4 TIPS FOR INTEGRATING AND USING AN

ATE System Power Supply

KEYSIGHT
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Introduction

Test system engineers face a constant stream of new verification requirements — and their test plans are continually evolving. Meeting these challenges is difficult, but there are ways to ensure you get the most out of your system power supplies while keeping your device under test (DUT) safe. Follow these four expert tips to integrate and use your system power supply successfully.

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4 Tips for Integrating and Using an ATE System Power Supply

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Properly Rack Mount a System Power Supply

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Properly Rack Mount a System Power Supply

When planning the layout of an ATE rack, be sure to include the energy requirements of your system power supply. While most instruments consume a constant amount of power, a power supply's consumption varies based on the load. Power supply specifications provide the worst-case max power usage. Measuring the actual power consumption allows right-sizing the AC power distribution and cooling. Knowing actual power consumption helps select the appropriate AC voltage for your power supply. An application that requires more DC power benefits from a higher AC voltage. Using higher AC voltages reduces the current that can cause measurement interference.

Power supplies can produce more heat under higher loads. It is essential to allow room for a power supply to intake cold air and exhaust hot air. Most instruments in an ATE system are sensitive to heat — mount sensitive equipment to avoid drawing in hot exhaust heat. Using the recommended rack mount kit also ensures critical heat vents are clear and not blocked. See Figure 1.

System power supplies optimize space with a compact design saving you expensive rack space. Along with its compact size comes higher weight density. Mounting heavy instruments such as power supplies at the bottom improves the stability of the rack. It is important to use the recommended rack mount kit as it holds the weight of the power supply without blocking vents.

Avoid interference by isolating low-voltage wires used for measurements, triggering, and control from the AC power mains as well as the DC output. Securing the cabling prevents intermittent problems in the future.

In summary, careful planning in the layout process helps avoid more significant problems when building a system. Start with the proper rackmount kit that handles the weight of the supply and ensures critical vents are clear. All instruments need to consistently draw in cold air. Plan for enough AC power keeping in mind a power supply input power increases as it outputs more DC power. Isolate low-level signal wires from significant sources of current.

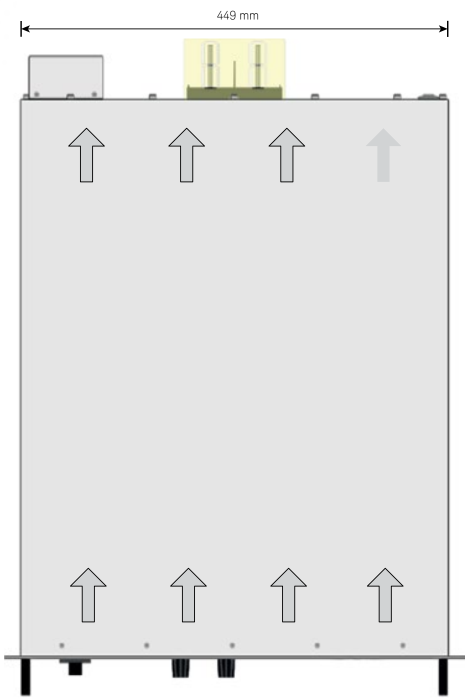

Figure 1. A power supply is intaking fresh air in the front and exhausting it out the back

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Tip 3: *Dealing with Unexpected Temperature Effects*

TIP 2

Six Methods to Protect Your DUT

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Six Methods to Protect Your DUT

You want to select a system power supply that provides adequate power without being excessive. Too large of a power supply can output excessive noise and lack resolution for protection settings. Modern system power supplies offer multiple layers of device protection.

The most common protection method is to set a current limit which causes the supply to shift from a constant voltage source to a constant current source. With a current limit set, six other types of device protection can help protect your device.

