

# Triple Output Bench Power Supply

## Power Your Next Insight

For more than 50 years, Keysight Technologies DC power supplies have been changing the way engineers prove their design, understand the issues, and ensure product quality. On the bench, the triple-output E36300 series is ready for your application. With low output ripple/noise and accurate voltage/current measurement, you can test with confidence — and power your next insight.



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# Get More for Less

The triple output E36300 Series gives you the performance of system power supplies at an affordable price. There are three models available in the series:

**E36311A:** This 80 W model offers simplified user experience and the lowest price of the series. Some of the key differences include channels 2 and 3 are configured in tracking mode only, USB interface only, 2-wire sensing. This model does not offer data logging, output sequencing, list mode and auto parallel/serial voltage or current boost.

**E36312A:** This 80 W model offers the complete feature set. Channels 2 and 3 are electrically isolated independent channels. Some of the key extended features include USB, LAN and optional GPIB interface, 2 or 4-wire sensing, data logging, output sequencing, list mode, and auto parallel/serial.

**E36313A:** This 160 W model offers twice the current of the other models with the same extended feature set as the E36312A model.



E36311A 80W Triple Output Power Supply, 6V, 5A &  $\pm 25V$ , 1A, USB



E36312A 80W Triple Output Power Supply, 6V, 5A & 2X 25V, 1A, USB, LAN



E36313A 160W Triple Output Power Supply, 6V, 10A & 2X 25V, 2A, USB, LAN

# Key Features

## Clean, Reliable Power

- Low output ripple and noise
- Excellent programming/readback accuracy
- Excellent line/load regulation: 0.01%
- 2-wire or 4-wire remote sense
- Over voltage, over current, and over temperature protection

## Convenient Benchtop Capabilities

- Three independent power supplies in one box
- Low acoustic noise
- Auto series/parallel connections
- Front and rear output terminal

## Intuitive and Easy to Use Interface

- 4.3-inch LCD color display
- Color-coded channels
- Individual knobs for voltage and current
- E3631A code compatible
- LAN (LXI), USB and GPIB (optional)

## Advanced Characterization

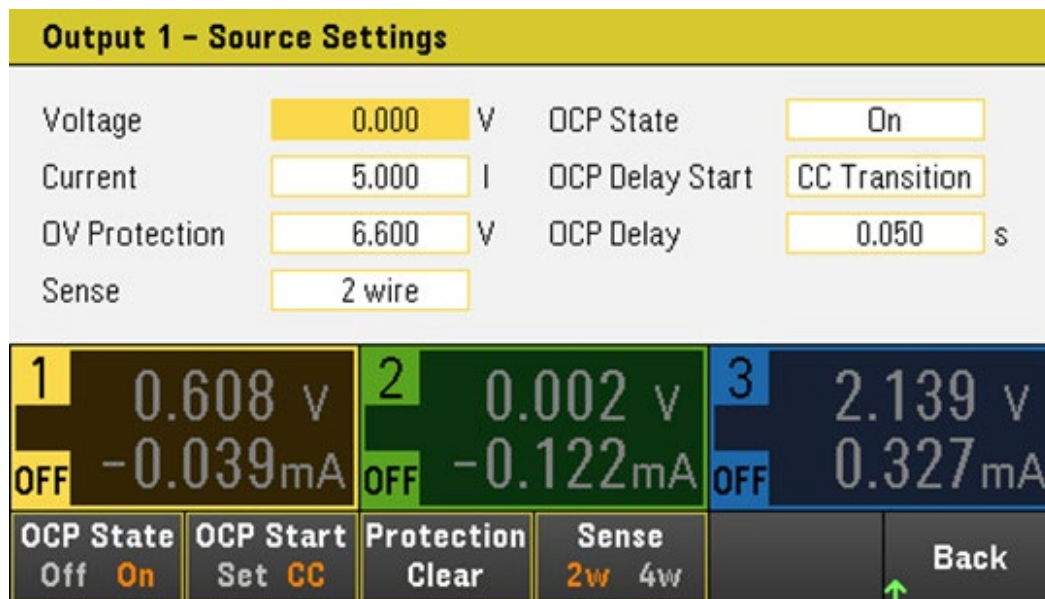
- Data logging
- Output sequencing
- LIST mode
- Low current range measurement

## Confidently Supply Your DUT with Clean, Reliable Power

Accurate voltage/current programming and readback capability provide excellent control on the power supply and power measurement. The low, normal mode noise specifications assure quality power for precision circuitry applications, enabling you to power your design with confidence. Besides the 0.01% load and line regulation, the E36300 Series can also maintain a steady output when power line and load changes occur, giving you more peace of mind. The built-in capability to measure low range current ( $< 20 \text{ mA}$ ) reduces the need for an external multimeter and simplifies the setup.

## Improved Measurement Accuracy with 4-Wire Sensing

To further improve the voltage regulation and measurement accuracy of the DC outputs, the E36312/13A models offer 4-wire sensing capability, also called remote sensing, on each of the rear terminals. Remote sensing permits the output module to monitor and regulate its output voltage directly at the DUT input terminals instead of the power supply's output terminals. Four wire sensing is particularly useful for compensating for the voltage drops in the power leads when using the higher output currents generated by the E36313A. For convenience, an internal relay controls switching between 2-wire mode (local sensing) and 4-wire mode (remote sensing) thus eliminating the need for shorting bars or jumpers commonly found on other bench power sources.



