

Keysight Technologies

Speed Up Your Test with an Upgraded Bench Power Supply

Application Note

Introduction

A power supply is a key component of every engineer's bench, and often a critical testing partner for decades. But as technology evolves, so do the demands on your bench power supply. You likely already know the importance of low noise, accuracy, reliability and a low total cost of ownership, but with new technology advancements, there are new capabilities to consider that can save you significant test time and enable you to create and test your design with the highest level of confidence and precision.

The Keysight E3631A triple output power supply has long been a well-known and popular instrument on an engineer's bench when it comes to DC bench power supply. Even if you are already familiar and comfortable with the popular Keysight E3631A triple output power supply, you may want to consider upgrading to a more modern variable DC power supply as demands have changed over time. The new E36300 Series bench power supply with three new models – E36311A, E36312A, and E36313A deliver never-before-seen capabilities in a linear power supply. This application note discusses some of the new capabilities available in a bench power supply and how these capabilities can simplify your measurement, reduce your test time, and provide a level of precision never before seen in this low cost DC power supply category.



Figure 1. Front panel of the E36313A (left) versus the E3631A (right)

Compatibility

- The E36300A Series provides a superset of functions and capabilities available on the E3631A
- The E36300 Series provides three independent outputs on the front panel
- Improved specifications and characteristics provide better measurement and programming accuracy
- SCPI programmability
- Similar physical dimensions (H x W x D) – both units fit in 3U x ½ rack:
E3631A – 133 mm x 213 mm x 348 mm
E36300 – 133 mm x 213 mm x 364 mm
- The E36300 Series offers a E3631A mode, which is a compatibility mode setting that enables the E36312A and E36313A to emulate the E3631A in programming. This means code written for the E3631A can be directly used on the E36312A and E36313A without changing a single line
- Both the E3631A and E36300 series are supported by BenchVue software, which makes it simple to connect, program, and obtain results across multiple instruments
- The international Keysight team is available to provide calibration, service, and support for either instrument

Improvement over the E3631A

If you're already familiar with the E3631A power supplies, the new E36300 Series will offer the same capabilities and functionality as well as several new additions:

- See the voltage and current measurements and setting display on all three channels simultaneously
- Get 2X the power: 10 A @ 6 V, 2 A @ ± 25 V
- Get more flexibility in voltage and current output with auto parallel and series channel combination
- Tackle any complex turn-on or turn off requirements with output sequencing
- Easily create output waveforms with LIST function
- Capture data with data logging
- Make measurements and export data faster with a new modern I/O: USB, LAN connectivity

Key Improvements and Differences

Table 1. Features comparison of the E36300 Series and E3631A

Physical appearance	Existing power supply		New power supplies	
	E3631A	E36311A	E36312A	E36313A
Display	Fluorescent		4.3-inch LCD color	
Color-coded channels	Not applicable		Yes	
Individual knobs for voltage and current	Not applicable		Yes	
LAN (LXI)	Not applicable	Not applicable	Yes	
USB port for communication	Not applicable		Yes	
Kensington lock slot	Not applicable		Yes	
RS-232	Yes		NA	
3-channel output at front and rear panel	No (front only)	No (front only)	Yes	Yes
GPIB	Yes	Not applicable	Yes, optional	Yes, optional
Digital I/O port	Not applicable	Not applicable	Yes	Yes
USB port for data logging/data storage	Not applicable	Not applicable	Yes	Yes
Rear Earth ground reference	Not applicable	Not applicable	Yes	Yes
Recessed binding post	Not applicable	Yes, pre-order	Yes, pre-order	Yes, pre-order
Rackmount kits	Yes	Yes	Yes	Yes

Easy to Use

The new E36300 Series bench power supplies have a 4.3-inch LCD color display and color-coded channels. The upgraded display and color-coding makes it easier to use the front panel and see your measurements compared to its predecessor, the E3631A.

