

# EL30000 Series

Bench DC electronic loads

## Measure, Capture, and Display

The EL30000 Series bench DC electronic loads provide superior performance in a 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 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. Advanced features include scope view, data logging, sequencing, battery test, and more, enabling you to measure, capture, and quickly display your results.

## Measure voltage and current accurately

Each EL30000 Series bench DC electronic load has 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 gives 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 it externally on a USB memory device as a .CSV file.



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## **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 dramatically reduces measurement setup complexity and provides accurate and fully specified measurements.

## **Optimize battery testing with precise voltage and capacity control**

The Battery Test feature for the EL30000 Series bench DC electronic loads offers users a streamlined and efficient solution for a wide range of battery testing applications. It seamlessly integrates with existing instrument modes and settings, simplifying the testing process while ensuring precision and safety. With customizable cut-off conditions based on voltage, capacity, or timer, users can tailor tests to their specific needs, preventing over-discharge and battery damage. The real-time meter view provides instant access to vital measurements, enhancing efficiency and monitoring capabilities.

# 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)
- Battery Test mode: Optimize battery testing with precise voltage and capacity control
- improve measurements with a low current range
- dynamic load profiles with List<sup>2</sup> (continuous, pulse, or toggle)
- adjust transient steps with a programmable slew rate
- modern connectivity:
  - LAN (LXI-core)<sup>1</sup>
  - USB
  - GPIB (optional)

1. LAN (LXI-core) only available for EL34143A and EL34243A  
 2. List only available for EL34143A and EL34243A



**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

Meter view – default

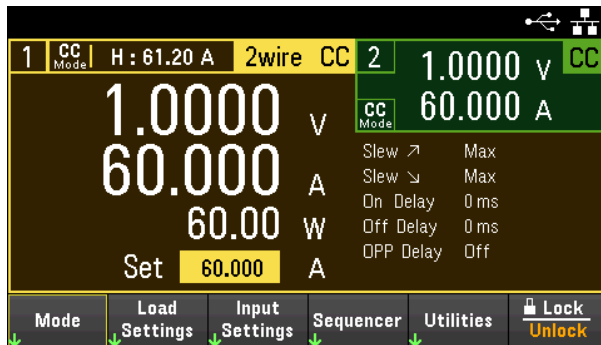


Figure 4. Default view on the EL34243A dual-input DC electronic load display both inputs

Meter view – single input

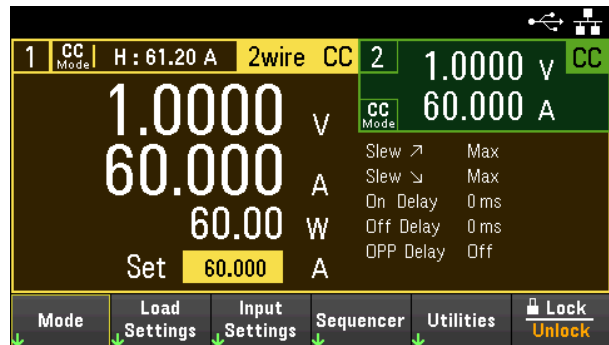


Figure 5. Display more details of the desired channel by selecting single view on the EL34243A dual-input DC electronic load

Scope view function

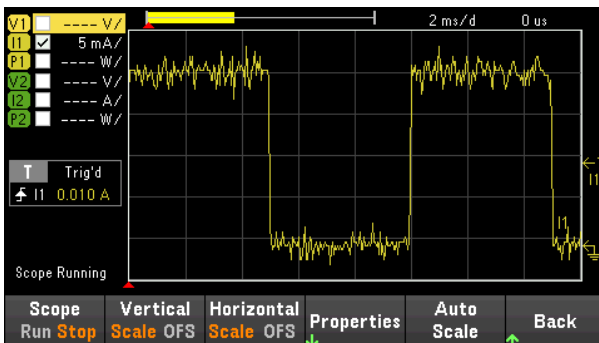


Figure 6. Capture voltage and current waveforms with a 200 kHz digitizer, up to 256k samples

Data logger function

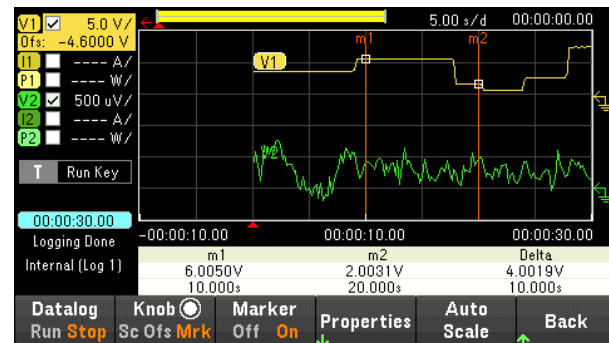


Figure 7. Log data with sample interval 20  $\mu$ s to 60 s, for up to 10,000 hours or 5 MB of data