**Figure 1.** On E36312A or E36313A set 2-wire or 4-wire sensing for output 1 in just one click.

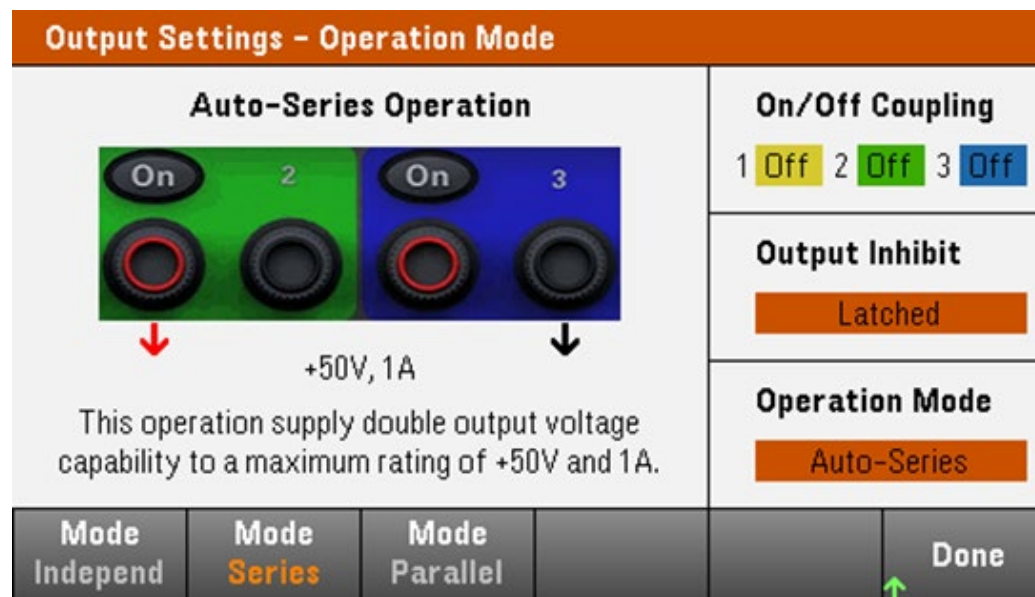
Keysight understands that protecting your DUT is crucial to limit testing, so the E36300 Series includes Over Voltage Protection (OVP), Over Current Protection (OCP), and Over Temperature Protection (OTP) to prevent damage.

## Reduce Space, Cost and Noise with Convenient Benchtop Capabilities

All three outputs on the E36300 Series can be turned on and off independently, so you are essentially getting three power supplies in one instrument which saves cost on maintenance. It also saves space on the bench as you can power up multiple analog/digital circuitries or devices with a single instrument.

For even more voltage or current, Channel 2 and Channel 3 of the E36312/13A set series or parallel mode on the front panel to double the output voltage (up to 50 V) or current (up to 4 A) respectively.

The E36300 Series is one of the quietest power supplies in its class. It automatically lowers the fan speed under the load/ no load condition to eliminate annoying acoustic noise through a thermal control circuit. At a typical noise level of less than 26 dBA under no load condition and less than 50 dBA under full load condition, it allows you to work in a quiet and undisturbed environment.



**Figure 2.** Auto-series operation to double the output voltage

Simplify set up and operation with an intuitive and easy-to-use front-panel interface and connectivity

The 4.3-inch LCD color display shows the voltage and current of all three channels with different views. Color coding of the knobs, display and binding posts helps avoid setup and connection errors. Two individual knobs for voltage and current with rotary encoder control for precise setting and keypad allows quick adjustments and configurations in less time.

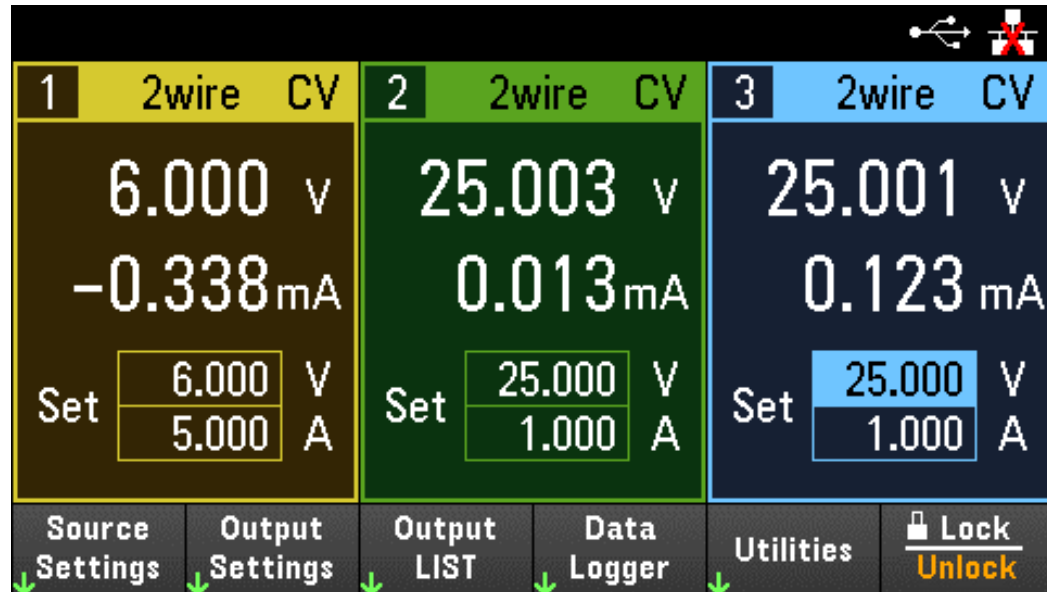
The E36312/13A also offer rear output terminals for easy wiring, which is ideal for both bench and system setup.