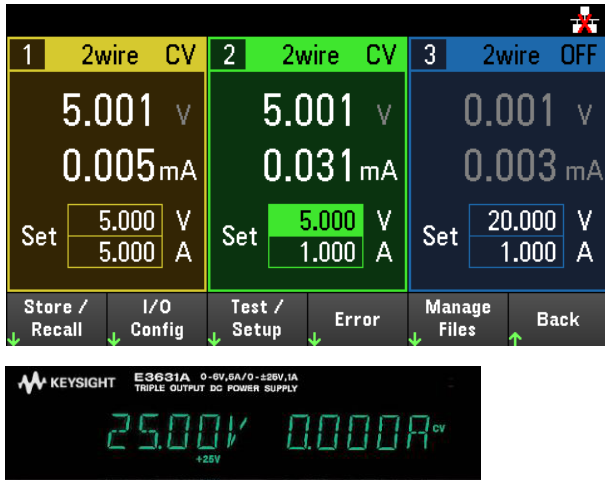


Figure 2. Display comparison of the E36300 series (top) and E3631A (bottom)

In normal view on the E36300 Series bench power supplies, you can simultaneously view all three channel settings, including the measured values, through the LCD color display. The E3631A allows display of either the programmed or measured values on a single channel at any time. The E36300 series lets you view an enlarged display of the selected channel with many details, including the measured power, OVP/OCP condition.

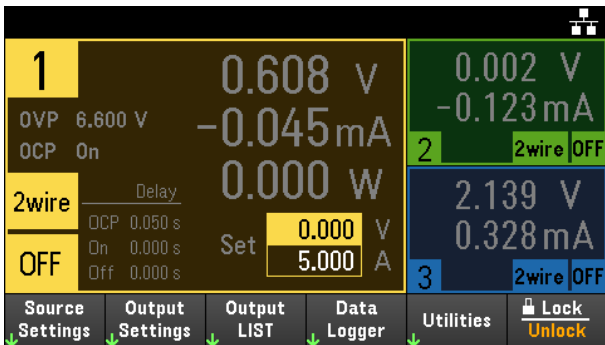


Figure 3. Enlarged display of a selected channel on the E36300 Series

New Capabilities Simplify Testing

There are many new advanced features offered by the E36300 series bench power supply that will further enable you to get to your test results faster and easier.

The E36312A and E36313A offer output terminals at the rear panel of the instrument as well as the front panel thus allowing for a flexible physical connection between the power supply and your device under test. In addition, the three outputs are electrically isolated from each other and from earth ground which eliminates a lot of noise at the output. For those tests that requires just a bit more power, the E36313A provides higher power at a maximum of 2 A per single output.

There are lots of options when it comes to connectivity with the instrument for setup requiring a remote connection and control. The E36300 Series has built-in USB and LAN interfaces and an optional GPIB connectivity interface that is user-installable for the E36312A and E36313A. You can always add GPIB connectivity if you need it for your applications. In addition, certain test setups require a complex network of communication between different instruments. The E36300 series bench power supply supports this via digital I/O ports. The E36312A and E36313A have digital I/O ports on the rear panel. The digital port consists of four I/O pins to access the various control functions: bi-directional digital I/O, digital input, fault/inhibit system protection, trigger input/output, and output couple control.



Figure 4. Back panel of the E36300 Series.

When a steady single DC signal isn't enough, the E36300 series bench power supplies offer many additional options for a dynamic and synchronized output. The built-in output sequencing capability on the E36312A and E36313A lets you create flexible and easy-to-use test sequences that automate the output. Each output channel can be individually set to turn on or off with a delay by sequences.

The E36312A and E36313A features an output LIST mode that allows for the generation of complex sequences of output changes with rapid, precise timing that can be synchronized with internal or external signals.

For applications requiring more voltage or current than what a single output can provide, channel 2 and Channel 3 of the E36312A and E36313A can be set to auto series or auto parallel mode to double the output voltage (up to 50 V) or current (up to 4 A) with just the click of a button. The setting is enabled through the front-panel graphical user interface with no external wiring required.

Easy Measurements

The E36312A and E36313A offer a data logger function, which lets you view and log the output voltage and current data for up to 30,000 hours. Because you can view and log output data for all three channels simultaneously, you can easily collect and analyze the data.

