

# EL30000 Series

## Bench DC electronic loads

### Measure, capture and display

The EL30000 Series bench DC electronic loads provide superior performance in compact bench form factor. A single and dual-channel model is available with up to 600W – ideal for design verification of consumer power supplies, batteries, battery modules, solar panels, LED drivers, and power converters. You can easily characterize wide-bandgap semiconductor components such as MOSFET and IGBT.

- Keysight EL33133A<sup>8</sup> single-input DC electronic load: 150V, 40A, 250W
- Keysight EL34143A single-input DC electronic load: 150V, 60A, 350W
- Keysight EL34243A dual-input DC electronic load: 150V, 60A, 300W; total 600W

The EL30000 Series bench DC electronic loads are fully SCPI programmable with built-in USB, LAN, and optional GPIB interfaces. Advance features include scope view, data logging, sequencing, and more, enabling you to measure, capture and quickly display your results.

### Measure voltage and current accurately

Each EL30000 Series bench DC electronic loads have a fully integrated voltmeter and ammeter to simultaneously measure the voltage and current for the device under test (DUT). Eliminating external shunt resistors and cables give you accurate voltage, current, and energy measurements.

To further reduce cabling error, the EL30000 Series bench DC electronic loads have remote sense technology to eliminate voltage drops caused by cables connecting to the DUT. All settings and measurements appear on a large 4.3-inch color display.

### Capture measurements over time with the built-in data logger

The EL30000 Series bench DC electronic loads can continuously log voltage, current and energy to a data file. The sample rate is adjustable from 20 microseconds to 60 seconds. Store the data file on the internal non-volatile RAM or save externally on a USB memory device as a .CSV file.

## Create, capture and display fast transients

Test the transient response of your power source with a dynamic load profile. The built-in scope feature digitizes the voltage and current and displays the results – just like an oscilloscope. The built-in scope function eliminates the need for external current shunts or current probes. This feature greatly reduces measurement set up complexity and provides accurate and fully specified measurements.

## Features

Table 1. Choose a single or dual-input model

	EL33133A	EL34143A	EL34243A	
Channel	1	1	1	2
Input power	250 W	350 W	300 W	300 W
DC input voltage	150 V	150 V	150 V	150 V
DC input current	40 A	60 A	60 A	60 A
DC input current (parallel)	-	-	120 A	

### Measures accurately

- integrated voltmeter and ammeter
- precise programming / readback accuracy
- built-in 2-wire and 4-wire remote sense technology

### Captures, stores, and transfers dynamic waveforms

- data logger that is configurable
- log voltage, current and energy
- internal or external memory storage
- export to .CSV for post analysis

### Displays like an oscilloscope for precise analysis

- performs precise transient analysis with a scope function
- digitizes voltage and current
- displays results on a 4.3-inch color LCD screen

### Advanced characterization

- use operating modes: constant current (CC), constant voltage (CV), constant resistance (CR), constant power (CP)
- improve measurements with low current range
- dynamic load profiles with *List* (continuous, pulse, or toggle)
- adjust transient steps with programmable slew rate
- modern connectivity: LAN (LXI-core), USB and GPIB (optional)



Figure 1. EL33133A 250 W bench electronic load 150 V, 40 A



Figure 2. EL34143A 350 W bench electronic load 150 V, 60 A



Figure 3. EL34243A 600 W dual input bench electronic load 150 V, 60 A

## Measurements at a glance with large color display

### Meter view – default

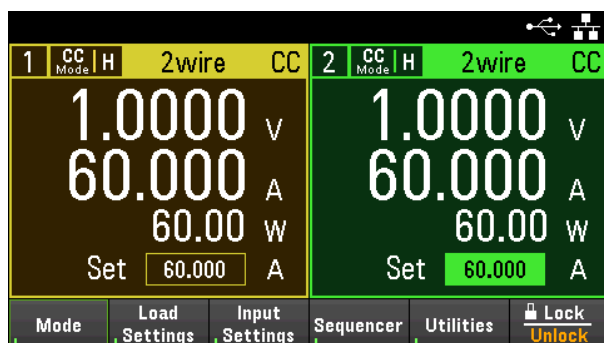


Figure 4. Default view on the EL34243A dual-input DC electronic load display both inputs