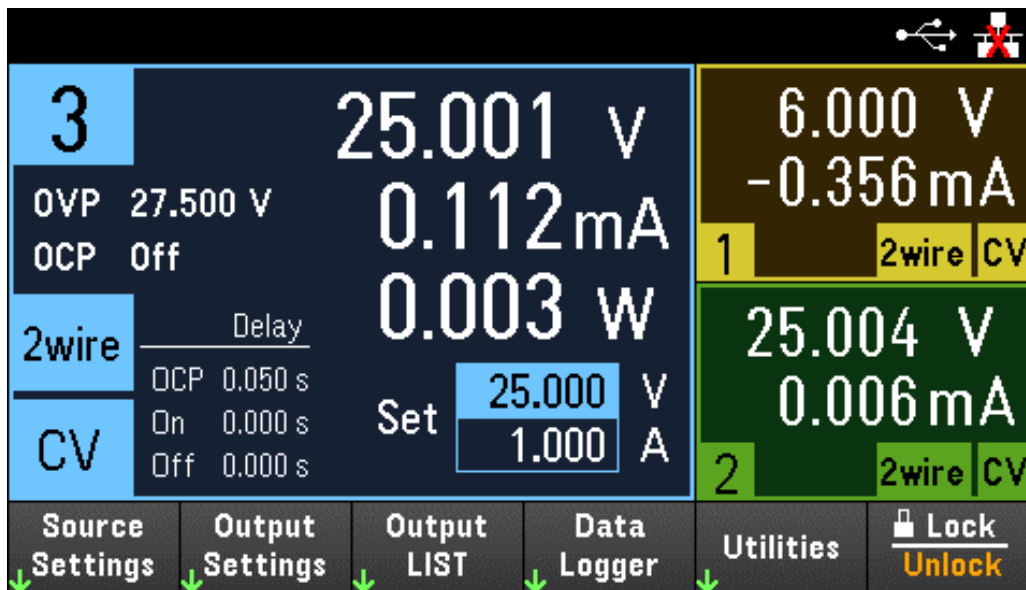
**Figure 3.** The E36312A and E36313A have rear output terminals for all channels.

All models support operation via SCPI (standard commands for programmable instruments) programming language, IVI (interchangeable virtual instruments) driver, Web Browser or BenchVue. The E36300A series is code compatible with the E3631A to assist in migration to a more modern power supply.

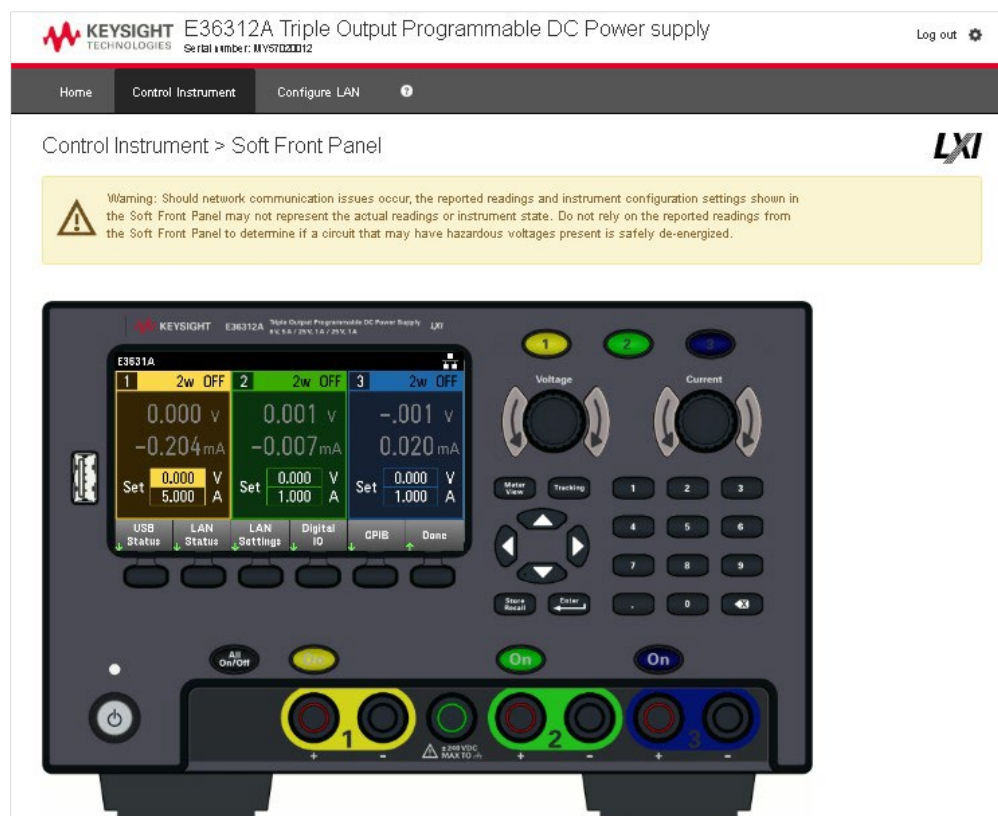
The E36311A ships standard with USB and the E36312/13A with both LAN and USB (GPIB optional).



**Figure 4.** View all three outputs simultaneously



**Figure 5.** View details of a single channel including the measured power, OVP/OCP condition, and delays.

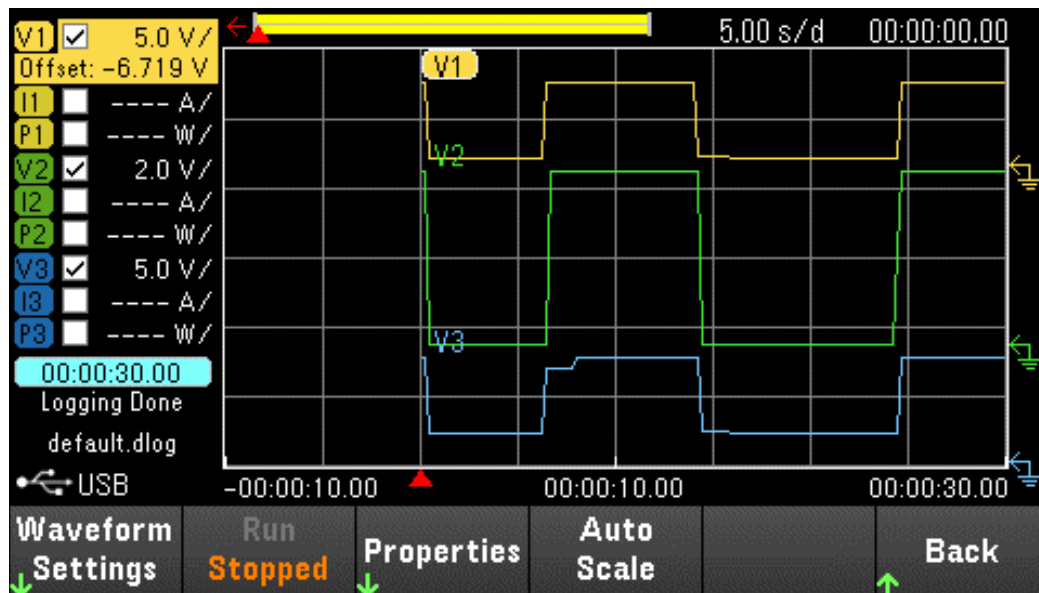


**Figure 6.** Control the power supply from anywhere with the web graphical user interface which is identical to operating the instrument front panel.

