

# PEL-3031E Series

Programmable D.C. Electronic Load

## FEATURES

- 7 Operating Modes : CC, CV, CR, CP, CC+CV, CR+CV, CP+CV
- Fully Programmable with Normal and Fast Sequences
- Soft Start
- Max. Slew Rate : 2.5A/ $\mu$ s
- Dynamic Mode
- Protection : OVP, OCP, OPP, OTP, RVP, UVP
- Remote Sense
- Integrated Meter
- External Voltage or Resistance Control
- Rear Panel BNC Trigger IN/OUT
- Analog External Control
- USB/GPIB (Optional)

**GW INSTEK**  
Simply Reliable

GW Instek launches new PEL-3000E series programmable single-channel electronic load. In the series, PEL-3031E provides 300W(1V~150V/60A) current sink capability. Inherited from the PEL-3000 series, PEL-3031E has an easy-to-read LCD panel and user-friendly interface. This model features high speed and accurate measurement capability for electronic component, battery, portable charger and power products that require low to medium power consumption.

The PEL-3000E series is designed for current sink operation starting from 60mA and aims at measurement applications, including charger, adapter, various power supply equipment, and portable charger.

The PEL-3000E has seven operating modes. Among them, four basic operating modes are constant current, constant voltage, constant resistance, and constant power. Three other combined operating modes are constant current + constant voltage, constant resistance + constant voltage, constant power + constant voltage. Users can select operating modes based upon products' test requirements. For C.C. mode, electronic load will sink a constant current according to the set current value; for C.V. mode, electronic load will attempt to sink sufficient current to control the source voltage to the programmed value; for C.R. mode, electronic load will sink a current linearly proportional to input voltage according to the set resistance value; for C.P. mode, electronic load will initiate load power sinking operation (load voltage x load current) in accordance with the programmed power setting.

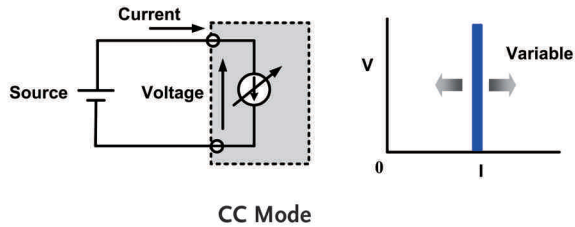
To meet the requirements of different test conditions, the Static function is to sink a constant current; the Dynamic function is to periodically switch between two sink conditions, and the Sequence function is to provide tests for more than two sink conditions. The sequence function can be divided into Normal Sequence and Fast Sequence. Normal Sequence are the most flexible means of generating complex sequences that can facilitate users to establish a set of changing current sink conditions based upon different sinking conditions (CC, CR, CV or CP mode) and time (adjustable range: 1ms to 999h 59min 59s). Fast sequence allows time resolution of 25us to be set for the smallest step. Setting parameters for multiple steps can simulate consecutive current changes of various real load conditions. For instance, while using an electronic load to test a power-driven tool's power supply we can first obtain waveforms by an oscilloscope and a current probe from the tool, and subsequently, use the obtained waveforms to edit simulated current waveforms, via electronic load's sequence function, to test the power-driven tool and to analyze its operational status. The Soft Start function allows users to determine the rise time of current sink that is to decide the required time to reach electronic load's set current, resistance or power value. Setting a proper rise time for Soft Start is effective to counter output voltage fluctuation caused by DUT's (power supply) transient output current. It is worth noting, General DC loads do not have the soft start function. When conducting high speed current sink operation, the inductance effect on the cable connecting electronic load and DUT will lead to transient voltage drop on electronic load's input terminal, therefore, that will result in Voltage Non-monotonic increase. PEL-3000E's soft start function not only allows output voltage to be Monotonic increase, but also prevents inrush current and surge voltage from happening on DUT. For instance, tests using a power supply, LED and a DC load (activate the soft start function) can prevent inrush current and surge voltage from causing damages on LED.

The PEL-3000E is equipped with the count time function to obtain total time for electronic load's current sink that helps users estimate DUT's power capacity. The cut off time function is for users to control the total time of electronic load's current sink. Both flexible time control functions increase the test adaptability of electronic load. UVP can be applied on battery discharge tests. Electronic load will cease operation if battery's voltage is lower than the set UVP threshold to protect battery from over discharge. Other than that, PEL-3000E provides users with analog control terminal to control PEL-3000E from external voltage, external resistance and switch. Analog control terminal can also monitor electronic load's status and display protective alarms.

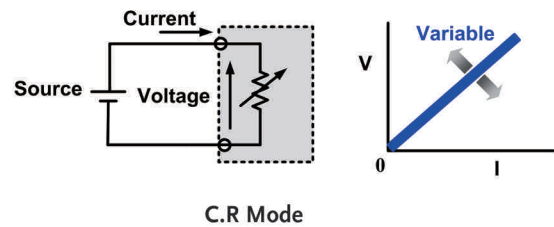
## A. OPERATING MODE

The PEL-3000E series provides four fundamental operating modes and three add-on modes of CC, CR and CP separately combining with CV. Users can set different load condition under different operating modes such as setting operating range for load level, Current Slew Rate, input voltage and load current. The input

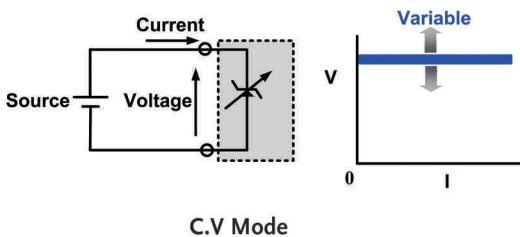
voltage range has two levels - high and low. The load current operating range has two levels - high and low current levels which possess different resolution to meet test requirements of different power product specifications.