### Meter view – single input

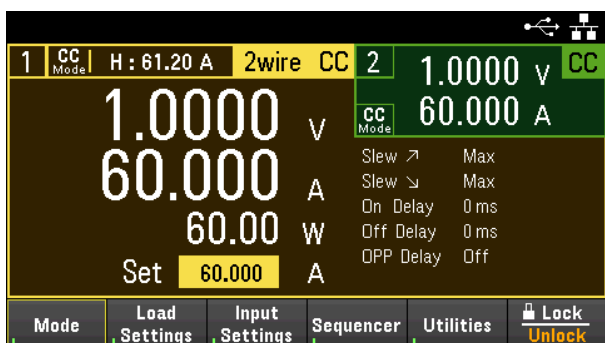


Figure 5. Display more details of the desired channel by selecting single view on the EL34243A dual-input DC electronic load

### Scope view function

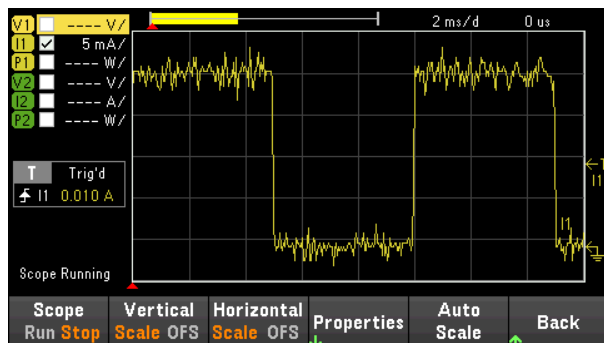


Figure 6. Capture voltage and current waveforms with a 200 kHz digitizer, up to 256k samples

### Data logger function

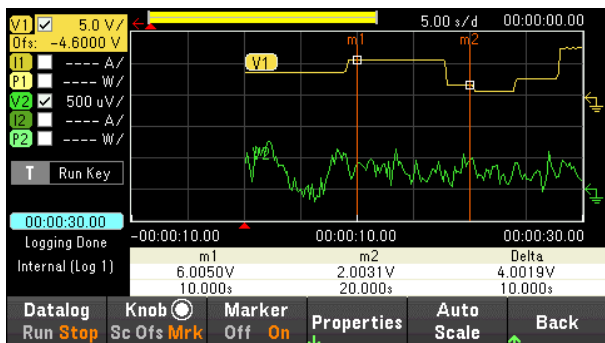


Figure 7. Log data with sample interval 20 us to 60 s, for up to 10,000 hours or 5 MB of data

### Input-independent mode

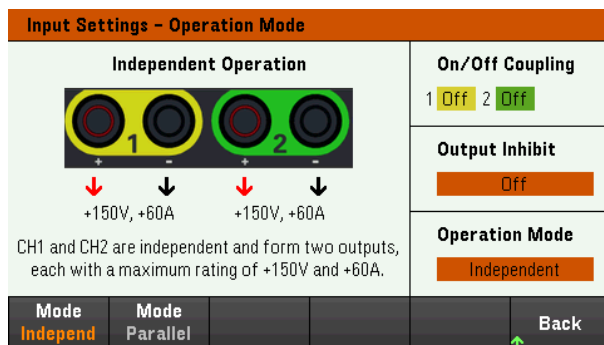


Figure 8. Two electronically isolated inputs allow independent operation like two individual units

### Input-parallel mode

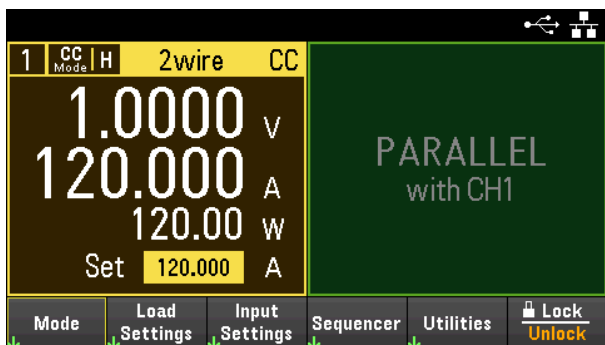


Figure 9. Input-parallel mode enables higher current up to 120 A or power up to 600 W