Input-independent mode

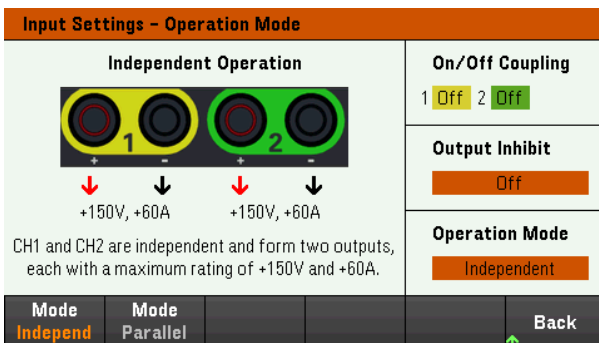


Figure 8. Two electronically isolated inputs allow independent operation like two individual units

Input-parallel mode

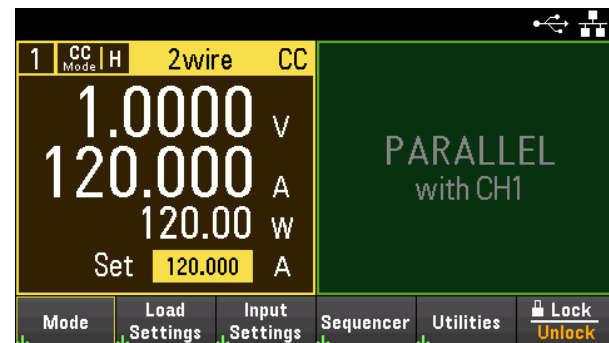


Figure 9. Input-parallel mode enables higher current up to 120 A or power up to 600 W

## Input-coupling

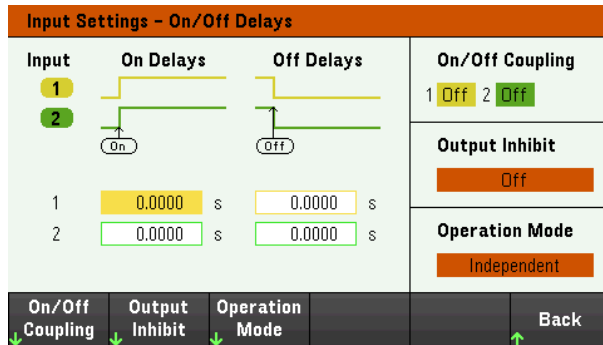


Figure 10. Synchronize the turning on/off the inputs of the EL34243A dual-input DC electronic load

## Programmable slew rate

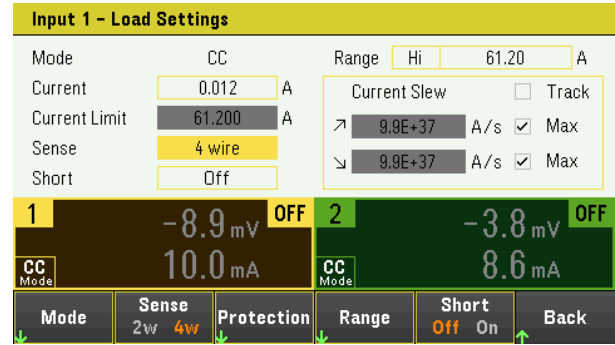


Figure 11. Programmable slew rate controls the rise and fall rate of both voltage and current

## Transient List



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

## Transient continuous

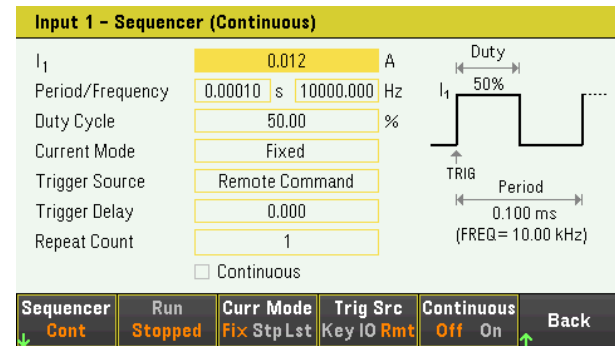


Figure 13. Continuous mode generates a repetitive pulse stream that toggles between two load levels

## Transient pulse

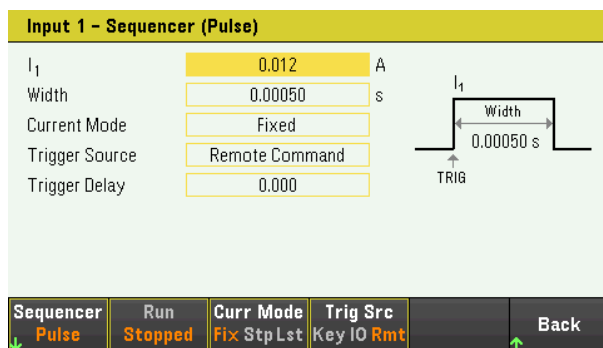


Figure 14. Pulse mode generates a load change that returns its original state over time