1. Overvoltage protection (OVP) – A separate circuit monitors the output and shuts down the output if an overvoltage condition occurs. When using a 4-wire remote sense, overvoltage protection continues to monitor the power supplies output.
2. Overcurrent protection (OCP) – Similar to overvoltage, OCP shuts down the output if an overcurrent condition occurs. An overcurrent transient often occurs during a change in voltage. The delayed overcurrent feature allows a known transient to occur without shutting down the output.
3. Overtemperature (OTP) – Overtemperature protects the power supply. An internal temperature rise above the threshold disables the outputs.
4. Front panel lockout – Protects against accidental changes to the power supplies output.
5. Interconnects/fault inhibit – Shuts down all channels (even across mainframes) if an error occurs.
6. Watchdog timer – Provides protection when the test program freezes, or the controller stops communicating.

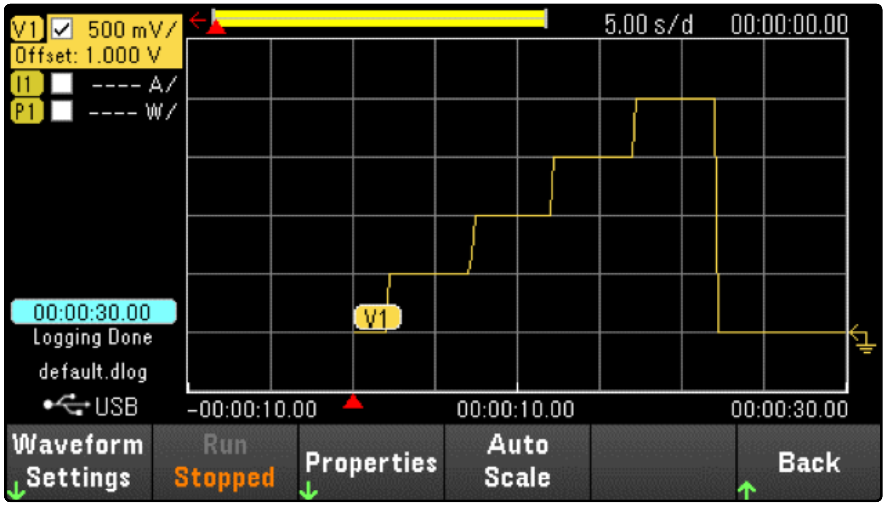

Figure 2. Output list mode increases the output voltage until the OVP level; then the output is shutdown

Setting a current limit is a significant first step to protecting your DUT. Adding additional layers of protection can further protect the test device, the power supply, and the operator.