## Input-coupling

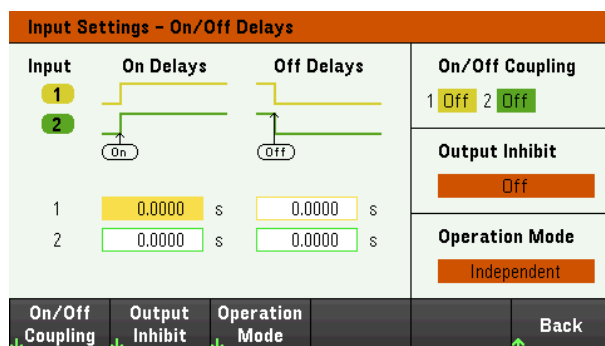


Figure 10. Synchronize the turning on/off the inputs of the EL34243A dual-input DC electronic load

## Programmable slew rate

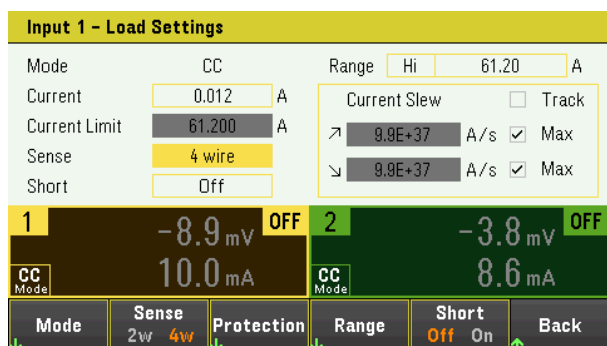


Figure 11. Programmable slew rate controls the rise and fall rate of both voltage and current

## Transient List



Figure 12. A List generates a complex sequence of changes with rapid and precise timing input

## Transient continuous

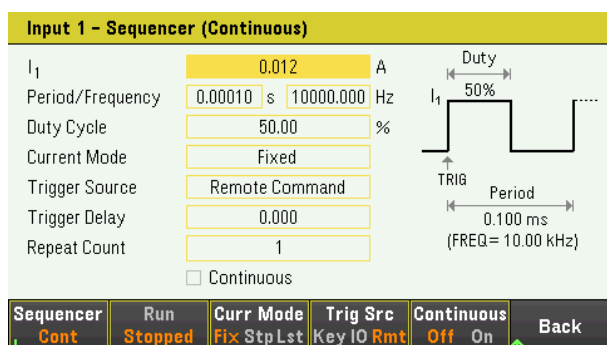


Figure 13. Continuous mode generates a repetitive pulse stream that toggles between two load levels

## Transient pulse

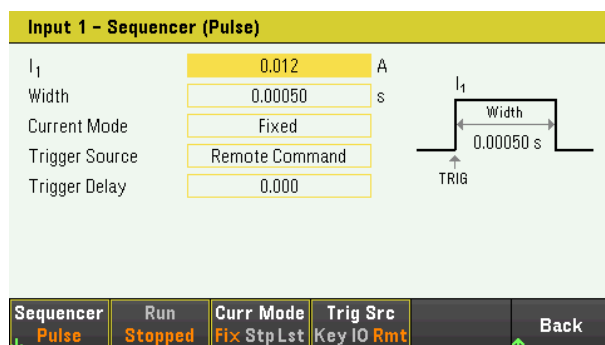


Figure 14. Pulse mode generates a load change that returns its original state over time