## Transient toggle

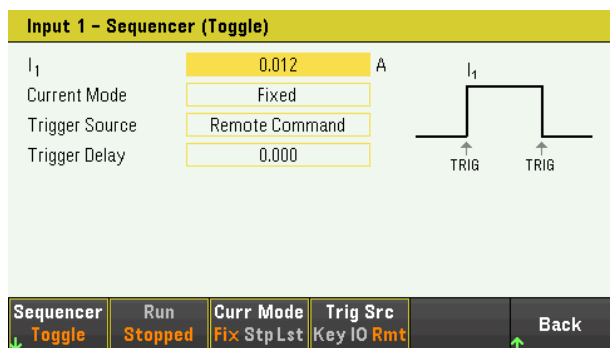
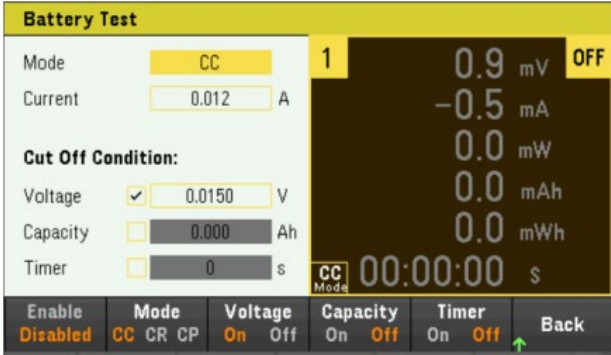


Figure 15. Toggle mode generates a pulse that toggles between two load levels with a controlled trigger signal

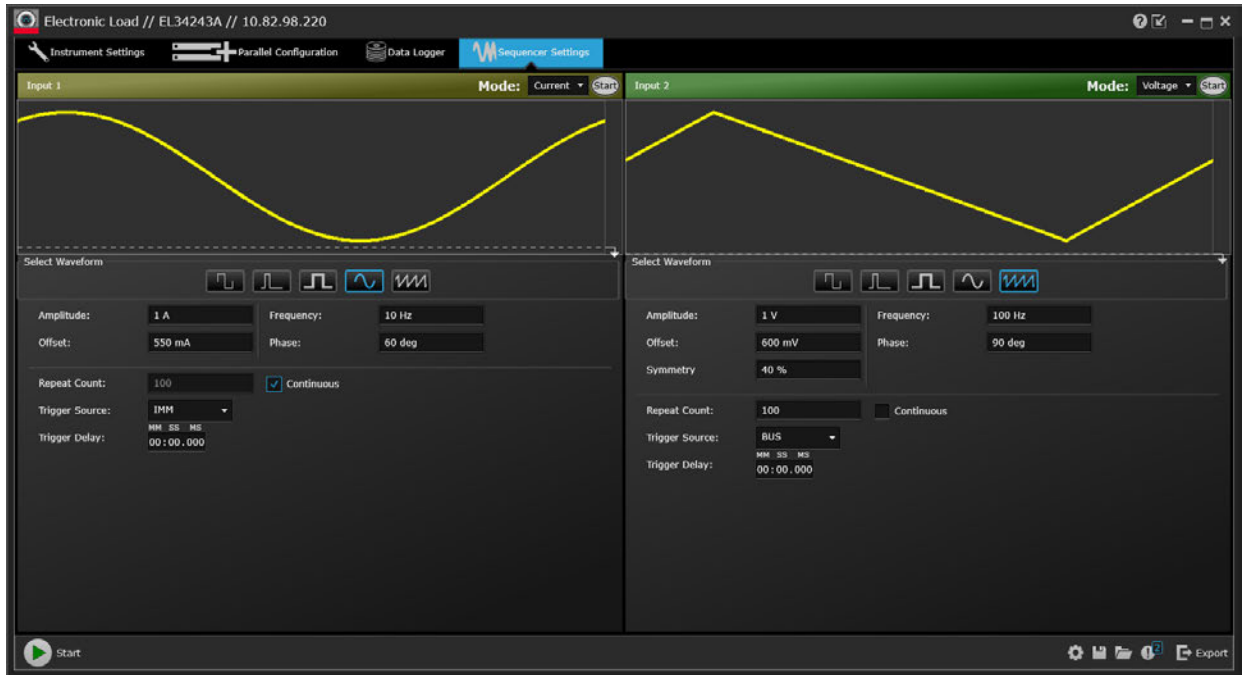
### Battery test mode



**Figure 16.** Battery test mode with customizable cut-off conditions based on voltage, capacity, or timer. The real-time meter view provides instant access to vital measurements, enhancing efficiency and monitoring capabilities.

