

3F LED Technology

What are the aspects to consider when choosing an LED luminaire?

Reference standards

When studying and designing products, 3F Filippi refers to the most recent specific reference standards:

IEC 62722-2-1

Luminaire performance - Part 2-1: Particular requirements for LED luminaires

IEC 62717

LED modules for general lighting - Performance requirements

CIE 121

The Photometry and Goniophotometry of Luminaires

IEC TR 62778

Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires

IEC EN 62471

Photobiological safety of lamps and lamp systems

IEC EN 60598-1

Luminaires: General requirements and tests

REGULATION (EU) No. 1194/2012

sets out the rules for the application of European Parliament and European Council Directive 2009/125/EC on the specifics of environmentally-friendly design of directional lamps, lamps with light-emitting diodes and other relevant equipment.

Ideal operating temperature

In order for LED modules to be able to function correctly and ensure a long lifetime (>50,000 h), a limited drop in luminous flux over time (>L85) and high luminous efficiency (>140 lm/W), they must be able to correctly dissipate the heat they generate.

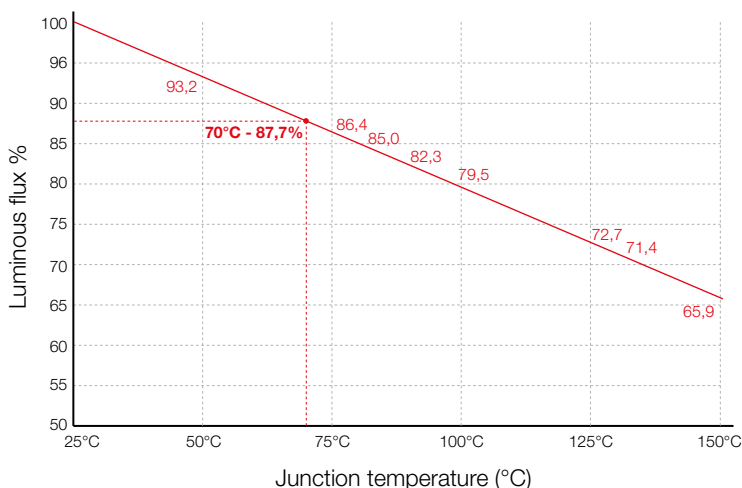
The rated data for LEDs applies only if the junction temperature (Tj) is not exceeded. For this reason, at 3F Filippi, we perform a series of thermal and illuminotecnical tests on our LED luminaires, which allow us to achieve the best combination of heat dissipation, luminous flux and rated power.

Luminous flux and LED performance temperature "tp" (IEC 62717)

The junction temperature (Tj) is the temperature inside the LED, and is useful for indicating the performance temperature (Tp) of the LED, to which reference is made when indicating data relating to the luminaire.

As the graph on the left shows, the luminous flux emitted by the LED is linked to the performance temperature while in operation (normally between 60°C and 80°C) and falls very fast as the Tp increases.

It is very important to highlight that on the market, there are many manufacturers who declare the luminous flux and useful life with a junction temperature Tj 25°C.



This indication is not correct, because it does not refer to the actual operation of the product.

This is clear when you consider that standards require the measurements to be taken at an ambient temperature (Ta) of 25°C – this would mean that the LED does not technically produce any heat - a physically impossible condition.

3F Filippi advises you be wary of luminaires which do not provide for correct heat dissipation and recommends that you request information on life expectancy, lifetime and luminous flux from measurements on luminaires which are running and thermally stabilised.

The performance of 3F Filippi luminaires is achieved with a room temperature (Ta) of + 25°C

as required by the standard IEC 62722-2-1.

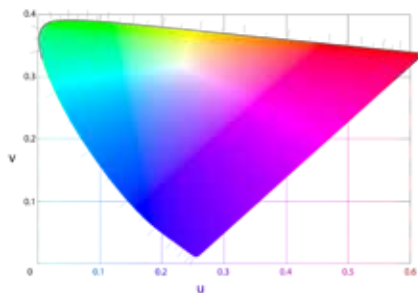
Conversely, the performance of the LEDs used in 3F Filippi luminaires is achieved with an operating temperature (Tp) of + 60°C to + 80°C, as required by the standard IEC 62717.

Thermal management

LED Junction temperature	T _j 25°C	T _j 60°C
Lumens	1000	950
System	178 lm/W	169 lm/W
Useful life (@50,000h)	L 100	L 85
Life expectancy	B 0	B 10

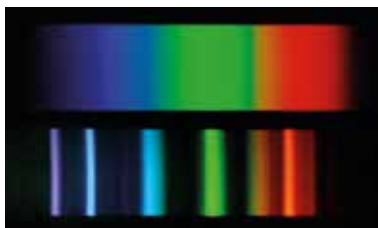
To increase LED luminaires' reliability to the maximum, correct thermal dissipation is essential. The temperature is fundamentally important as it influences the luminosity and lifetime of the LED component. 3F Filippi pays great attention to this factor and as a result we develop luminaires which ensure optimum heat dissipation. To the left, a chart that correlates the performance values at different junction temperatures T_j (the operating temperature).

Colour rendering index (CRI)



The colour rendering index is an important parameter for the performance of a light source, and evaluates the source's ability to provide an accurate perception of an object's real colours. All LEDs used by 3F Filippi have colour rendering Ra>80, with a typical average value of around 85. Where not already provided for, high colour rendering of Ra>90 can be requested on some products.

Colorimetry and light spectrum



Typical LED light spectrum

Typical light spectrum for traditional sources

LED sources have a light spectrum with greater uniformity across the whole range of colours. Unlike traditional light sources, LEDs do not have interruptions in colour, thus ensuring complete and much-improved vision of the entire colour spectrum - very similar to that seen with natural light.

Chemical compatibility

For LED luminaires, care must be taken to ensure chemical compatibility with the individual LED chips which, when exposed to given organic compounds, for example substances containing sulphur (S), chlorine (C) or other halogens (ammonia, diesel etc.) are liable to sulphuration (or oxidation) of the component. Sulphuration can cause reductions in flow and useful lifetime, a change in chromatic co-ordinates and, in extreme cases, interruption of the electrical circuit and breaking of the junction. Even for the LEDs inside IP65 lighting bodies, which also benefit from significant protection, this cannot be considered absolute. **On request: for particularly corrosive applications, LED modules with special protection can be used.**