## Transient toggle

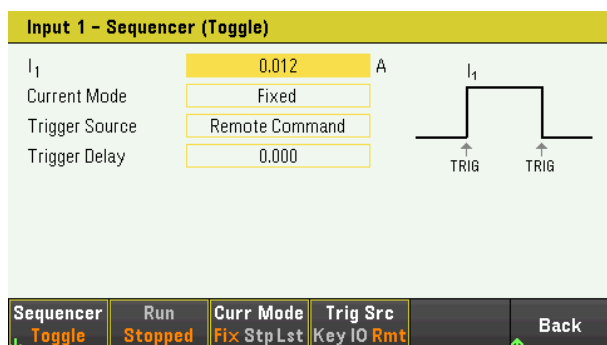
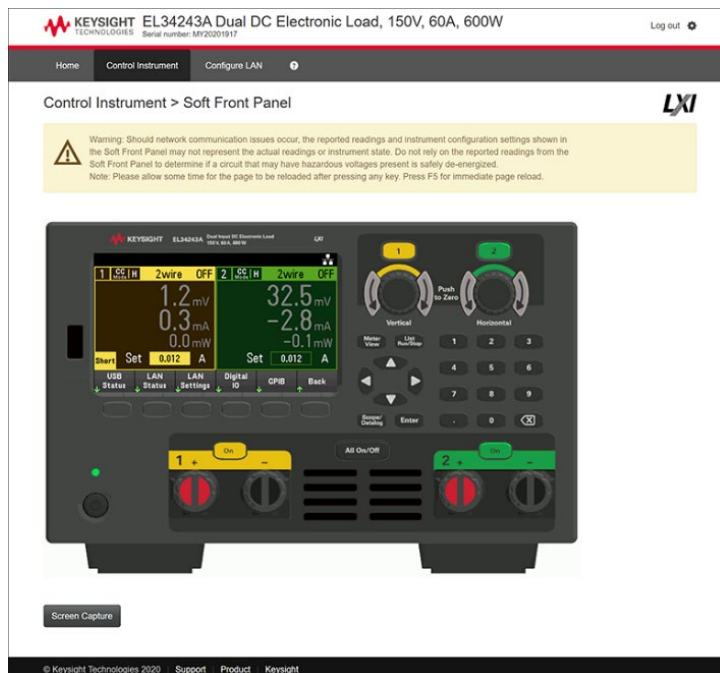
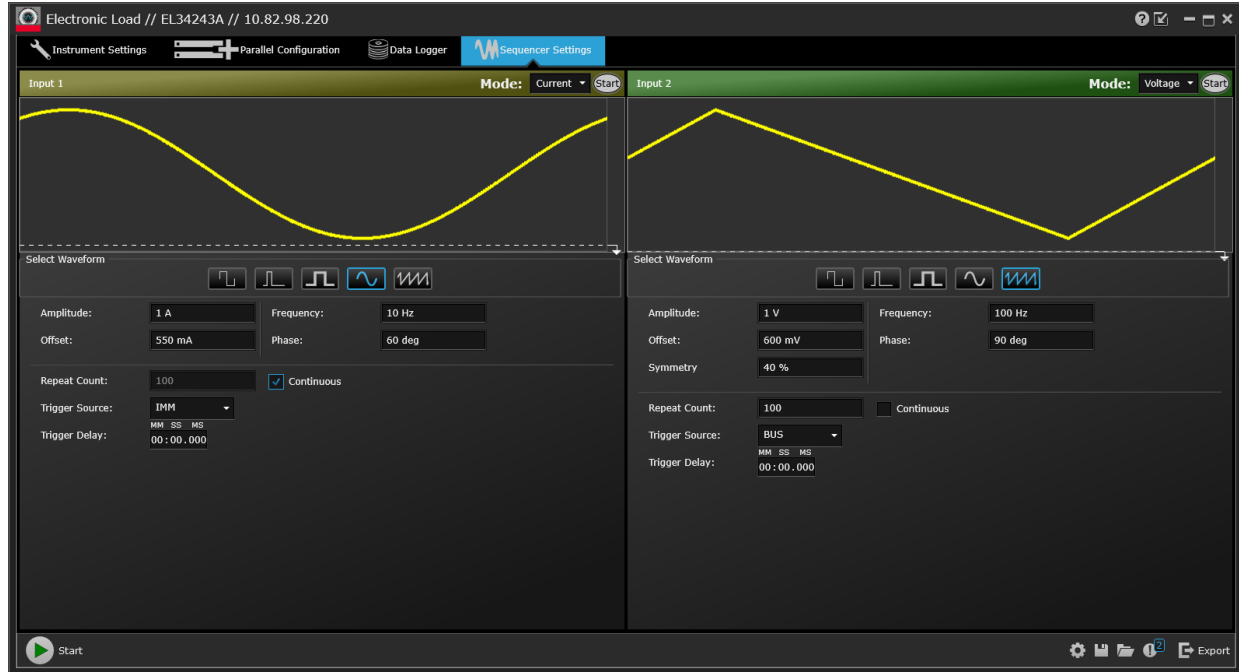