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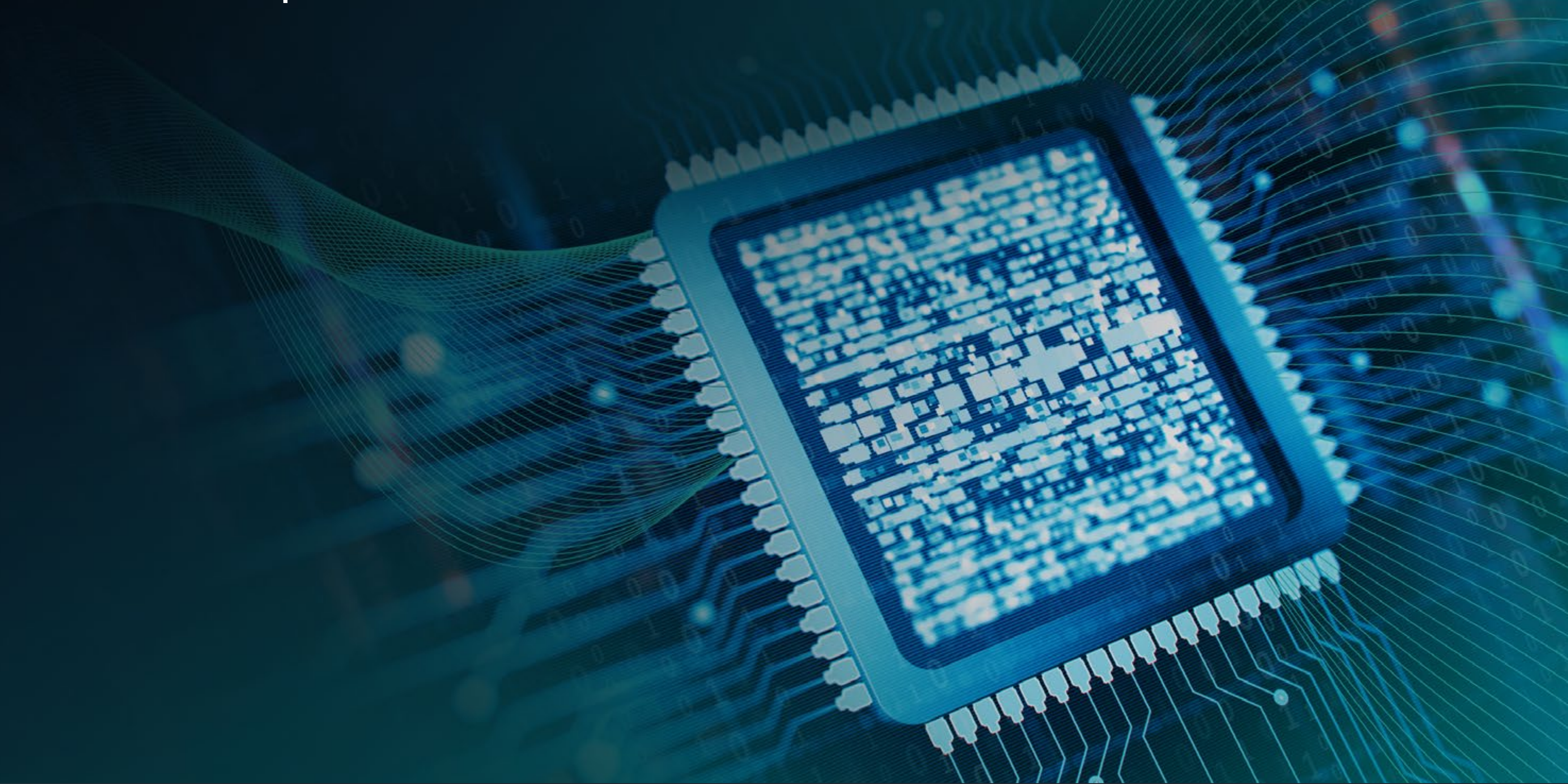
White Paper: *Improve Voltage Regulation Using Remote Sense*

TIP 3

Quickly Achieve Stable Output Power



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TIP 3

Quickly Achieve Stable Output Power

Most applications need a power supply with a steady DC output under a variety of load conditions. When a test requires multiple voltage changes or fast activation times, a high-bandwidth system power supply will reduce test times by responding faster. When you test a wireless device that pulls current in bursts, a high-bandwidth power supply can be unstable. You can make trade-offs to slow the power supply, or you can add external capacitance to match the power supply's impedance with the load.

Understanding and compensating for the load keeps the power supply responsive to programmed changes in output voltages. For faster test times, select a power supply with fast output response time, down-programming response time, and transient response time.

Output response time is the measure of how fast the output stabilizes after changing from one voltage level to the next. It has a variety of names — programming speed, settling time, output response time, output response characteristic, and programming response time. Figure 3 is a representation of the output response.

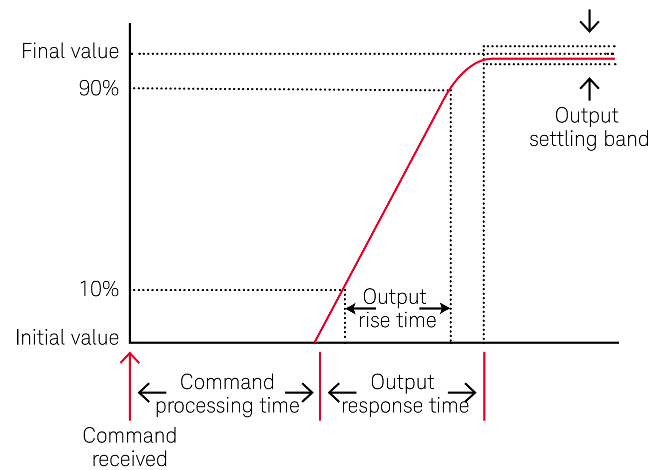

Figure 3. Output response time measures how fast a power supply changes to a different output voltage

Like output response time, down-programming response time measures how quickly a power supply output can switch to a lower voltage. Down-programming times can vary significantly between power supplies. Faster power supplies include an active down-programming circuit to reduce down-programming time. Without an active down-programmer, the response time is dependent on how much current the load draws.