# 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

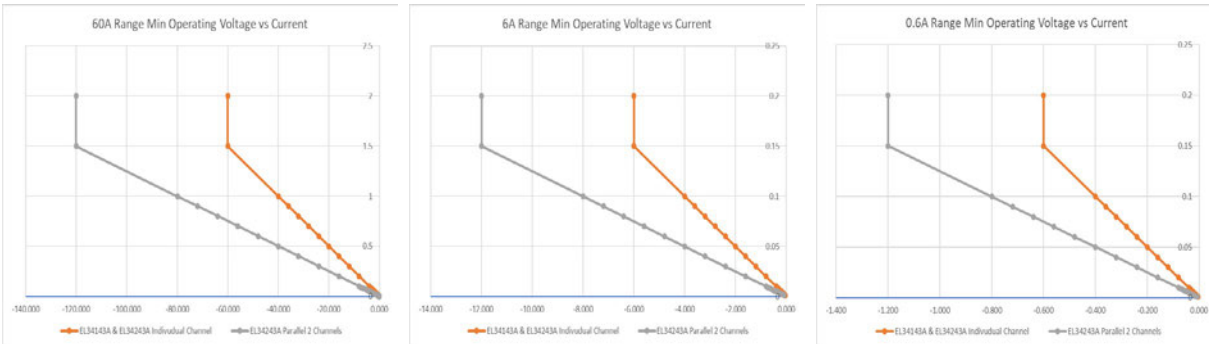
EL33133A

EL34143A

EL34243A

Channel	1	1	1	2
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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 $\mu$ A	7 $\mu$ A
	Medium	-	70 $\mu$ A
	High	450 $\mu$ A	700 $\mu$ A
Constant voltage mode	Low, 15 V	170 $\mu$ V	170 $\mu$ V
	High, 150 V	1.7 mV	1.7 mV
Constant resistance mode <sup>3</sup>	Low, 0.08 / 0.05 $\Omega$ to 30 $\Omega$	450 $\mu$ S	700 $\mu$ S
	Medium, 10 $\Omega$ to 1.25 k $\Omega$	450 $\mu$ S	700 $\mu$ S
	High, 100 $\Omega$ to 4 k $\Omega$	45 $\mu$ S	70 $\mu$ S
	Ultra-high, 250 $\Omega$ to 100 k $\Omega$	-	7 $\mu$ S
Constant power mode <sup>4</sup>	Low	675 $\mu$ W	105 $\mu$ W
	Medium	6.75 mW	10.5 mW
	High	67.5 mW	105 mW
Readback resolution			
Current <sup>2</sup>	Low	70 $\mu$ A	15 $\mu$ A
	Medium	-	100 $\mu$ A
	High	700 $\mu$ A	1 mA
Voltage	Low, 15 V	270 $\mu$ V	270 $\mu$ V
	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 based on the rate of its minimum operating resistance 0.025  $\Omega$ .  
 For below the typical minimum operating voltage of 0.15 V at a constant current low range, the current decreases linearly based on the rate of its minimum operating resistance of 0.25  $\Omega$ .

Typical characteristics		EL33133A	EL34143A	EL34243A
Channel		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 $\mu$ A
	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 $\Omega$ to 30 $\Omega$	0.08 $\Omega$		0.05 $\Omega$
	Medium, 10 $\Omega$ to 1.25 k $\Omega$	10 $\Omega$		10 $\Omega$
	High, 100 $\Omega$ to 4 k $\Omega$	100 $\Omega$		100 $\Omega$
	Ultra-high, 250 $\Omega$ to 100 k $\Omega$	-		250 $\Omega$
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 m $\Omega$ (4 A / 40 A)		25 m $\Omega$ (6 A / 60 A) / 250 m $\Omega$ (0.6 A)
Input off impedance		824 k $\Omega$		824 k $\Omega$
Ripple and noise				
Current (rms)		3 mA		2 mA
Voltage (rms)			5 mV	
Measurement of small signal bandwidth (-3 dB typical)				
Voltage / Current			30 kHz	
Measurement of 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
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

## EL33133A

## EL34143A

## EL34243A

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 temperatures 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 ( $\pm 10\%$ ), 50/60Hz		
Interface capabilities			
GPIB (Optional)	SCPI-1999, IEEE 488.2 compliant interface		
USB 2.0	Requires Keysight IO Library version 17.2.208 and up		
10/100 LAN	N/A	Requires Keysight IO Library version 17.2.208 and up	
LXI compliance	N/A	Class C	
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			
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

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- EL34243A Dual-input DC electronic load: 150 V, 60 A, 300 W; total 600 W

## Standard Shipped Accessory

- AC power cord
- Connector(s)

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