What is a Power Supply : Types for Electrical Circuits

December 10, 2018 By Dave

The power supply is the essential component in every electrical or electronic system. There are various requirements that need to be considered while choosing an exact power supply such as; necessities of power for the circuit or load mainly include voltage and current. The safety features of the power supply circuit like current and voltage limits for protecting the load, efficiency, physical size, and system noise immunity. In this article, we look into the **definition of a power supply**, **different types of power supplies,** and how they work. These power supplies are mainly used for measurement, maintenance, test, and product expansion activities.

What is a Power Supply?

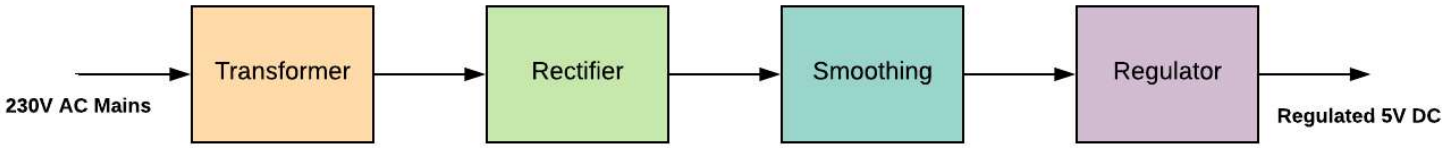
The power supply can be **defined** as it is an electrical device used to give electrical supply to electrical loads. The main function of this device is to change the electrical current from a source to the accurate voltage, frequency, and current to supply the load. Sometimes, these power supplies can be named to as electric power converters. Some types of supplies are separate pieces of loads, whereas others are fabricated into the appliances that they control.

Power Supply Circuit

The Power supply circuit is used in various electrical & electronic devices. The power supply circuits are classified into different types based on the power they utilize for providing for circuits or devices. For instance, the microcontroller-based circuits are generally the 5V DC regulated power supply (RPS) circuits, which can be designed with the help of different method for changing the power from 230V AC to 5V DC.

The power supply circuit is shown above, and the step by step conversion of 230V AC to 12V DC is discussed below.

- A step-down transformer converts the 230V AC into12v.
- The bridge rectifier is used to change AC to DC
- A capacitor is used to filter the AC ripples and gives to the voltage regulator.
- Finally voltage regulator regulates the voltage to 5V and finally, a blocking diode is used for taking the pulsating waveform.



Power Supply Block Diagram

Different Types of Power Supplies

The different types of power supplies are classified as follows.

1) SMPS- Switched Mode Power Supply

An SMPS power supply or computer power supply is one type of power supply that includes a switching regulator for converting electrical-power powerfully. Similar to other power supplies, this power supply transmits the power from a DC source or AC source to DC loads, such as a PC (personal computer), while changing the characteristics of current and voltage. Please refer this link to know more about Know All about Switch Mode Power Supply

SMPS – Switched Mode Power Supply

2) Uninterruptible Power Supply

A UPS (uninterruptible power supply) is an electrical device that permits a PC to keep working for some time as the main power supply is lost. This device is also given protection from power flow.

UPS – Uninterruptible Power Supply

A UPS includes a battery to store the energy when the device detects a power loss from the main source. For instance, if you are using the PC when the uninterruptible power supply senses the power loss, then you have to save the data before the UPS (secondary power source) discharges.

When both the primary and secondary power sources run out, any data in your PC's RAM (random access memory) is erased. When power loss occurs, a secondary power source stops the loss of power so that it doesn't harm the personal computer. Please refer this link to know more about Uninterruptible Power Supply Circuit Diagram and Working

3) AC Power Supply

Typically, an AC power supply acquires the voltage from the mains supply and the voltage can be step up or step down by using a transformer to the required voltage and some filtering may take place. The

different types of AC power supplies are designed to offer an almost stable current, and o/p voltage may change based on the load's impedance. In some cases, as the power supply is DC, a step-up transformer and an inverter may be utilized for converting it into AC power. Some sorts of AC power alteration don't use a transformer.

AC Power Supply

If the input and output voltages are the similar and main function of the apparatus is to filter AC power. If the apparatus is designed for providing backup power, then it may be named as an uninterruptable power supply (UPS). At present, AC power supplies are classified into two types namely single-phase systems as well as three-phase systems. The main differences between these two are the dependability of delivery. These supplies can also be applicable for changing the voltage as well as frequency.