Transient response (or load transient recovery time) is the time it takes for the power supply's output voltage to recover from a change in the load. Whenever the load current changes from a low current to a higher current, the output voltage temporarily dips down slightly and then quickly recovers back to the original value as shown in Figure 4.

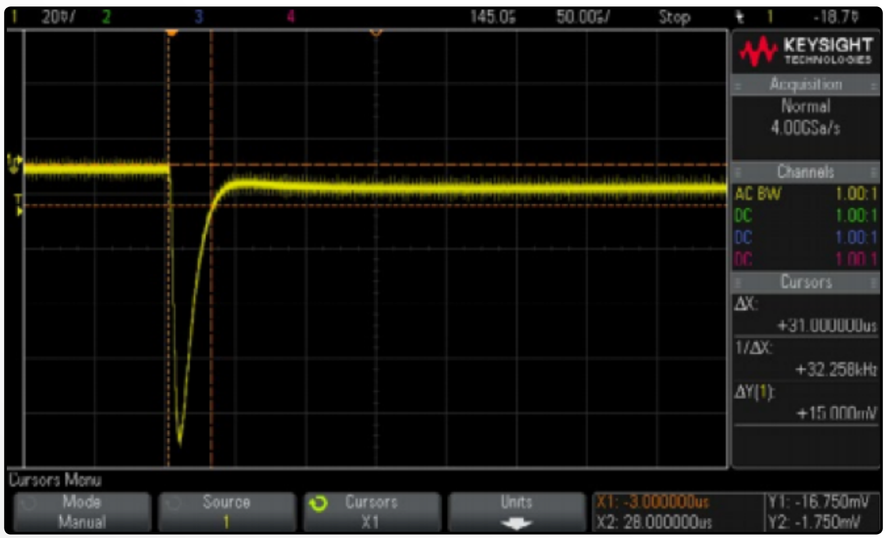

Figure 4. The output voltage drops due to a sudden change in the load's current draw

When selecting a system power supply be sure to understand your test needs and select a power with appropriate response times. Fast response times can decrease test times improving test throughput.

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Tip 3: Understanding Transient Response Time

TIP 4

Learn to Leverage Output Characteristics

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Learn to Leverage Output Characteristics

System power supplies that feature autoranging are popular because they provide higher current at more voltage settings than a single output supply. Often test plans evolve, and the need for a specific voltage and current can change. Flexibility in the available voltage and current combinations ensures that the power supply can meet your future needs.

It is easy to spot an autoranging or dual range power supply as they provide their voltage and current specifications as "up to." It is also clear from their maximum power rating, multiplying their maximum voltage and maximum current yield a power much greater than the power supplies capabilities.

Output characteristics provide a graphical representation of the valid voltage and current combinations. Any voltage-current combination inside the graph is a valid operating point for that supply. The three common output characteristics are:

1. Rectangular output – The rectangular or single range is the most common output characteristic. All voltage and current combinations are valid up to the maximum voltage and maximum current; see Figure 5.
2. Dual-range output – A dual range power supply provides more flexibility in voltage-current combinations. A high voltage range provides lower current, and a low voltage range delivers more current; see Figure 6.
3. Autorange output – Provides the most flexibility in voltage and current combinations, allowing more combinations of voltages and current within the power limit of the supply; see Figure 7.

