

## How to choose an LED driver?

This topic will not explain technical side in depth, only what is required to understand in order to get the best performance of your LED system.

The first question should be "What is an LED?" as this topic is all about them.

History in short, the LEDs has been with us since 60's, those emitting visible light were used mainly for indication purposes, due to their advantages over incandescent bulb like longer lifespan, lower energy consumption, physical robustness and others.

The LEDs which are currently in course for indoor and outdoor lighting are high brightness LEDs, based on blue LED, introduced in 1994 by Shuji Nakamura (recipient of Nobel price for Physics - high efficient blue LED).

To achieve the best performance, the first thing is to understand the LED electrical basics in order to choose the correct type of power supply.

LED has to be supplied by the DC (Direct Current) but what we get from the mains electricity supply is an AC or Alternate Current. The LED has to be driven by an AC-to-DC Power Supply - which is an essential requirement.

Getting back to the mains electricity supply, its AC form may be harmless, the problematic part is the LED flicker, which it would cause as the LED is semi-conductor component (current must be flowing in one direction). LED has a voltage and current specification. Mains electricity can supply up to 16 Amps (current) and 230 Volts (voltage). Consider for a moment, that the mains electricity supply has a DC form. Multiply current and voltage ( $16A \times 230V$ ) and we get maximum power of 3680W. In most cases, mains electricity supply is protected by a circuit breaker (or a fuse). In this case, we have 16A supply, therefore 16A fuse or circuit breaker. So now, lets take 3680W LED and connect it to this mains electricity supply. What will happen? The circuit breaker or the fuse will disconnect the supply immediately after LED connection. Now comes the part, which can be explained in the technical literature, but we will consider this as a fact, that the LED is a current driven. And it will take as much current as it possibly can, even more than offered (but only if the voltage specification is satisfied - we will get to this later). That is why, we need to prevent current "overfeeding" of the LED, like with the fuse or circuit breaker, but we want to get the light operating for much longer than few milliseconds.

And that is why, we need an LED power supply, also known as LED driver.

Most common LED driver types are constant voltage and constant current. Both types are widely used, and each type has its advantages. Having said that, there are opinions that the constant current is easier to use.

Single LED diode can require 2.9-3.1V. If this requirement is met, then it is a current which dictates, how bright the LED will be and how long it is going to last.

Imagine a 90W LED luminaire, consisting of three parallel strings each containing ten LED diodes. Each LED diode will be driven at 3V and 1A. This luminaire will require voltage 30V and current 3A.

In this case, we will be choosing an LED driver with output current of 3A and a correct output voltage range, of course 30V must be in this range.

There are cases where the LED luminaire will require such current, that the 100% fit LED driver will be difficult to find. That is why, some drivers can be equipped with dimming input, by which the user can adjust the output current.

Such dimming input can be 0-10V, or so-called analogue dimming input, where by applying resistance, output current of the LED driver will be decreased. There are other dimming inputs as well, such as PWM, DALI, but also programmable through AC power input of the LED driver.

Although choosing the correct LED driver could seem like a challenge, it is sometimes simplified by choosing closest LED drivers to the LED specification and choosing by costs.

As an example, there can be 30W and 50W LED drivers. Both supplying 2A. 30W driver voltage range will be 7-15V, 50W driver voltage range will be 12-25V. Example LED luminaire requires 14V and 2A. Both drivers are applicable.

However situation may occur that 25W driver with 1.75A current and 7-14V voltage range will be available, in this case the luminaire will operate at 24.5W, 250mA less than required, resulting in decreased intensity but increased lifespan of LED.

With all these options and information covered in this article, it is now possible to understand, how to choose the driver according to voltage and current specification.

Although there are other specifications as well, these are the ones which are essential in order to operate the LED correctly.