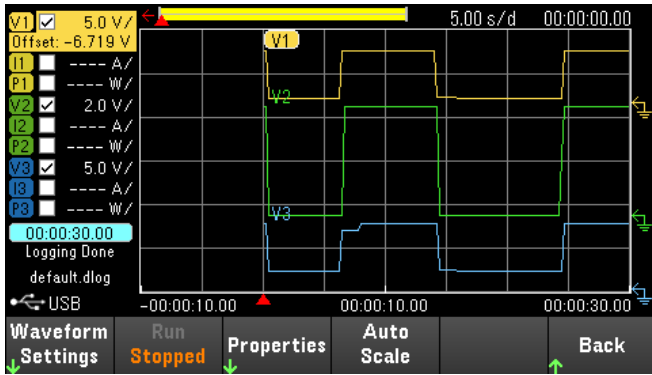


Figure 5. Data logger display on the E36300 Series

Easily share data using the built-in front-panel USB port for data logging and transfer of data from the instrument to a USB memory stick. Get accurate current measurements down to the range of 100 s of uAs with the lower-current readback range accuracy of 0.25% ±80 uA, offered by the E36312A and E36313A.

Table 2. Specifications comparison of the E36300 series and E3631A

	E3631A			E36311A			E36312A			E36313A		
Performance Specifications												
Power Output	80W			80W			80W			160W		
DC output Rating (0 to 40°C)	1	2	3	1	2	3	1	2	3	1	2	2
	0 to +6 V	0 to +25 V	0 to -25 V	0 to +6 V	0 to +25 V	0 to -25 V	0 to +6 V	0 to 25 V	0 to 25 V	0 to +6 V	0 to 25 V	0 to 25 V
	0 to 5 A	0 to 1 A	0 to 1 A	0 to 5 A	0 to 1 A	0 to 1 A	0 to 5 A	0 to 1 A	0 to 1 A	0 to 10 A	0 to 2 A	0 to 2 A
DC output Voltage (0 to 40°C) - series mode				NA	NA	NA	NA	50 V	NA	NA	50 V	NA
DC output Current (0 to 40°C) - series mode				NA	NA	NA	NA	2 A	NA	NA	4 A	NA
Load regulation ± (% of output + offset)												
Voltage	<0.01% +2 mV			<0.01% +2 mV			<0.01% +2 mV			<0.01% +4 mV		
Current	<0.01% +250 uA			<0.01% +250 uA			<0.01% +250 uA			<0.01% +500 uA		
Line regulation ± (% of output + offset)												
Voltage	<0.01% +2 mV			<0.01% +1 mV			<0.01% +1 mV			<0.01% +1 mV		
Current	<0.01% +250 uA			<0.01% +250 uA			<0.01% +250 uA			<0.01% +500 uA		
Output Ripple and noise (20 Hz to 20 MHz)												
Normal Mode Voltage	<350 uVrms/2 mVpp			<350 uVrms/2 mVpp			<350uVrms/2mVpp			<350 uVrms/ 2 mVpp	< 1 mVrms/5 mVpp	
Accuracy(1) 12 months (25°C + 5°C)												
Programming accuracy ± (% of output + offset)												
Voltage	0.1% +5 mV	0.05% +20 mV		0.1% +5 mV	0.05% +20 mV		0.03% +2 mV	0.03% +5 mV		0.03% +3 mV	0.03% +5 mV	
Current	0.2% +10mA	0.15% +4mA		0.1% +10 mA	0.1% +4 mA		0.04% +3 mA	0.04% +2 mA		0.05% +4 mA	0.04% +3 mA	
Readback(2) accuracy ± (% of output + offset)												
Voltage	0.1% +5 mV	0.05% +10 mV		0.1% +5 mV	0.05% +10 mV		0.04% +2 mV	0.04% +5 mV		0.04% +3 mV	0.03% +5 mV	
Current	0.2% +10 mA	0.15% +4 mA		0.1% +10 mA	0.1% +4 mA		0.04% +3 mA	0.04% +3 mA		0.05% +5 mA	0.04% +3 mA	
Small Current	NA			NA			0.25% +80 uA			0.25% +80 uA		
Load transient recovery time (Time to recover to within the settling band following a load change from 50% to 100% and from 100% to 50% of full load)												
Voltage settling band	15 mV			15 mV						15 mV	30 mV	15 mV
Time	< 50 uS			< 50 uS								
Voltage settling band (Parallel Mode)	NA			NA			NA	30 mV	NA	NA	30 mV	NA
Time (Parallel Mode)	NA			NA			NA	< 50 uS	NA	NA	< 50 uS	NA

Conclusion

The new E36300 bench power supply provides significant improvements in ease of use, programming, and measurement accuracy to help simply your test.

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