Please refer to this link to know more about Regulated DC Power Supply MCQs

4) DC Power Supply

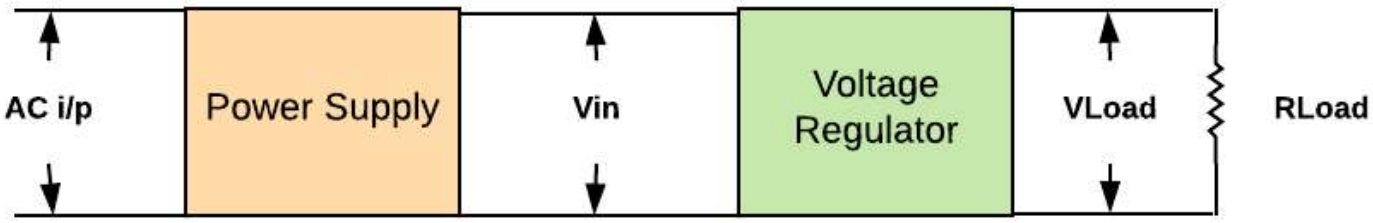
A DC power supply is one that provides a consistent DC voltage to its load. Based on its plan, a DC power supply might be controlled from a DC supply or from an AC supply like the power mains.

DC Power Supply

5) Regulated Power Supply

An RPS (regulated power supply) is a fixed circuit used to change unregulated alternating current into a stable direct current.

Here rectifier is used to change AC supply to DC, and its main function is to give a stable voltage to a device or circuit that should be functioned in a particular limit of the power supply. The output of the RPS may be changing (or) unidirectional, but it always DC (direct current).



Regulated Power Supply

The sort of stabilization used can be controlled to ensuring that the o/p remains in certain restrictions beneath various load conditions.

6) Programmable Power Supply

This type of power supply permits remote control for its operation via analog input otherwise digital interfaces like GPIB or RS232. The controlled properties of this supply include current, voltage, frequency. These type of supplies are used in a wide range of applications like fabrication of semiconductors, X-ray generators, monitoring of crystal growth, automated apparatus testing.

Generally, these types of power supplies use an essential microcomputer for controlling as well as monitoring the operation of a power supply. A power supply provided with an interface of computer uses standard (or) proprietary communication protocols, and device control language like SCPI (standard-commands-for-programmable-instruments)

7) Computer Power Supply

The power supply unit in a computer is the part of the hardware that is used for changing the power supplied from the outlet into utilizable power for the several parts of the computer. It converts the alternating current into direct current

It also controls over-heating through controlling voltage, which may modify manually or automatically based on the power supply. The PSU or power supply unit is also called as a power converter or a power pack.

In a computer, the internal components like cases, motherboards, & power supplies all available in different configurations, sizes which are known as form factor. All these three components must be well-matched to work appropriately together.

Please refer to this link to know more about Electric Circuit MCQs

8) Linear Power Supply

The LPS (linear power supply) or LR (linear regulator) circuit is used in various electrical & electronic circuits for supplying the DC current to the entire circuit. The linear power supply mainly includes a step-down transformer, rectifier, filter circuit & voltage regulator. The main function of this circuit is at first; step downs the alternating current voltage then changes it into direct current. The main features of this power supply include the following.

- The efficiency of this power supply ranges from 20 to 25%
- The magnetic materials used in this power supply are CRGO core or St Alloy.
- It is more reliable, less complex and bulky.
- It gives a faster response.

The main advantages of linear power supply include reliability, simplicity, low cost and the noise level is low. Along with these benefits, there are some disadvantages such as

These are best for several low power applications as a result when a high-power is required; the drawbacks turn into more clearly. The disadvantages of this power supply include a high loss of heat, size, & low-efficiency level. Whenever linear power supply is used in high power applications; it requires large components to manage the power.

Please refer to this link for Electric Power MCQs.

Thus, this is all about different types of power supplies, and these are being used for providing the power supply to different systems efficiently. Power supplies are the essential components of every system to get electrical energy for the operation. So, some of the considerations of a power supply like design or development are more significant. Because day-by-day the invention of technology as well as power supplies are being increased for providing protection to electrical and electronic devices.