Figure 15. Toggle mode generates a pulse that toggles between two load levels with a controlled trigger signal

## Operate remotely

Keysight's Pathwave BenchVue software for the PC or a soft front panel via a web interface allows users to operate the electronic load remotely, execute test sequences, log data, and integrate with other test instruments.



## Specifications

Performance Specifications (23°C ± 5°C)		EL33133A	EL34143A	EL34243A	
Maximum Input Power		250 W	350 W	300 W	300 W
Channel		1	1	1	2
Input Ratings (0 to 40°C)		0 to 150 V	0 to 150 V	0 to 150 V	0 to 150 V
		0 to 40 A	0 to 60 A	0 to 60 A	0 to 60 A
Parallel Mode Current <sup>1</sup>		NA	NA	120 A	
Programming Accuracy ± (% of output + offset)					
Constant current mode <sup>2</sup>	Low	0.05% + 820 µA	0.04% + 130 µA		
	Medium	-	0.04% + 2 mA		
	High	0.05% + 7.2 mA	0.04% + 12 mA		
Constant voltage mode	Low, 15 V	0.03% + 4.2 mV	0.02% + 3 mV		
	High, 150 V	0.03% + 15 mV	0.02% + 15 mV		
Constant resistance mode <sup>3</sup>	Low, 0.08 / 0.05 Ω to 30 Ω	0.1% + 160 mS	0.1% + 230 mS		
	Medium, 10 Ω to 1.25 kΩ	0.1% + 16 mS	0.1% + 18 mS		
	High, 100 Ω to 4 kΩ	0.1% + 1.8 mS	0.1% + 3.5 mS		
	Ultra-high, 250 Ω to 100 kΩ	-	0.1% + 400 µS		
Constant power mode <sup>4</sup>	Low	0.08% + 18 mW	0.06% + 4 mW		
	Medium	0.08% + 150 mW	0.06% + 260 mW		
	High	0.08% + 1.5 W	0.06% + 1.6 W		
Readback Accuracy ± (% of output + offset)					
Current <sup>2</sup>	Low	0.05% + 820 µA	0.04% + 120 µA		
	Medium	-	0.04% + 1.8 mA		
	High	0.05% + 7.2 mA	0.04% + 9.6 mA		
Voltage	Low, 15 V	0.03% + 4.2 mV	0.02% + 3 mV		
	High, 150 V	0.03% + 15 mV	0.02% + 15 mV		
Power <sup>4</sup>	Low	0.08% + 18 mW	0.06% + 3 mW		
	Medium	0.08% + 150 mW	0.06% + 260 mW		
	High	0.08% + 1.2 W	0.06% + 1.5 W		

<sup>1</sup> Do not connect the dual inputs on EL34243A in series, parallel mode is only allowed for CC, CR and CP.

<sup>2</sup> Current ranges:

EL33133A – Low = 4 A; High = 40 A

EL34143A/EL34243A – Low = 0.6 A; Medium = 6 A; High = 60 A

<sup>3</sup> Does not apply to current setting <0.05% of full scale current, minimum voltage = 0.5V.

Low range – full scale current = 40 A / 60 A, maximum voltage = 15 V, maximum power = maximum input power;

EL33133A = 0.08 Ω to 30 Ω; EL34143A and EL34243A = 0.05 Ω to 30 Ω

Medium range – full scale current = 40 A / 60 A, maximum voltage = 150 V, maximum power = maximum input power

High range – full scale current = 4 A / 6 A, maximum voltage = 150 V, maximum power = maximum input power