## Data Logging and Output Sequencing for Increased Productivity <sup>1</sup>

Emulating the normal behaviors of your power subsystems early in the design process, including controlling multiple power supply voltage sequences, measuring wide dynamic ranges of current, and varying the speed of the power supply voltage to reflect real circuit characteristics is critical to your design's success. The E36312/13A offer additional capabilities for emulating and analyzing power behaviors.

Logging data is key to reviewing test set ups and repeating test conditions. The E36312/13A simultaneously logs data on all three DC outputs, both voltage and current measurements, spaced by a programmable sample period, to the large color display and a file. Export the data logger display in PNG, BMP file formats or export the time stamped data as a CSV file for reports and documentation. The built-in battery backup real time clock allows for proper timestamping of logged data.



**Figure 7.** In Data Logger View, you can log data on multiple traces. Here the voltage of output 1, output 2 and output 3 are captured over 30 seconds

<sup>1</sup> Data logging and output sequencing is only available on E36312A and E36313A models.

Simulate power problems or normal operation with either sequencing or list mode. Sequence each channel on the E36312/13A models individually to turn on or turn off with a delay. Generate complex sequences of output changes with rapid, precise timing synchronized with internal or external signals by using LIST mode.

| Output 3 - Output LIST |         |         |       |                                     |                                     |
|------------------------|---------|---------|-------|-------------------------------------|-------------------------------------|
| Step                   | Voltage | Current | Time  | BOST                                | EOST                                |
| 0                      | 5.000   | 0.500   | 1.000 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 1                      | 3.000   | 1.000   | 2.000 | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 2                      | 1.000   | 0.300   | 1.000 | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
|                        |         |         |       |                                     |                                     |
|                        |         |         |       |                                     |                                     |
|                        |         |         |       |                                     |                                     |
|                        |         |         |       |                                     |                                     |
|                        |         |         |       |                                     |                                     |
|                        |         |         |       |                                     |                                     |
|                        |         |         |       |                                     |                                     |

Run  
Stopped

Add

Delete

Clear All

Properties  
↓

Back  
↑

**Figure 8.** Output sequencing and Output LIST mode setting

## BenchVue Control and Visualization

BenchVue software for the PC makes it simple to connect, control, and view Keysight power supplies simultaneously with other Keysight bench instruments without programming.

- Visualize the output of multiple power supplies simultaneously
- Log data, capture screen shots, and save a system state
- Recall a past state of your bench to replicate results
- Export measurement data in desired format fast
- Quickly access manuals, drivers, FAQs and videos
- Monitor and control your bench from mobile devices



Figure 9. BenchVue software application

## Which Model Is for You?

There are three models in the E36300 Series. The chart below compares the features set available in each model.

| Feature                              | E36311A 80 W<br>Economy Model | E36312A 80 W<br>Full-Featured Model | E36313A 160 W<br>High Current Model |
|--------------------------------------|-------------------------------|-------------------------------------|-------------------------------------|
| Channels                             | Tracking Only                 | Fully Independent                   | Fully Independent                   |
| Electrically isolated channels       | Not available                 | Standard                            | Standard                            |
| Remote sensing                       | 2 Wire Only                   | 2 and 4-Wire                        | 2 and 4-Wire                        |
| Auto series/parallel                 | Not available                 | Standard                            | Standard                            |
| Data logging                         | Not available                 | Standard                            | Standard                            |
| Output sequencing                    | Not available                 | Standard                            | Standard                            |
| List mode                            | Not available                 | Standard                            | Standard                            |
| USB port for data logging/storage    | Not available                 | Standard                            | Standard                            |
| Digital triggers                     | Not available                 | Standard                            | Standard                            |
| Rear output terminals                | Not available                 | Standard                            | Standard                            |
| Earth ground reference at rear panel | Not available                 | Standard                            | Standard                            |
| Digital I/O port                     | Not available                 | Standard                            | Standard                            |
| Connectivity                         | USB                           | USB and LAN Standard, GPIB Optional | USB and LAN Standard, GPIB Optional |
| Recessed binding posts               | Optional                      | Optional                            | Optional                            |
| Keypad locking                       | Standard                      | Standard                            | Standard                            |
| Benchtop lock                        | Standard                      | Standard                            | Standard                            |

# Performance Specifications

## E36311A 80 W

E36311A Performance Specification 80 W

|                                                                                                                                                       |                  | 1               | 2             | 3          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|---------------|------------|
| DC output rating<br>(0 to 40 °C)                                                                                                                      |                  | 0 to 6 V        | 0 to +25 V    | 0 to -25 V |
|                                                                                                                                                       |                  | 0 to 5 A        | 0 to 1 A      | 0 to 1 A   |
| Series mode voltage <sup>2</sup>                                                                                                                      |                  | NA              |               |            |
| Parallel mode current <sup>2</sup>                                                                                                                    |                  | NA              |               |            |
| Load Regulation ± (% of Output + Offset)                                                                                                              |                  |                 |               |            |
| Voltage                                                                                                                                               |                  | < 0.01% +2 mV   |               |            |
| Current                                                                                                                                               |                  | < 0.01% +250 μA |               |            |
| Line Regulation ± (% of Output + Offset)                                                                                                              |                  |                 |               |            |
| Voltage                                                                                                                                               |                  | < 0.01% +1 mV   |               |            |
| Current                                                                                                                                               |                  | < 0.01% +250 μA |               |            |
| Output Ripples and Noise (20 Hz to 20 MHz)                                                                                                            |                  |                 |               |            |
| Normal voltage mode                                                                                                                                   | Vrms             | < 350 μVrms     |               |            |
|                                                                                                                                                       | Vpp <sup>3</sup> | 2 mVpp          |               |            |
| Accuracy 12 Months (23 °C ± 5 °C)                                                                                                                     |                  |                 |               |            |
| Programming Accuracy ± (% of Output + offset)                                                                                                         |                  |                 |               |            |
| Voltage                                                                                                                                               |                  | 0.1% + 5 mV     | 0.05% + 20 mV |            |
| Current                                                                                                                                               |                  | 0.1% + 10 mA    | 0.1% + 4 mA   |            |
| Readback Accuracy ± (% of Output + Offset)                                                                                                            |                  |                 |               |            |
| Voltage                                                                                                                                               |                  | 0.1% + 5 mV     | 0.05% + 10 mV |            |
| Current                                                                                                                                               |                  | 0.1% + 10 mA    | 0.1% + 4 mA   |            |
| Low range current <sup>1</sup>                                                                                                                        |                  | NA              |               |            |
| 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           |               |            |
| Voltage settling band (Parallel mode)                                                                                                                 |                  | NA              |               |            |
| Time                                                                                                                                                  |                  | < 50 μS         |               |            |