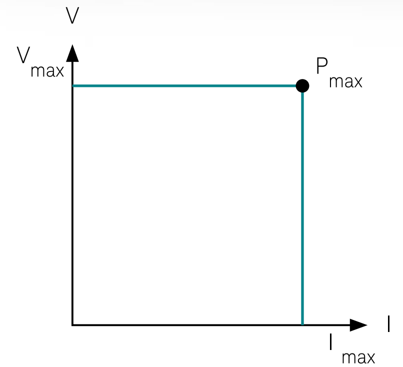


Figure 5. A rectangular output characteristic has a single maximum power point

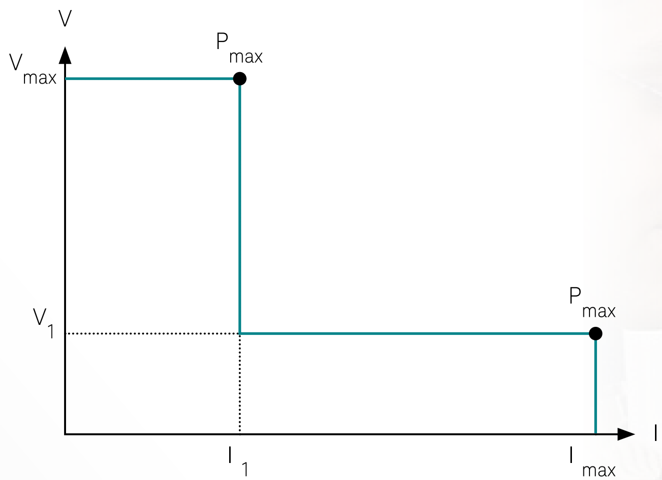


Figure 6. Dual-range output characteristic provides more voltage-current combinations than a rectangular output