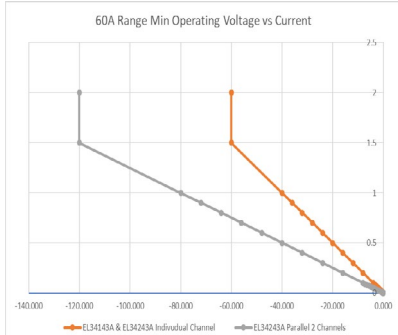
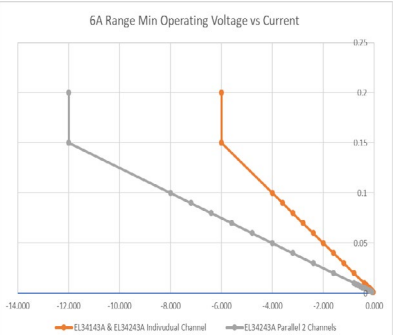
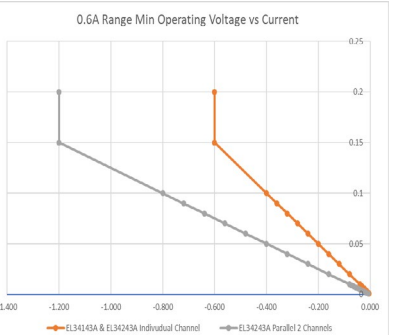
Ultra-high range – full scale current = 0.6 A, maximum voltage = 150 V, maximum power = 10% of maximum input power

<sup>4</sup> Power ranges:

EL33133A – Low = 0.02 W – 5 W; Medium = 0.15 W – 25 W; High = 1.5 W – 250 W

EL34143A – Low = 0.02 W – 8 W; Medium = 0.3 W – 35 W; High = 2 W – 350 W

EL34243A – Low = 0.02 W – 7 W; Medium = 0.3 W – 30 W; High = 2 W – 300 W

Typical Characteristics		EL33133A	EL34143A	EL34243A	
Channel		1	1	1	2
Input Characteristic <sup>5</sup>					
					
Typical Minimum Operating Voltage at Full Scale Current and for Full Dynamic					
Current <sup>2</sup>	Low	0.15 V		0.15 V	
	Medium	-		0.15 V	
	High	1.5 V		1.5 V	
Programming Resolution					
Constant current mode <sup>2</sup>	Low	45 μA		7 μA	
	Medium	-		70 μA	
	High	450 μA		700 μA	
Constant voltage mode	Low, 15 V	170 μV		170 μV	
	High, 150 V	1.7 mV		1.7 mV	
Constant resistance mode <sup>3</sup>	Low, 0.08 / 0.05 Ω to 30 Ω	450 μS		700 μS	
	Medium, 10 Ω to 1.25 kΩ	450 μS		700 μS	
	High, 100 Ω to 4 kΩ	45 μS		70 μS	
	Ultra-high, 250 Ω to 100 kΩ	-		7 μS	
Constant power mode <sup>4</sup>	Low	675 μW		105 μW	
	Medium	6.75 mW		10.5 mW	
	High	67.5 mW		105 mW	
Readback Resolution					
Current <sup>2</sup>	Low	70 μA		15 μA	
	Medium	-		100 μA	
	High	700 μA		1 mA	
Voltage	Low, 15 V	270 μV		270 μV	
	High, 150 V	2.7 mV		2.7 mV	

<sup>5</sup> For below the typical minimum operating voltage of 1.5 V at constant current high range and medium range, the current decreases linearly base on the rate of its minimum operating resistance 0.025  $\Omega$ .  
For below the typical minimum operating voltage of 0.15 V at constant current low range, the current decreases linearly base on the rate of its minimum operating resistance 0.25  $\Omega$ .