1. 20 mA for CH1, 10 mA for CH2 and CH3. Tested at constant voltage mode.

2. All specifications are not applicable during auto series/parallel mode.

3. Applicable in CV mode. The differential amplifier and oscilloscope bandwidth set to 20 MHz.

# Performance Specification 80 W

## E36312A Performance Specification 80 W

|                                                                                                                                                       |                  | 1                    | 2                     | 3                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------|-----------------------|-----------------------|
| DC output rating<br>(0 to 40 °C)                                                                                                                      |                  | 0 to 6 V<br>0 to 5 A | 0 to 25 V<br>0 to 1 A | 0 to 25 V<br>0 to 1 A |
| Series mode voltage <sup>2</sup>                                                                                                                      |                  |                      | 50 V                  |                       |
| Parallel mode current <sup>2</sup>                                                                                                                    |                  |                      | 2 A                   |                       |
| Load Regulation ± (% of Output + Offset)                                                                                                              |                  |                      |                       |                       |
| Voltage                                                                                                                                               |                  | < 0.01% +2 mV        |                       |                       |
| Current                                                                                                                                               |                  | < 0.01% +250 µA      |                       |                       |
| Line Regulation ± (% Of output + Offset)                                                                                                              |                  |                      |                       |                       |
| Voltage                                                                                                                                               |                  | < 0.01% +1 mV        |                       |                       |
| Current                                                                                                                                               |                  | < 0.01% +250 µA      |                       |                       |
| Output Ripples and Noise (20 Hz to 20 MHz)                                                                                                            |                  |                      |                       |                       |
| Normal voltage mode                                                                                                                                   | Vrms             | < 350 µVrms          |                       |                       |
|                                                                                                                                                       | Vpp <sup>3</sup> | 2 mVpp               |                       |                       |
| Accuracy 12 Months (23 °C ± 5 °C)                                                                                                                     |                  |                      |                       |                       |
| Programming Accuracy ± (% of Output + Offset)                                                                                                         |                  |                      |                       |                       |
| Voltage                                                                                                                                               |                  | 0.03% + 2 mV         | 0.03% + 5 mV          |                       |
| Current                                                                                                                                               |                  | 0.04% + 3 mA         | 0.04% + 2 mA          |                       |
| Readback Accuracy ± (% of Output + Offset)                                                                                                            |                  |                      |                       |                       |
| Voltage                                                                                                                                               |                  | 0.04%+ 2mV           | 0.04% + 5 mV          |                       |
| Current                                                                                                                                               |                  | 0.04% + 3 mA         | 0.04% + 3 mA          |                       |
| Low range current <sup>1</sup>                                                                                                                        |                  | 0.25% +80 µA         |                       |                       |
| 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                |                       |                       |
| Voltage settling band (Parallel mode)                                                                                                                 |                  |                      | 30 mV                 |                       |
| Time                                                                                                                                                  |                  | < 50 µS              |                       |                       |

1. 20 mA for CH1, 10 mA for CH2 and CH3. Tested at constant voltage mode.

2. All specifications are not applicable during auto series/parallel mode.

3. Applicable in CV mode. The differential amplifier and oscilloscope bandwidth set to 20 MHz

# Performance Specification 160 W

## E36313A Performance Specification 160 W

|                                                                                                                                                       |                  | 1                | 2            | 3         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------|--------------|-----------|
| DC output rating<br>(0 to 40 °C)                                                                                                                      |                  | 0 to 6 V         | 0 to 25 V    | 0 to 25 V |
|                                                                                                                                                       |                  | 0 to 10 A        | 0 to 2 A     | 0 to 2 A  |
| Series mode voltage <sup>2</sup>                                                                                                                      |                  |                  | 50 V         |           |
| Parallel mode current <sup>2</sup>                                                                                                                    |                  |                  | 4 A          |           |
| Load Regulation ± (% of Output + Offset)                                                                                                              |                  |                  |              |           |
| Voltage                                                                                                                                               |                  | < 0.01% + 4 mV   |              |           |
| Current                                                                                                                                               |                  | < 0.01% + 500 µA |              |           |
| Line Regulation ± (% of Output + Offset)                                                                                                              |                  |                  |              |           |
| Voltage                                                                                                                                               |                  | < 0.01% + 1 mV   |              |           |
| Current                                                                                                                                               |                  | < 0.01% + 500 µA |              |           |
| Output Ripples and Noise (20 Hz to 20 MHz)                                                                                                            |                  |                  |              |           |
| Normal voltage mode                                                                                                                                   | Vrms             | < 350 µVrms      | < 1 mVrms    |           |
|                                                                                                                                                       | Vpp <sup>3</sup> | 2 mVpp           | 5 mVpp       |           |
| Accuracy 12 Months (23 °C ± 5 °C)                                                                                                                     |                  |                  |              |           |
| Programming Accuracy ± (% of Output + Offset)                                                                                                         |                  |                  |              |           |
| Voltage                                                                                                                                               |                  | 0.03% + 3 mV     | 0.03% + 5 mV |           |
| Current                                                                                                                                               |                  | 0.05% + 4 mA     | 0.04% + 3 mA |           |
| Readback Accuracy ± (% of Output + Offset)                                                                                                            |                  |                  |              |           |
| Voltage                                                                                                                                               |                  | 0.04% + 3 mV     | 0.03% + 5 mV |           |
| Current                                                                                                                                               |                  | 0.05% + 5 mA     | 0.04% + 3 mA |           |
| Low range current <sup>1</sup>                                                                                                                        |                  | 0.25% +80 µA     |              |           |
| 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            | 30 mV        | 15 mV     |
| Voltage settling band (Parallel mode)                                                                                                                 |                  |                  | 30 mV        |           |
| Time                                                                                                                                                  |                  | < 50 µS          |              |           |

