Experiment No: 04

Experiment Name: Stady of Universal power supply

Objective:

- To know about Universal power supply
- To know about Universal power supply working procedure
- To know about universal power supply drawback

Starting procedure:

The starting procedure for a universal power supply:
1. Inspect for damage and ensure all connections are secure.
2. Set the input voltage to match your local power source.
3. Plug it into an AC outlet.
4. Adjust output voltage and current settings for your devices.
5. Turn on the power supply.
6. Check output values for safety.
7. Ensure devices are working.
8. Turn off the supply, disconnect devices, and unplug it.
9. Follow safety guidelines and refer to the manual.

Working Procedure:

The Universal Power Supply (UPS) works by converting and regulating electrical power to provide uninterrupted and clean power to connected devices during power interruptions or fluctuations. Here is a description of the working process of a UPS in a narrative form.When the UPS is connected to an electrical outlet, it starts by drawing power from the mains electricity. This incoming AC (alternating current) power is first passed through a rectifier. The rectifier's job is to convert AC power into DC (direct current). This DC power is used primarily to charge the UPS's internal batteries.Inside the UPS, there is a battery bank comprising one or more batteries. These batteries serve as an energy reservoir. The charger circuit in the UPS ensures that the batteries are consistently charged and maintained at their optimal level.As the UPS operates, it continuously monitors the quality of the incoming power. When there's a power interruption or if the incoming power quality falls outside acceptable parameters (e.g., voltage spikes or sags), the UPS quickly switches from drawing power from the mains to utilizing the energy stored in its batteries.This transition from mains power to battery power occurs seamlessly and almost instantaneously, typically within milliseconds. During this transition, the DC power stored in the batteries is converted back into AC power by an inverter. The inverter's role is crucial in this process, as it produces a clean and stable sine wave or a modified sine wave (depending on the UPS type). This output power matches the frequency and voltage of the utility power, ensuring that the connected devices receive a consistent and reliable power supply.The clean AC power generated by the inverter is then supplied to the connected devices through the various output sockets or outlets on the UPS.This stable power source protects these devices from voltage spikes, voltage sags, or complete power losses.Throughout this process, the UPS may also continuously monitor its own status and the status of its batteries. Many modern UPS units come equipped with monitoring and management features, allowing users to check the UPS's health, load capacity, battery status,

and more. Some advanced UPS models can be remotely controlled and programmed to initiate graceful shutdowns of connected devices during extended power outages to preserve data integrity.Once power is restored after an outage, the UPS switches back to drawing power from the mains and simultaneously begins recharging its batteries. This recharging process ensures that the UPS is ready for the next interruption, maintaining its ability to provide backup power and protect connected equipment. In summary, a Universal Power Supply functions by converting, regulating, and storing electrical power to provide a consistent and uninterrupted power supply to connected devices, safeguarding them from power disturbances and ensuring their continued operation during power outages.

Universal power supply Difference:

Certainly, here's a brief overview of the key differences in universal power supplies (UPS) without going into specific details or points. Universal power supplies come in different topologies, including online, line-interactive, and standby. Online UPS offers the highest level of power protection, while standby UPS provides basic protection. PS units can produce either a pure sine wave (clean and stable) or a modified sine wave (less clean). Pure sine wave UPS is suitable for sensitive electronics, while modified sine wave UPS is more cost-effective. PS units vary in capacity, which determines the number and type of devices they can support. Systems use different types of batteries, such as sealed lead-acid (SLA) or lithium-ion, which can impact performance and lifespan. The duration a UPS can provide power during an outage depends on its battery capacity and the load it supports. Advanced UPS units may offer features like remote monitoring, network connectivity, and management software.UPS units come in various shapes and sizes, including tower, rack-mounted, and compact designs.UPS units vary in cost based on capacity and features.UPS systems have different levels of efficiency, with online UPS being less efficient than line-interactive or standby UPS.The length and terms of the warranty provided by the manufacturer can differ.UPS units can vary in the amount of fan noise they produce.Ensure the UPS is compatible with the devices you plan to connect to it. In summary, universal power supplies come in various configurations and specifications, allowing users to select the UPS that best meets their specific needs, whether it's for protecting sensitive electronics, providing backup power during outages, or other applications. The choice depends on factors such as capacity, output waveform, and intended use.

Rating
0/380v – 2A
0/240v 4A ⟵ (a) ⟶ 3A 0/240v
220v – 4A ⟵ (b) ⟶ 3A 220v
0\225v – 1A

Fig 1: Universal power supply

Universal power supply drawback:

UPS units can be relatively expensive, which may be a significant upfront investment for home or business users. PS systems require periodic maintenance, including battery replacement and testing, to ensure their continued reliability. This maintenance can add to the total cost of ownership. The backup runtime of a UPS is limited by the capacity of its internal batteries. During extended power outages, the UPS may only provide power for a limited duration, potentially leaving critical equipment unprotected. UPS batteries have a finite lifespan (typically 3-5 years), and replacing them can be an ongoing cost and inconvenience. UPS units can be bulky and heavy, requiring sufficient space and support for installation. The manufacturing and disposal of UPS batteries can have environmental consequences due to the chemicals involved. Some UPS models can generate fan noise or audible alarms, which may be a concern in quiet environments. Not all devices are compatible with UPS units, especially those with high power requirements or specialized voltage needs. Some UPS units, particularly older or less advanced models, may not be as energy-efficient, leading to increased electricity consumption. Advanced UPS systems with extensive features may be complex to set up and configure, requiring technical expertise. While UPS units offer surge protection, they may not provide the same level of protection as dedicated surge suppressors or power conditioners. Users need to be aware of when and how to perform UPS maintenance tasks, such as battery replacement, to keep the system in optimal condition. These drawbacks should be considered when evaluating whether a universal power supply is the right choice for a particular application, and users should weigh these limitations against the benefits of uninterrupted power and equipment protection.

Discussion:

A universal power supply, often abbreviated as UPS, is a critical electrical device that provides power backup and protection to connected equipment during power outages, voltage fluctuations, or surges. UPS units are widely used in various settings, including homes, businesses, data centres, and industrial facilities, to ensure the continuous and reliable operation of sensitive electronic devices and critical systems. UPS operates, it continuously monitors the quality of the incoming power. When there's a power interruption or if the incoming power quality falls outside acceptable parameters (e.g., voltage spikes or sags), the UPS quickly switches from drawing power from the mains to utilizing the energy stored in its batteries. This transition from mains power to battery power occurs seamlessly and almost instantaneously, typically within milliseconds. During this transition, the DC power stored in the batteries is converted back into AC power by an inverter.