Typical Characteristics		EL33133A	EL34143A	EL34243A	
Channel		1	1	1	2
Slew Rates <sup>6</sup>					
Constant current mode <sup>2</sup>	Low	200 kA/s	40 kA/s		
	Medium	-	400 kA/s		
	High	3.7 MA/s	4.8 MA/s		
Constant voltage mode	Low, 15 V	79 kV/s	79 kV/s		
	High, 150 V	310 kV/s	310 kV/s		
Minimum Programmable Operating Point					
Constant current mode <sup>2</sup>	Low	1 mA	200 μA		
	Medium	-	2 mA		
	High	10 mA	12 mA		
Constant voltage mode	Low, 15 V	5 mV	3 mV		
	High, 150 V	20 mV	15 mV		
Constant resistance mode <sup>3</sup>	Low, 0.08 / 0.05 Ω to 30 Ω	0.08 Ω	0.05 Ω		
	Medium, 10 Ω to 1.25 kΩ	10 Ω	10 Ω		
	High, 100 Ω to 4 kΩ	100 Ω	100 Ω		
	Ultra-high, 250 Ω to 100 kΩ	-	250 Ω		
Constant power mode <sup>4</sup>	Low	0.02 W	0.02 W		
	Medium	0.15 W	0.3 W		
	High	1.5 W	2 W		
Maximum Programmable Power Operating Point					
Constant power mode <sup>4</sup>	Low	5.1 W	8.16 W	7.14 W	
	Medium	25.5 W	35.7 W	30.6 W	
	High	255 W	357 W	306 W	
Programmable Short / Open					
Programmable short		37.5 mΩ (4 A / 40 A)	25 mΩ (6 A/ 60 A) / 250 mΩ (0.6 A)		
Input off impedance		824 kΩ	824 kΩ		
Ripple and Noise					
Current (rms)		3 mA	2 mA		
Voltage (rms)		5 mV			
Measurement Small Signal Bandwidth (-3 dB typical)					
Voltage / Current		30 kHz			
Measurement Small Signal Bandwidth (-1 dB typical)					
Voltage / Current		17.5 kHz			
Command Processing Time					
< 10 ms					

<sup>6</sup> Typical maximum slew rate changes in current over time from 10% to 90% or 90% to 10%.



Typical Characteristics		EL33133A	EL34143A	EL34243A	
Channel		1	1	1	2
Temperature Coefficients - Programming / Readback					
Constant current mode <sup>2</sup>	Low	0.009%/°C + 16 μA/°C	0.008%/°C + 3 μA/°C		
	Medium	-	0.008%/°C + 30 μA/°C		
	High	0.008%/°C + 200 μA/°C	0.008%/°C + 300 μA/°C		
Constant voltage mode	Low, 15 V	0.006%/°C + 110 μV/°C	0.004%/°C + 100 μV/°C		
	High, 150 V	0.006%/°C + 600 μV/°C	0.004%/°C + 600 μV/°C		
Constant resistance mode <sup>3/7</sup>	Low, 0.08 / 0.05 Ω to 30 Ω	0.01%/°C + 3 mS/°C	0.01%/°C + 6 mS/°C		
	Medium, 10 Ω to 1.25 kΩ	0.01%/°C + 250 μS/°C	0.01%/°C + 320 μS/°C		
	High, 100 Ω to 4 kΩ	0.01%/°C + 25 μS/°C	0.01%/°C + 35 μS/°C		
	Ultra-high, 250 Ω to 100 kΩ	-	0.01%/°C + 6 μS/°C		
Constant power mode <sup>4</sup>	Low	0.015%/°C + 1 mW/°C	0.012%/°C + 1 mW/°C		
	Medium	0.015%/°C + 3 mW/°C	0.012%/°C + 5 mW/°C		
	High	0.015%/°C + 30 mW/°C	0.012%/°C + 40 mW/°C		
Protection					
Fixed OCP <sup>2</sup>	Low	4.35 A ± 25 mA	0.65 A ± 4 mA		
	Medium	-	6.5 A ± 40 mA		
	High	42 A ± 250 mA	63 A ± 0.2 A		
Programming OCP <sup>2/7</sup>	Low	0.2% + 50 mA	0.2% + 7 mA		
	Medium	-	0.2% + 70 mA		
	High	0.2% + 80 mA	0.2% + 100 mA		
OVP	Low, 15 V	16.5 V +/- 85 mV	16.5 V +/- 60 mV		
	High, 150 V	165 V +/- 600 mV	165 V +/- 350 mV		
OPP <sup>4</sup>	Low	5.5 W	8.8 W	7.7 W	
	Medium	27.5 W	38.5 W	33 W	
	High	275 W	385 W	330 W	
Protection Activation Time					
INH input		< 5 us			
Fault on coupled output		< 10 us			
Mainframe Oscilloscope Measurement Accuracy					
Constant current mode <sup>2</sup>	Low	0.04% + 3 mA	0.04% + 1 mA		
	Medium	-	0.04% + 4 mA		
	High	0.04% + 10 mA	0.04% + 15 mA		
Constant voltage mode	Low, 15 V	0.02% + 15 mV	0.02% + 15 mV		
	High, 150 V	0.02% + 40 mV	0.02% + 40 mV		

<sup>7</sup> CV mode only.

