

How Does A Variable DC Benchtop Power Supply Regulate Current

The DC bench power supply is a device capable of providing stable output voltage and current, with current regulation achieved through a series of electronic circuits and control algorithms. The principle of a bench power supply is to adjust the output voltage or current. It typically contains a control circuit that adjusts the output voltage or current based on preset adjustment signals or feedback signals.

3 Modes To Regulate Current In Bench Top Power Supplies

A variable bench power supply primarily includes three regulation modes: constant current, constant voltage, and constant power regulation. Depending on the chosen regulation mode, the power supply can automatically monitor load current, input voltage, and load voltage, adjusting the output voltage and current accordingly. This ensures stable power output, making it suitable for supplying power to various devices and components.

1. Constant Current Regulation

When the load changes, a bench DC power supply needs to maintain a constant output current by adjusting the output voltage. Utilizing the principle of negative feedback, the DC power supply can monitor changes in load current. It automatically adjusts the output voltage to ensure the load remains in a stable operating condition.

2. Constant Voltage Regulation

In constant voltage regulation mode, a DC bench power supply variable automatically adjusts the output current to maintain a constant output voltage. When the load current changes, the power supply adjusts the output current accordingly to keep the output voltage stable. In this mode, the load current cannot exceed the preset current limit.

3. Constant Power Regulation

In constant power regulation mode, a variable voltage power supply adjusts the output power adaptively based on the load current and load voltage. When the load current or load resistance changes, the power supply automatically adjusts the voltage and current according to the load's variations to maintain constant power output under its operating conditions.

Typically, different regulation modes are suited for different applications. Constant current regulation is suitable for scenarios where a steady current output is required. Situations that call for a stable voltage output find constant voltage regulation ideal. Constant power regulation is appropriate for cases where the load requires simultaneous changes in both current and voltage.

Current Regulation Process For DC Bench Power Supply

The current regulation of an bench adjustable DC power supply is primarily achieved through several stages: collecting the output current signal, processing the signal, adjusting the circuit, controlling the switching state of power devices, feedback control, and protection circuits. These

stages work in concert to ensure that the variable power supply can provide stable and reliable output current, meeting the requirements of various application scenarios.

1. Input Signal Collection

The current regulation system of a bench power supply first requires collecting the output current signal through a collection circuit. These signals can be either analog or digital, depending on the design and implementation of the variable power supply.

2. Signal Processing

The collected current signal undergoes processing through a signal processing circuit, involving operations such as amplification, filtering, and comparison. These processes serve as preliminary treatments of the signal, facilitating subsequent regulation and control.

3. Regulating Circuit

The regulating circuit is the core component of a bench DC power supply. It generates a regulation signal by comparing the collected current signal with a preset reference value. This regulation signal, usually in the form of a control voltage or control current, is used to control the output current of the adjustable voltage power supply.

4. Power Device Control

In a benchtop power supply, power devices such as transistors and MOSFETs are used to control the output current. The regulation signal produced by the regulating circuit adjusts the output current by controlling the switching state of these power devices. In other words, the regulation signal controls the on and off times of the power devices, thereby changing the amount of output current.

5. Feedback Control Loop

Benchtop power supplies typically incorporate a feedback control loop, which is used to monitor and adjust the output current in real time. The feedback control loop can either be an open-loop or closed-loop control system, depending on specific application requirements.

In an open-loop control system, the regulation signal directly controls the magnitude of the output current; in a closed-loop control system, the regulation signal adjusts in real time based on the feedback of the output current, ensuring stability and accuracy of the output.

6. Protection Circuit

To safeguard the DC power supply and the devices it powers, variable bench power supplies typically include protection circuits, such as overcurrent and overvoltage protection. When the output current exceeds the preset safety limits, the protection circuit activates corresponding protective mechanisms. These mechanisms might involve disconnecting the power devices, reducing the output voltage, and other actions to prevent damage caused by excessive current or voltage.

In Conclusion

DC benchtop power supplies offer precise control over output current and voltage through advanced electronic circuits and control mechanisms. ETOMMENS, a leading supplier in this industry, offers a wide range of [variable bench power supplies](#) designed to meet various application needs.

We are committed to meeting the diverse needs of our customers through bespoke customization, OEM, and ODM services. This tailored approach enables ETOMMENS to deliver unique solutions that align perfectly with specific requirements, ensuring that each product not only meets but also exceeds customer expectations. Explore our range of bench top power supplies today and find the perfect solution for your needs.