

# DC1-10V electronic potentiometer work with LED driver in EU

## Introduction

Mean Well LED driver offers dimming function to fit the modern lighting control demand. LED driver will change its output current based on 3 different input signal/setup including DC 0(1)-10V, PWM and 100K ohm resistor dimming. The difference between DC 0-10V and DC 1-10V has been addressed in the previous article\*. This application note describes how a commercially available dimmer to work with Mean Well LED driver.

## Potentiometer: simple solution with problems

One of the solutions to dim with the LED driver is just to use a simple adjustable 100k ohm potentiometer shown in the Figure 1. This is a cost effective solution and works well with the LED driver. However there are two essential drawbacks which makes it in some cases less suitable. First the dimming response is not good in case there are multiple LED drivers connected to one potentiometer. Second there is not much choice on the frame plate in terms of color, material to be used in the house where fullness and harmonized interior design is desired. Because of these drawbacks, electronic potentiometers were invented to resolve the issues described before.

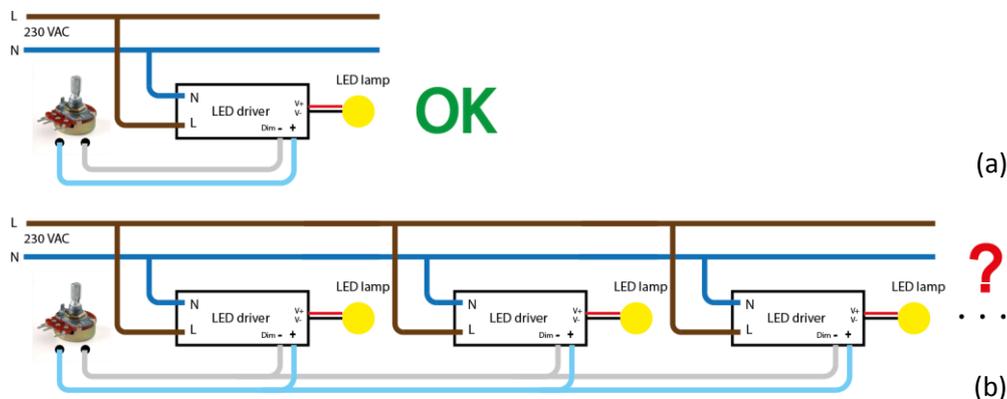


Figure 1. Potentiometer as dimmer to dim only one driver: Good dimming performance (a); to dim two or multiple drivers: Poor dimming performance (b)

There are many electronic potentiometers available on the market from the manufacturers of electrical installation and building system. Sometimes it is also called DC 1-10V dimmer because the potentiometer converts the current from dimming port of LED driver into DC 1-10V. These can be found online using the keyword "Potentiometer 1-10 V" in Google. Most of these have same or similar electronic design. Electronic potentiometers provide two main functions: Switch On/Off and potentiometer as illustrated in Figure 2. The switch function allows the user to change the light output state by pressing the dimmer which has an equivalent circuit in Figure 2(c). Further the electronic potentiometer provides a dimming function. In general the sink current of dimmer determines the max. allowable number of LED drivers connected to it. For instance, dimmer shows

50mA on the label which indicates it can theoretically connect up to 500 LED drivers in parallel due to the fact that each Mean Well LED driver generates 0,1mA output current. However the final allowable device should also consider based on the type of fuse inside dimmer which is subject to the Inrush current of AC current of LED driver. For instance, 0,5A ceramic fuse is used inside the Figure 2(c). The calculated number is 5 in case the rated input current on each driver is 0,1A. As result the max. allowable number of driver connected to dimmer in this example is just 5 by comparing the calculated results from dimmer current and fuse.

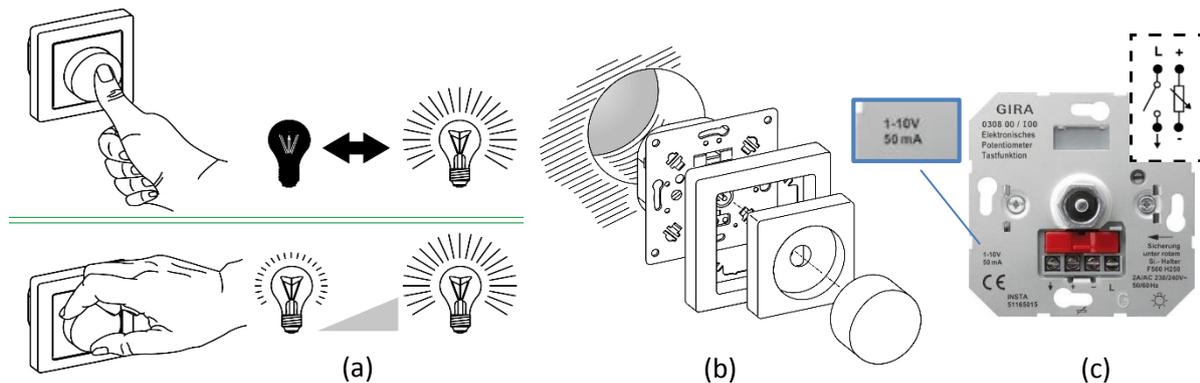


Figure 2. Functions of electronic potentiometer (a); It is designed to be embedded into wall (b); Commercial electronic potentiometer from GIRA GmbH with equivalent circuit (c)