Environmental Conditions			
Operating environment	Indoor use, installation category II (for AC input), pollution degree 2		
Operating temperature range	0 °C to 40 °C		
Storage temperature	–40 to 70 °C		
Relative humidity	Up to 85% RH at temperature up to 40 °C (non-condensing)		
Altitude	Up to 2000 meters		
Electromagnetic compatibility	Compliant with EMC Directive (2014/30/EU) 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		
Acoustic noise declaration	Sound pressure Lp <65 dB(A) at operator position, Lp <70 dB(A) at bystander position Sound power, Lw <70 dB(A)		
AC input	100 VAC to 240 VAC (±10%), 50/60Hz		
Interface Capabilities			
GPIB	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			
Maximum voltage ratings	+16.5 VDC/ -5 VDC between pins (pin 4 internally connected to chassis ground)		
Pins 1 and 2 as fault output	Maximum low-level output voltage = 0.5 V @ 4 mA Maximum low-level sink current = 4 mA Typical high-level leakage current = 1 mA @ 16.5 VDC		
Pins 1 - 3 as digital/trigger outputs (pin 4 = common)	Maximum low-level sink current = 100 mA Typical high-level leakage current = 0.8 mA @ 16.5 VDC		
Pins 1 - 3 as digital/trigger inputs and pin 3 as inhibit input (pin 4 = common)	Maximum low-level input voltage = 0.8 V Maximum high-level input voltage = 2 V Typical low-level leakage current = 2 mA @ 0 V (internal 2.2k pull-up) Typical high-level leakage current = 0.12 mA @ 16.5 VDC		
Remote Sense Capabilities			
Inputs can maintain specifications with up to a 5-volt drop per load lead. The load lead drop reduces the maximum available voltage at the load.			
Weight and Dimensions			
Model	EL33133A	EL34143A	EL34243A
Weight, kg	6.50	6.50	8.42
Overall dimension, mm (H x W x D)	144.85 x 215.90 x 457.60	144.85 x 215.90 x 476.01	
Net dimension (without feet, strap handle and GPIB module), mm (H x W x D)	132.51 x 212.80 x 457.60	132.51 x 212.80 x 458.48	

## Ordering Information

### Keysight EL30000 Series bench DC electronic loads

EL33133A <sup>8</sup>	Single-input DC electronic load: 150 V, 40 A, 250 W	<a href="#">Buy Now</a>
EL34143A	Single-input DC electronic load: 150 V, 60 A, 350 W	
EL34243A	Dual-input DC electronic load: 150 V, 60 A, 300 W; total 600 W	

<sup>8</sup> The EL33133A is only available through [Keysight's Buy Online](#) store in the US and Canada

### Standard Shipped Accessory

- AC power cord
- Connectors and quantity:

Description	EL33133A / EL34143A	EL34243A
10A, 3.5mm female 4-pin terminal I/O block connector	1	1
8A, 3.5mm 2-pin terminal sense block connector	1	2
85A, 12mm 2-pin input connector	1	2

### Options

Option SEC	NISPOM and file security
Option UK6	Commercial calibration with test result data

### Keysight GPIB module and rackmount kits

EL34GPBU	GPIB user-installable interface module (EL34143A & EL34243A Only)
1CM104A	Rack mount flange kit with two flange brackets
1CM105A	Rack mount flange kit without handles and two flange brackets
1CM116A	Rack mount flange kit with one flange bracket, one half-module bracket
1CN107A	Handle kit with two front handles
1CP108A	Rack mount flange and handle kit with two brackets and front handles

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