1. 20 mA for CH1, 10 mA for CH2 and CH3. Tested at constant voltage mode.

2. All specifications are not applicable during auto series/parallel mode.

3. Applicable in CV mode. The differential amplifier and oscilloscope bandwidth set to 20 MHz

# Typical Characteristics

E36311A 80 W Typical Characteristics

| Resolution                                                                                              | 1             | 2                | 3 |
|---------------------------------------------------------------------------------------------------------|---------------|------------------|---|
| <b>Programming Remote</b>                                                                               |               |                  |   |
| Voltage                                                                                                 | 0.5 mV        | 1.5 mV           |   |
| Current                                                                                                 | 0.5 mA        | 0.1 mA           |   |
| <b>Readback Remote</b>                                                                                  |               |                  |   |
| Voltage                                                                                                 | 0.5 mV        | 1.5 mV           |   |
| Current                                                                                                 | 0.5 mA        | 0.1 mA           |   |
| Low range current <sup>1</sup>                                                                          | NA            |                  |   |
| <b>Programming Front Panel</b>                                                                          |               |                  |   |
| Voltage                                                                                                 | 1 mV          |                  |   |
| Current                                                                                                 | 1 mA          |                  |   |
| <b>Readback Front Current</b>                                                                           |               |                  |   |
| Voltage                                                                                                 | 1 mV          | 10 mV            |   |
| Current                                                                                                 | 1 mA          |                  |   |
| Low range current <sup>1</sup>                                                                          | NA            |                  |   |
| <b>Output Ripples and Noise (20 Hz to 20 MHz)</b>                                                       |               |                  |   |
| Normal mode current                                                                                     | < 2 mArms     | < 500 $\mu$ Arms |   |
| <b>Overvoltage Protection (OVP) <math>\pm</math> (% of Output + Offset)</b>                             |               |                  |   |
| Programming accuracy                                                                                    | 0.20% + 0.1 V | 0.20% + 0.4 V    |   |
| <b>Activation Time (Average Time for the Output to Start to Drop after OVP or OCP Condition Occurs)</b> |               |                  |   |
| Overvoltage (OVP)                                                                                       | < 5 ms        |                  |   |
| Overcurrent (OCP)                                                                                       | < 5 ms        |                  |   |
| <b>Command Processing Time</b>                                                                          |               |                  |   |
|                                                                                                         | < 10 ms       |                  |   |
| <b>Programming Temperature Coefficient per <math>^{\circ}</math>C (% of Output + Offset)</b>            |               |                  |   |
| Voltage                                                                                                 | 0.01% + 2 mV  | 0.01% + 3 mV     |   |
| Current                                                                                                 | 0.02% + 3 mA  | 0.02% + 0.5 mA   |   |
| <b>Readback Temperature Coefficient per <math>^{\circ}</math>C (% of Output + Offset)</b>               |               |                  |   |
| Voltage                                                                                                 | NA            |                  |   |
| Current                                                                                                 | NA            |                  |   |
| <b>Remote Sense (Max. Voltage in Load Lead)</b>                                                         |               |                  |   |
|                                                                                                         | NA            |                  |   |
| <b>Up/Down Programming Settling Time to Within 1% of Total Excursion</b>                                |               |                  |   |
| Up full load                                                                                            | 11 msec       | 50 msec          |   |
| Up no load                                                                                              | 10 msec       | 20 msec          |   |
| Down full load                                                                                          | 13 msec       | 45 msec          |   |
| Down no load                                                                                            | 200 msec      | 400 msec         |   |
| <b>Connectivity</b>                                                                                     |               |                  |   |
|                                                                                                         | USB           |                  |   |

1. 20 mA for CH1, 10 mA for CH2 and CH3.