## Connecting an electronic potentiometer to LED driver

The installation manual of electronic potentiometer or DC 1-10V indicates the conventional way to connect it to driver shown in Figure 3(a). It is suitable both Mean Well driver with DC 1-10V and DC 0-10V. The switch of dimmer is connected to AC mains so that the LED driver is surely switched off when needed. However such connection has risk of electrical shock during wiring due to the present of high voltage. Another possible connection is proposed in Figure 3(b). Such connection does not need to work with high voltage because there is no need to connect the AC mains wire on dimmer side. The dim to off function provided by the Mean Well DC 0-10V LED driver is used to put the driver into standby mode in case the button of dimmer or electronic potentiometer is pushed. As result, it is very important that the standby power consumption is low to save the energy. All Mean Well LED drivers with DC 0-10V dim to off function are designed to have low standby power while compliant the latest Ecodesign or ErP regulation required by CE. LED driver with DC 1-10V may not suitable for Figure 3(b) connection simply because it is not equipped with dim to off function.

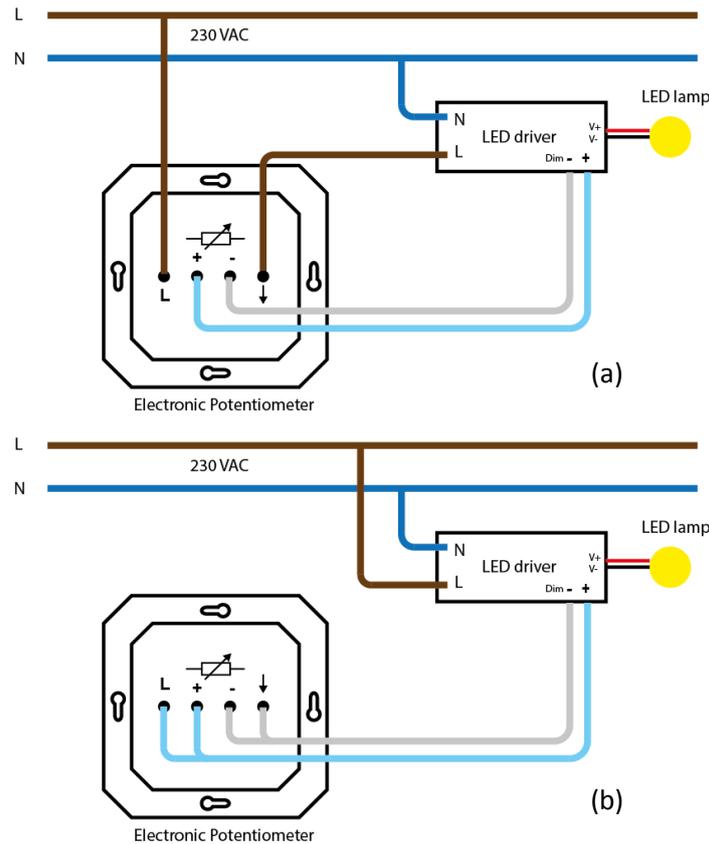


Figure 3. Connection diagram for Conventional method (a); New proposed connection (b)

Mean Well dimmable driver	DC 1-10V dimmer connection	
	Figure 3(a)	Figure 3(b)
DC 1-10V	OK	May not suitable
DC 0-10V(dim to off)	OK	OK

Table 1. Mean Well dimmable driver vs connection scenario of dimmer

## Summary

This article explains commercially electronic potentiometer/DC 1-10V dimmer can work well with dimmable Mean Well LED driver. There are two connection provided for user to choose which suits the best. A quick overview is given in the Table 1. The new proposed connection in Figure 3(b) is suggested because it avoids the electric shock when electrician is working with DC 1-10V electronic potentiometer. Additional benefit is the reduction of excess cost due to miswiring or incautious action. The max. number of LED drivers connected to dimmer compared with conventional connection is higher because it does not need to take the fuse of dimmer and AC current of driver into account. Also the false trigger of circuit breaker due to high inrush of driver would not be an issue because the driver is not turned on/off at primary side. Table 2 gives the list of dimmers on the market which proof the concept.



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Dimmer manufacturer	Website	Type
<b>GIRA</b>	<a href="http://www.gira.de/">http://www.gira.de/</a>	0308 00
<b>GIRA</b>	<a href="http://www.gira.de/">http://www.gira.de/</a>	0309 00
<b>Insta</b>	<a href="http://www.insta.de/">http://www.insta.de/</a>	51165010
<b>Insta</b>	<a href="http://www.insta.de/">http://www.insta.de/</a>	51165015
<b>Jung</b>	<a href="http://www.jung.de/">http://www.jung.de/</a>	240-10
<b>Jung</b>	<a href="http://www.jung.de/">http://www.jung.de/</a>	240-31
<b>Merten (Schneider)</b>	<a href="http://www.merten.de/">http://www.merten.de/</a>	MEG5142-0000
<b>Merten (Schneider)</b>	<a href="http://www.merten.de/">http://www.merten.de/</a>	572999
<b>Niko</b>	<a href="http://www.niko.eu/">http://www.niko.eu/</a>	310-01101

Table 2. Proven electronic potentiometers/ DC 1-10V dimmers work with Mean Well LED drivers

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