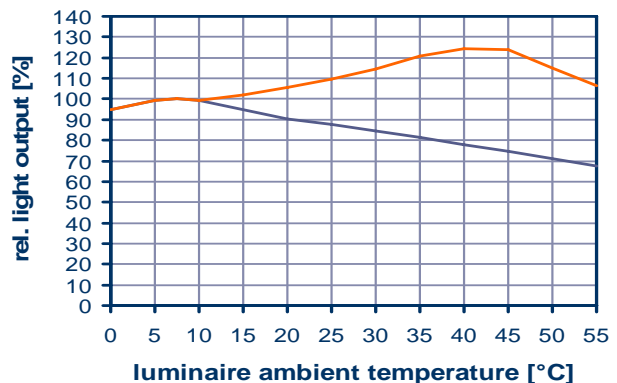
**Figure 3:**

Nevertheless, the **luminous flux of the luminaire is hardly affected**, as the efficiency of the system raises due to the temperature limitation.



**Figure 4:**

The tremendous raise of the relative light output emphasizes: **The limitation of the temperature in hot luminaires has positive effects on energy saving.**



Example: tight 2x80 W luminaire

— without limitation of the temperature

— with limitation of the temperature

The scaling depends on the type of luminaire and the mounting location of the ECGs.

# Intelligent thermal management

## Why are the light losses so small due to the temperature limitation?

Assuming a luminaire, whose internal temperature (= lamp ambient temperature) has to be reduced from 65 °C to 55 °C: A reduction of the system power of 20 % is necessary. In the diagram, the  $\Phi(T)$ -curves of T5 lamps are shown for 100 % and 80 % system power.

Switching over to the 80 % curve (and reducing the lamp ambient temperature by 10 °C) means nearly same luminous flux.

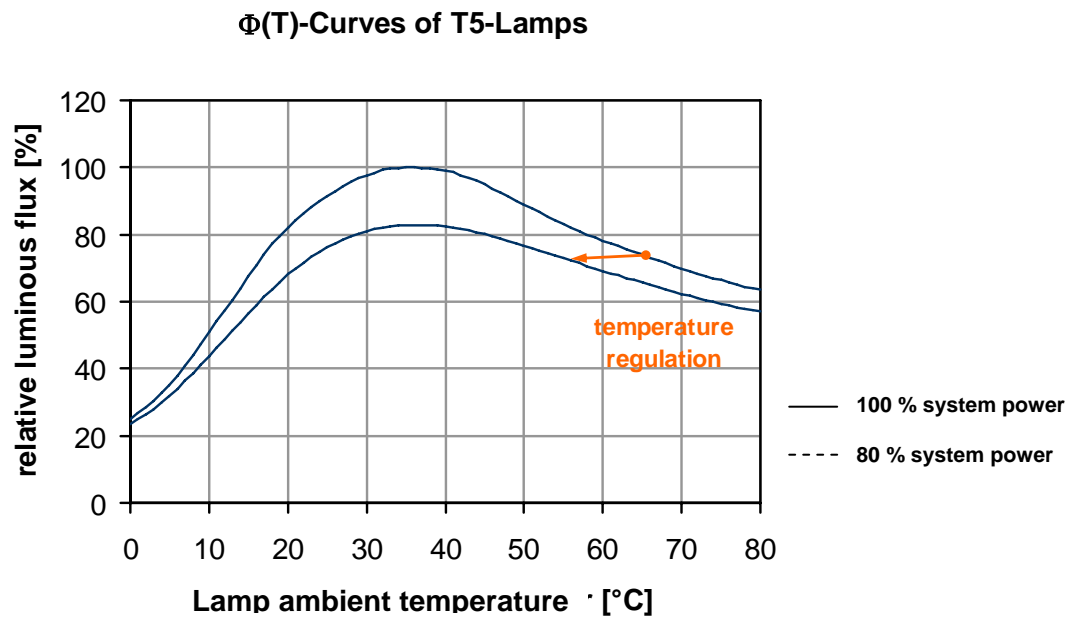


Figure 5: Temperature regulation and relative luminous flux

## QTi DALI...DIM never stop thinking: Hints to thermal decoupling of lamp and ECG

Temperature limitation is control engineering in the classical way and needs therefore a **closed control loop**: The lamps have to be able to warm up the ECG. This can be guaranteed, as long as the lamps and ECGs are in the same luminaire area (at best separated by a reflector).

As long as the ECGs are mounted outside the luminaire, the advantages of the temperature limitation can not be used.