### E36312A 80 W Typical Characteristics

| Resolution                                                                                              | 1                  | 2                  | 3              |
|---------------------------------------------------------------------------------------------------------|--------------------|--------------------|----------------|
| <b>Programming Remote</b>                                                                               |                    |                    |                |
| Voltage                                                                                                 | 0.36 mV            | 1.5 mV             |                |
| Current                                                                                                 | 0.3 mA             | 0.1 mA             |                |
| <b>Readback Remote</b>                                                                                  |                    |                    |                |
| Voltage                                                                                                 | 0.24 mV            | 1 mV               |                |
| Current                                                                                                 | 0.2 mA             | 160 mA             | 80 mA          |
| Low range current <sup>1</sup>                                                                          | 10 $\mu$ A         | 3 $\mu$ A          | 2 $\mu$ A      |
| <b>Programming Front Panel</b>                                                                          |                    |                    |                |
| Voltage                                                                                                 | 1 mV               |                    |                |
| Current                                                                                                 | 1 mA               |                    |                |
| <b>Readback Front Current</b>                                                                           |                    |                    |                |
| Voltage                                                                                                 | 1 mV               |                    |                |
| Current                                                                                                 | 1 mA               |                    |                |
| Low range current <sup>1</sup>                                                                          | 10 $\mu$ A         | 3 $\mu$ A          | 2 $\mu$ A      |
| <b>Output Ripples and Noise (20 Hz to 20 MHz)</b>                                                       |                    |                    |                |
| Normal mode current                                                                                     | < 2 mArms          | 1 mArms            | 500 $\mu$ Arms |
| <b>Overvoltage Protection (OVP) <math>\pm</math> (% of Output + Offset)</b>                             |                    |                    |                |
| Programming accuracy                                                                                    | 0.20% +0.1 V       | 0.20% +0.4 V       |                |
| <b>Activation Time (Average Time for the Output to Start to Drop after OVP or OCP Condition Occurs)</b> |                    |                    |                |
| Overvoltage (OVP)                                                                                       | < 5 ms             |                    |                |
| Overcurrent (OCP)                                                                                       | < 5 ms             |                    |                |
| <b>Command Processing Time</b>                                                                          |                    |                    |                |
|                                                                                                         | < 10 ms            |                    |                |
| <b>Programming Temperature Coefficient per <math>^{\circ}</math>C (% of Output + Offset)</b>            |                    |                    |                |
| Voltage                                                                                                 | 0.01% +0.18 mV     | 0.01% +0.6 mV      |                |
| Current                                                                                                 | 0.01% +0.25 mA     | 0.01% +0.2 mA      | 0.01% +0.1 mA  |
| <b>Readback Temperature Coefficient per <math>^{\circ}</math>C (% of Output + Offset)</b>               |                    |                    |                |
| Voltage                                                                                                 | 0.01% + 20 $\mu$ V | 0.01% + 40 $\mu$ V |                |
| Current                                                                                                 | 0.01% + 0.25 mA    | 0.01% +0.2 mA      | 0.01% +0.1 mA  |
| <b>Remote Sense (Max. Voltage in Load Lead)</b>                                                         |                    |                    |                |
|                                                                                                         | 1 V                |                    |                |
| <b>Up/Down Programming Settling Time to Within 1% of Total Excursion</b>                                |                    |                    |                |
| Up full load                                                                                            | 11 msec            | 50 msec            |                |
| Up no load                                                                                              | 10 msec            | 20 msec            |                |
| Down full load                                                                                          | 13 msec            | 45 msec            |                |
| Down no load                                                                                            | 100 msec           | 150 msec           |                |
| <b>Connectivity</b>                                                                                     |                    |                    |                |
|                                                                                                         | USB / LAN Opt-GPIB |                    |                |

1. 20 mA for CH1, 10 mA for CH2 and CH3.

### E36313A 160 W Typical Characteristics

| Resolution                                                                                              | 1                  | 2                  | 3             |
|---------------------------------------------------------------------------------------------------------|--------------------|--------------------|---------------|
| <b>Programming Remote</b>                                                                               |                    |                    |               |
| Voltage                                                                                                 | 0.36 mV            | 1.5 mV             |               |
| Current                                                                                                 | 0.6 mA             | 0.5 mA             |               |
| <b>Readback Remote</b>                                                                                  |                    |                    |               |
| Voltage                                                                                                 | 0.24 mV            | 1 mV               |               |
| Current                                                                                                 | 0.2 mA             | 320 mA             | 160 mA        |
| Low range current <sup>1</sup>                                                                          | 10 $\mu$ A         | 3 $\mu$ A          | 2 $\mu$ A     |
| <b>Programming Front Panel</b>                                                                          |                    |                    |               |
| Voltage                                                                                                 | 1 mV               |                    |               |
| Current                                                                                                 | 1 mA               |                    |               |
| <b>Readback Front Current</b>                                                                           |                    |                    |               |
| Voltage                                                                                                 | 1 mV               |                    |               |
| Current                                                                                                 | 1 mA               |                    |               |
| Low range current <sup>1</sup>                                                                          | 10 $\mu$ A         | 3 $\mu$ A          | 2 $\mu$ A     |
| <b>Output Ripples and Noise (20 Hz to 20 MHz)</b>                                                       |                    |                    |               |
| Normal mode current                                                                                     | < 4 mArms          | 2 mArms            | 1 mArms       |
| <b>Overvoltage Protection (OVP) <math>\pm</math> (% of Output + Offset)</b>                             |                    |                    |               |
| Programming accuracy                                                                                    | 0.20% +0.1 V       | 0.20% +0.4 V       |               |
| <b>Activation Time (Average Time for the Output to Start to Drop after OVP or OCP Condition Occurs)</b> |                    |                    |               |
| Overvoltage (OVP)                                                                                       | < 5 ms             |                    |               |
| Overcurrent (OCP)                                                                                       | < 5 ms             |                    |               |
| <b>Command Processing Time</b>                                                                          |                    |                    |               |
|                                                                                                         | < 10 ms            |                    |               |
| <b>Programming Temperature Coefficient per <math>^{\circ}</math>C (% of Output + Offset)</b>            |                    |                    |               |
| Voltage                                                                                                 | 0.01% +0.18 mV     | 0.01% +0.6 mV      |               |
| Current                                                                                                 | 0.01% +0.5 mA      | 0.01% +0.4 mA      | 0.01% +0.2 mA |
| <b>Readback Temperature Coefficient per <math>^{\circ}</math>C (% of Output + Offset)</b>               |                    |                    |               |
| Voltage                                                                                                 | 0.01% + 20 $\mu$ V | 0.01% + 40 $\mu$ V |               |
| Current                                                                                                 | 0.01% + 0.5 mA     | 0.01% +0.4 mA      | 0.01% +0.2 mA |
| <b>Remote Sense (Max. Voltage in Load Lead)</b>                                                         |                    |                    |               |
|                                                                                                         | 1 V                |                    |               |
| <b>Up/Down Programming Settling Time to within 1% of Total Excursion</b>                                |                    |                    |               |
| Up full load                                                                                            | 15 msec            | 50 msec            |               |
| Up no load                                                                                              | 15 msec            | 20 msec            |               |
| Down full load                                                                                          | 13 msec            | 45 msec            |               |
| Down no load                                                                                            | 100 msec           | 400 msec           |               |
| <b>Connectivity</b>                                                                                     |                    |                    |               |
|                                                                                                         | USB / LAN Opt-GPIB |                    |               |

1. 20 mA for CH1, 10 mA for CH2 and CH3.

