

FAQ

Multi-Channel Power Supplies

How do multi-channel power supplies support test and process operations?

Multi-channel power supplies provide multiple outputs to drive electronic testing from a single AC input. Their primary advantage is saving space to increase power density in automatic test equipment (ATE) racks where multiple, simultaneous output voltages are required to satisfy the needs of the device under test (DUT). Multi-channel supplies also save space in process applications where multiple voltage or power levels are required in sequential process steps.

Their ability to increase power density and add flexibility has led to the adoption of multi-channel power supplies in many applications in military and aerospace, electronics, power generation and delivery, research and development (R&D), and more.

How do multi-channel power supplies affect test system footprints?

Depending on the DUTs being tested, a multi-channel power supply can provide all the power inputs required for test, taking up less space than a separate supply for each channel. For example, a three-channel power supply that is 1U (1.75 in. high) takes up 1/3rd the space than three separate 1U power supplies, opening up 2U of rack space for other uses.

Larger-scale custom ATEs often combine several multi-channel power supplies to provide their required inputs. Most test equipment suppliers have the ability to bundle power supplies into packages that can supply up to or greater than 240kW to test rigs while providing a range of selectable voltages. The space savings and increased power density afforded by multi-channel supplies becomes especially important in these larger systems.

How do multi-channel power supplies improve system flexibility?

In addition to saving space, multi-channel power supplies add flexibility to process applications. They can supply the different voltage or power levels required by sequential process steps because each channel can be programmed independently. For example, in a six-step tungsten filament conditioning process, each successive stage in the automated assembly machine imparts a progressively higher power to the tungsten wire product to increase its service life.

Multi-channel power supplies also offer flexibility in R&D applications, scale-up situations, and in applications with changing test requirements. In these cases, a multi-channel power supply can be adapted to different roles and may remove the need to install new equipment when test needs expand or change.

What types of multi-channel power supplies are available?

DC power supplies are the predominant type of multi-channel power supplies, followed by multi-channel loads, and then AC sources. The DC supplies come in fixed or autoranging varieties.

Fixed or full-power-output supplies offer maximum power density at their rated voltage and full-power models are most appropriate where the application requires a voltage/current combination at full power.

Autoranging supplies trade off power density for a broader range of voltages and a corresponding range of currents. The product of the two is the maximum power available, though it is half of the full capability of the power electronics. For instance, a channel rated for 600W can support 40V at 15A, 80V at 7.5A, and other combinations

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in between, but the power electronics are actually designed for 1200W. Autoranging power supplies permit flexibility by covering a broad range with a single unit at lower power.

Multi-channel AC power supplies deliver programmed AC waveforms primarily to test equipment in avionics testing and other military and aerospace applications. In some products, AC power modules can be combined with electronic loads and DC power channels and controlled from a single central controller.

How much power is available in multi-channel power supplies?

Power per channel in multi-channel power supplies is very much application dependent. For example, in a stimulus/test application such as an ATE or avionics test rig, the power per channel can range from 10W to 600W depending on whether the DUT is a lower-level circuit board assembly or a completed final product. Multi-channel stimulus/test applications frequently require greater degrees of precision and repeatability than other applications.

Process applications, on the other hand, may require each channel to supply power ranging from a few hundred watts to a few hundred kilowatts. The precision required here varies widely; precision applications may only permit variations of around 0.01% while other applications may only require bulk-power precision of about 1%.

No matter the application, the power rating of a given multi-channel power supply depends on the type of power being supplied, the number of channels, and the power per channel. Less frequently used multi-channel AC power supplies can be rated for power factors as low as 500VA or as high as 1MVA. DC power supplies for electronic testing, are considered low-power DC sources with per-channel power in the range of 200W to 600W. The total power available when combining the channels ranges from about 500W to 1,800W.

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What voltage ranges are available?

Output voltages for multi-channel power supplies vary from as little as 5V to 600V and above. Within this large range, voltage requirements depend on the application. For example, the 5V or 8V units can be used on semiconductors or low-power, battery-driven devices. The 20V outputs are typically associated with devices that run on 12V such as conventional automotive applications. Devices that run off 270VDC aircraft bus voltage would typically use a 300V supply. Power supplies for devices used in water purification, oil logging, solar, and electric vehicles commonly use higher voltages.

Will a multi-channel power supply communicate with my system?

Multi-channel power supplies interface with standard test equipment using either remote analog control or remote digital control. Remote digital control is available using LXI-based Ethernet communication, RS232, IEEE 488.2 GPIB, USB.

SCPI (Standard Commands for Programmable Instruments) commands control output voltage and current, overvoltage protection, hold and trigger, calibration, and mode (constant voltage, constant current, constant power, or foldback), among other behaviors. In larger systems, software interfaces like Virtual Panels and LabVIEW are used to automate and coordinate the control of power supplies and instruments.

Industrial applications more frequently use analog remote control. This is usually accomplished with commands from a Programmable Logic Controller (PLC) or a more sophisticated Hardware In the Loop (HIL) control.

Some multi-channel power supplies can also be controlled by front panel touch screens. For instance, power supplies in AMETEK Programmable Power's Asterion DC series have icons representing a dashboard, output programming parameters, measurements, sequencing, configuration, control interfaces, applications, and system settings.

Should I worry about interference from neighboring power channels?

Precision is important in test and measurement applications, and interference from nearby electrical signals is always a concern. Look for products with low normal-mode noise measured using both ripple and peak-peak measures. Low common-mode noise is another measure of isolation.

Wire and cable dress, shielding, and twisted-pair construction from the power supply to the DUT are also extremely important in controlling unwanted noise and interference. Also ensure the proper use of the remote sense line connections to provide increased accuracy to the DUT.

How can I choose the right power supply for my test setup?

When choosing a power supply for your test setup, key factors include how it affects your current and future footprint, its effect on scalability, and its cost. You'll also want to ensure it integrates with your existing software or communications protocol and other test system components. Consider contacting a test equipment supplier like AMETEK Programmable Power who has application engineers available with the expertise to help you choose the right system for your needs.