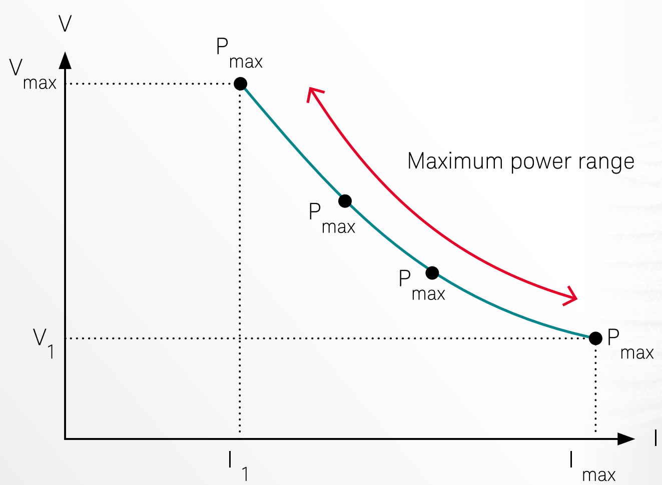
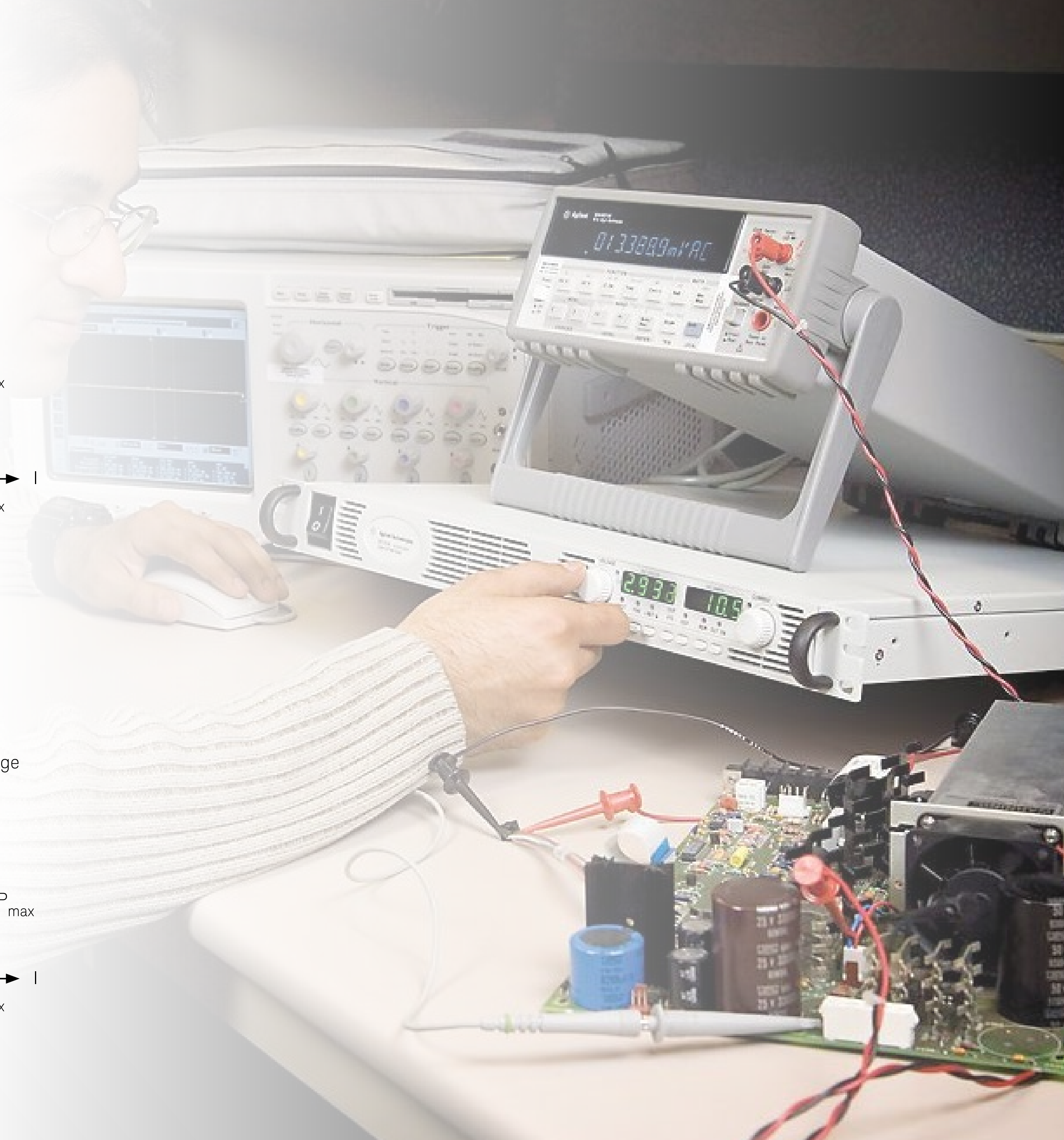


Figure 7. Autoranging output characteristic provides the most voltage-current combinations



WANT TO LEARN MORE?

Get Our Guide on Selecting Power Supplies

Whether you need a simple power supply or more sophisticated features for specific applications, this guide helps you select the power supply for your needs. Indexes list power supplies by output voltage, power and series making it easy to see all the available choices.

How Much Power?

Evaluate the voltage, current, and power for your device upfront and select a power supply that slightly exceeds the device's needs to ensure you have enough energy to handle transient or surge currents. These are common issues when powering up a device. Choose a power supply with enough resolution and accuracy to directly measure the current.

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To learn more, check out the N6700 Series Modular Power Supply.

Modular Power Supplies

Modular power supplies are the most popular supplies for an ATE system. A separate module drives each output allowing for optimization of each output. As test plans change, add or exchange modules for different voltage and current combinations. Modules come in various performance levels from basic to precision. Precision modules can output power arbitrary waveforms and digitize current and voltage waveforms. The N6700 series offers three mainframes with different power levels and a selection of 40 modules.

Source and Sink Current

The N6700C series has two new electronic load modules that can dissipate 200 or 400 W of power. Adding a load to the power supply makes it easy to test devices that generate, convert, or store power. The N6790 series electronic load modules can apply static or dynamic loads.

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Selection Guide: *Power Product Solutions*