

Difference Between Regulated and Unregulated Power Supply

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Key Difference - Regulated vs Unregulated Power Supply

Generally, a [power supply](#) is a device or an electrical circuit that gives energy (power) to another electrical device. There are many types of power supplies; regulated and unregulated power supplies are two such categories based on the type of output. **In regulated power supplies, the output [DC voltage](#) is regulated so that a change in input voltage is not reflected in the output.** In contrast, **unregulated power supplies do not have a voltage regulation at the output.** This is the key difference between regulated and unregulated power supply. Although there are AC power supplies in use, regulated and unregulated power supplies most commonly refer to DC power supplies.

What is a Regulated Power Supply?

[Voltage](#) regulation refers to maintaining the voltage at the desired level, which is suitable for the connected appliance. Regulated power supplies maintain the voltage in order to provide a smooth supply of voltage to sensitive electrical and electronic devices. Regulated DC voltage is produced through a series of sub-functions in a power supply.

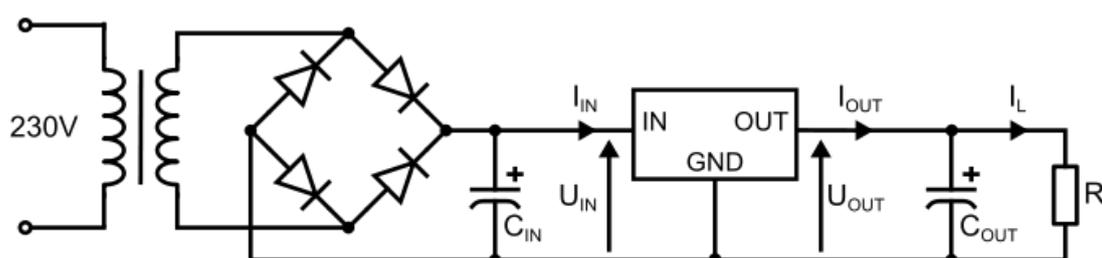


Figure 01: Power supply with Linear Voltage Regulator

As shown in the above figure, the AC supply is first stepped down to the desired output level by a transformer. After that, a diode bridge rectifying circuit transforms the reduced AC voltage into a positive waveform. Then, a filter circuit composed of a parallel-connected [capacitor](#) makes the positive waveform a rippled-DC voltage. Furthermore, the ripples in the DC is regulated by a voltage regulator circuit which outputs a smooth DC voltage to the connected load.

If the [current](#) drawn by the load (the connected device) is less than the maximum supply current of the power supply, the voltage will be constant independent of the drawn current. A regulated power supply helps to run almost all the electronic devices available since they are highly sensitive to voltage variations. Some may even burn at excessive voltages while some may function improperly. Therefore, it is crucial to have a smooth voltage supply.

What is an Unregulated Power Supply?

In an unregulated power supply, a voltage regulation is not involved. However, some amount of regulation happens in unregulated power supplies as well. There, all blocks in the regulated power supply except the voltage regulation block are also available in an unregulated power supply. Similar to the regulated supply, the AC input voltage is processed up to the rippled DC voltage output between the filter capacitor. Nevertheless, there may be power supplies without this smoothing capacitor as well. In that case, slow variations in the input AC voltages, such as voltage sags, could be reflected in the output. Even with a smoothing capacitor at the filter, there may be high-frequency noise, which comes from the AC mains at the output.

The main disadvantage of an unregulated power supply is that the DC voltage output depends on the output current. That is, when the load draws a high current due to its power requirement, the DC voltage drops according to the desired power. However, unregulated power supplies are cheaper since there are fewer components. The heat dissipation is also less than a regulated power supply as there is no voltage regulator (this may be not true in the case of a switched mode DC power supply, in which the efficiency is much higher).

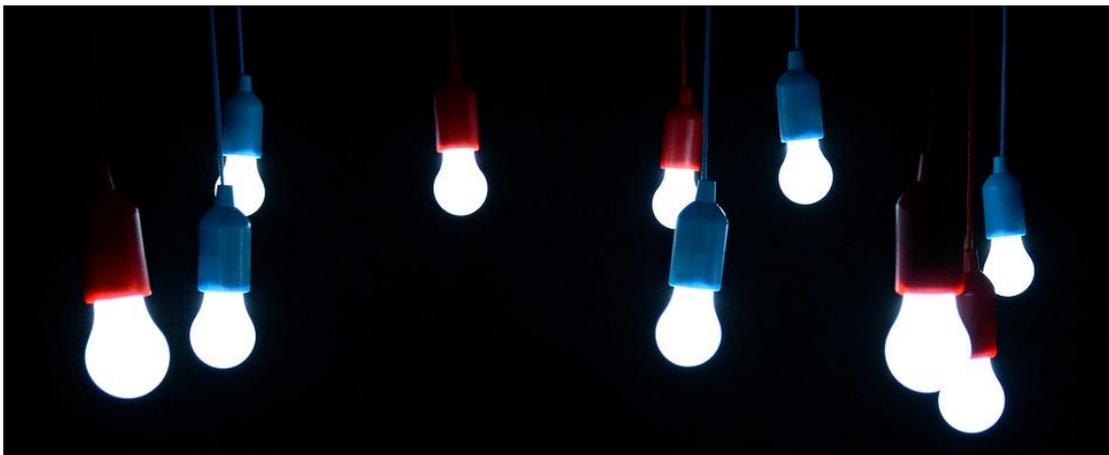


Figure 02: Electrical devices such as LED bulbs, which are not sensitive to slight alternations in the voltage can be used with unregulated power supplies.

What is the difference between Regulated and Unregulated Power Supply?

Regulated vs Unregulated Power Supply	
Regulated power supplies are able to supply regulated DC voltage to sensitive electronic devices.	Unregulated power supplies do not have voltage regulation circuit; thus, any variation in the input AC will be reflected in the output.
Output Voltage	
The output voltage of the regulated power supply does not vary with the current drawn by the load. That is, voltage is independent of the load current.	The output voltage of an unregulated power supply always changes with the output current, mainly due to the high internal resistance of the power supply.
Usage	
Electronic devices such as computers, TVs, etc. should always use regulated power supplies.	Electrical devices like DC motors, LED lamps that are not sensitive to small voltage variations can be used with unregulated power supply.
Cost	
Voltage regulation circuits in regulated power supplies are comparatively costly to produce. Therefore, the unregulated power supplies are expensive.	Unregulated power supplies are cheaper to produce since they do not contain voltage regulation.

Summary - Regulated vs Unregulated Power Supply

Power supplies are used to provide power to electrical and electronic devices. Most of the electronic devices use DC power for the operation, and this DC power should have a clean and constant voltage. Regulated power supplies are the units that convert AC main voltage into a clean, constant DC voltage. With the use of a voltage regulator circuit, the variations and noise in the input AC voltage are avoided in the output. In contrast, unregulated DC power supply does not have a voltage regulation circuit. Therefore, it only provides a rippled-DC voltage by rectifying and filtering the AC. This is the main difference between regulated and unregulated power supply. Unlike the output of a regulated power supply, unregulated power supply output will reflect the variations and noise in the input AC. Nevertheless, these AC distortions can be mitigated using smoothing capacitors at the output.

Reference:

1. "Regulated Power Supply." Electrical4u. N.p., n.d. Web. [Available here](#). 13 June 2017.
2. "Unregulated Power Supply." Electronics Tutorials. N.p., n.d. Web. [Available here](#). 13 June 2017.

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1. "Power supply with linear voltage regulator" By CLI - Own work (Public Domain) via [Commons Wikimedia](#)

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