## Interface Capabilities

|                |                                                      |
|----------------|------------------------------------------------------|
| GPIO           | SCPI – 1999, IEEE 488.2 compliant interface          |
| LXI compliance | Class C                                              |
| USB 2.0        | Requires Keysight IO Library version 17.2.208 and up |
| 10 / 100 LAN   | Requires Keysight IO Library version 17.2.208 and up |

## Digital Control Characteristics

### Digital Control Characteristics

|                                                                                  |                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maximum voltage ratings                                                          | +16.5 VDC/–5 VDC between pins (pin 4 is internally connected to chassis ground)                                                                                                                                                                                                     |
| Pins 1 and 2 as fault output                                                     | <ul style="list-style-type: none"> <li>Maximum low-level output voltage = 0.5 V @ 4 mA</li> <li>Maximum low-level sink current = 4 mA</li> <li>Typical high-level leakage current = 1 mA @ 16.5 VDC</li> </ul>                                                                      |
| Pins 1 - 3 as digital / trigger outputs (pin 4 = common)                         | <ul style="list-style-type: none"> <li>Maximum low-level output voltage = 0.5 V @ 4 mA; 1 V @ 50 mA; 1.75 V @ 100 mA</li> <li>Maximum low-level sink current = 100 mA</li> <li>Typical high-level leakage current = 0.8 mA @ 16.5 VDC</li> </ul>                                    |
| Pins 1 - 3 as digital/trigger inputs and pin 3 as inhibit input (pin 4 = common) | <ul style="list-style-type: none"> <li>Maximum low-level input voltage = 0.8 V</li> <li>Minimum high-level input voltage = 2 V</li> <li>Typical low-level current = 2 mA @ 0 V (internal 2.2 k pull-up)</li> <li>Typical high-level leakage current = 0.12 mA @ 16.5 VDC</li> </ul> |

## Environmental Conditions

### Environmental Conditions

|                               |                                                                                                                                                                     |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating environment         | Indoor use, installation category II (for AC input), pollution degree 2                                                                                             |
| Operating temperature range   | 0 to 40 °C                                                                                                                                                          |
| Storage temperature           | –20 to 70 °C                                                                                                                                                        |
| Relative humidity             | Up to 95%                                                                                                                                                           |
| Altitude                      | Up to 2000 meters                                                                                                                                                   |
| Electromagnetic compatibility | Compliant with EMC Directive (2004/108/EC) IEC 61326-1:2012/EN 61326-1:2013 Group 1 Class A Canada: ICES-001:2004 Australia/New Zealand: AS/NZS South Korea KC mark |
| Safety                        | UL 61010-1 3rd edition, CAN/CSA-C22.2 No. 61010-1-12, IEC 61010-1:2010 3rd edition                                                                                  |
| AC input                      | 100, 115, or 230 V input (±10%), 50/60 Hz, 250 VA for E36311A and E36312A; 600 VA for E36313A                                                                       |
| Net weight                    | Refer to the next table                                                                                                                                             |
| Dimensions                    | Refer to the next table                                                                                                                                             |

## Weight and Dimensions

|                                                                                | E36311A            | E36312A            | E36313A            |
|--------------------------------------------------------------------------------|--------------------|--------------------|--------------------|
| Weight                                                                         | 8.1 kg             | 8.3 kg             | 9.8 kg             |
| Overall dimension<br>(H x W x D)                                               | 145 x 216 x 364 mm | 145 x 216 x 367 mm | 145 x 216 x 367 mm |
| Net dimensions (without feet, strap<br>handle, and GPIB module)<br>(H x W x D) | 133 x 213 x 364 mm | 133 x 213 x 364 mm | 133 x 213 x 364 mm |

## Ordering Information

### Keysight E36300 Series Power Supplies

|         |                                                                             |
|---------|-----------------------------------------------------------------------------|
| E36311A | 80 W DC power supply, triple-output, 6 V, 5 A and $\pm 25$ V, 1 A, USB      |
| E36312A | 80 W DC power supply, triple-output, 6 V, 5 A and 2 x 25 V, 1 A, LAN, USB   |
| E36313A | 160 W DC power supply, triple-output, 6 V, 10 A and 2 x 25 V, 2 A, LAN, USB |

## Standard Shipped Accessory

AC power cord (based on destination country)

### Connectors

|               |                                                                                                                                                                                                               |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E36311A       | None                                                                                                                                                                                                          |
| E36312A / 13A | E-Connector kit (P/N: E36312-89001)<br>One 10 A, 3.5 mm female 4-pin terminal block connector<br>One 12 A, 5 mm female 4-pin terminal block connector<br>One 15 A, 5 mm female 8-pin terminal block connector |

### Ordering Options

|            |                                              |
|------------|----------------------------------------------|
| Option 0E3 | 230 VAC $\pm 10\%$                           |
| Option 0EM | 115 VAC $\pm 10\%$                           |
| Option 0E9 | 100 VAC $\pm 10\%$                           |
| Option RBP | Recessed binding posts, not upgradable       |
| Option GPB | GPIB module                                  |
| Option UK6 | Commercial calibration with test result data |
| Option SEC | NISPOM and file security                     |
| BV0003B    | Power Supply Control & Automation            |

## Rackmount Kit

|         |                                                                        |
|---------|------------------------------------------------------------------------|
| 1CM116A | Rack Mount Flange Kit with one flange bracket, one half-module bracket |
| 1CM104A | Rack Mount Flange Kit with two flange brackets                         |
| 1CM105A | Rack Mount Flange Kit without handles and two flange brackets          |
| 1CN107A | Handle Kit with two front handles                                      |
| 1CP108A | Rack Mount Flange and Handle Kit with two brackets and front handles   |

## Upgrade (post-purchase)

### Upgrade

|          |                                                            |
|----------|------------------------------------------------------------|
| E363GPBU | GPB user installable interface module for E36312A, E36313A |
|----------|------------------------------------------------------------|



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