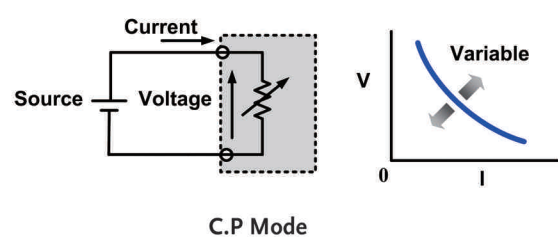
Under constant current mode, electronic load will sink the amount of current users has set. Different current settings via CC mode allow users to test the voltage changes of DC power supply which is called load regulation rate test.



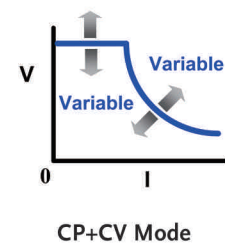
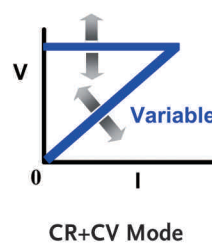
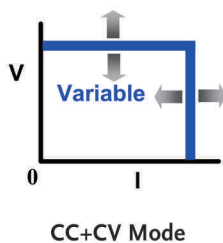
Under constant resistance mode, electronic load will sink load current, which is linearly direct proportion to input voltage. This mode can be utilized in testing voltage or the activation and current limit of power supply.



Under constant voltage mode, electronic load will sink sufficient current to regulate the voltage source to the set value. This mode allows users not only to test current limit function of power supply, but also to simulate battery operation in testing battery chargers.



Under constant power mode, electronic load will sink load current, which is indirect proportion to input voltage to reach preset constant power requirement. Hence, the changes of input voltage will have indirect proportion effect on current sinking so as to reach constant power control.



+CV mode can be selected under CC, CR or CP mode. When +CV mode function is turned on and electronic load sinks more current than the maximum current of power supply under test, electronic load will automatically switch to CV mode. It is because that the current sunk is the maximum current of power device. Therefore,

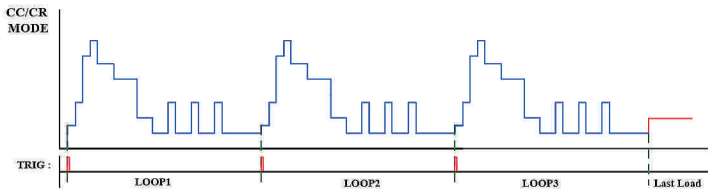
power supply will switch to CC mode and PEL-3000 will switch to CV mode to limit electronic load from sinking the total current of power supply so as to prevent power supply under test from damaging. Electronic load will cease operation once the voltage of DUT is lower than the set voltage under +CV mode.

## B. STATIC/DYNAMIC/SEQUENCE MODE

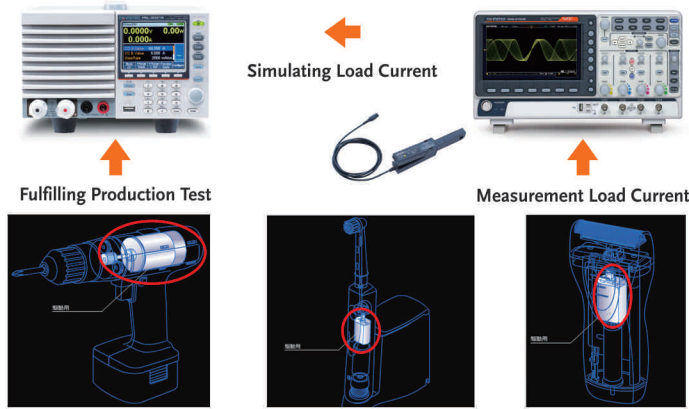
Operation Function	Static	Dynamic	Sequence	
			Fast	Normal
Operating Condition Selection	Single fixed condition	Selection between two conditions	Selection from more than two conditions	Selection from more than two conditions
Operating Modes	All modes	<ul style="list-style-type: none"> <li>Two conditions using same mode</li> <li>Support CC or CR</li> </ul>	<ul style="list-style-type: none"> <li>Each condition must use same mode</li> <li>Support CC or CR mode</li> </ul>	<ul style="list-style-type: none"> <li>Each condition is able to be used in different mode</li> <li>All modes</li> </ul>
Adjustable Condition Setting	<ul style="list-style-type: none"> <li>Value A/ Value B</li> <li>Slew Rate</li> </ul>	<ul style="list-style-type: none"> <li>Level 1/Level 2</li> <li>Timer 1/Timer 2</li> <li>Slew Rate 1/Slew Rate 2</li> </ul>	<ul style="list-style-type: none"> <li>Level</li> <li>Timer</li> <li>Slew Rate</li> <li>Others...</li> </ul>	<ul style="list-style-type: none"> <li>Level</li> <li>Timer</li> <li>Slew Rate</li> <li>Others...</li> </ul>
Sequence Step Combination	N/A	N/A	<ul style="list-style-type: none"> <li>1 Sequence</li> <li>1,000 steps</li> <li>25μs/step</li> </ul>	<ul style="list-style-type: none"> <li>10 Sequence</li> <li>1,000 steps</li> <li>1ms/step</li> </ul>
Other Functions	N/A	Trigger Out function	Trigger Out function	<ul style="list-style-type: none"> <li>Trigger Out function</li> <li>Ramp function</li> </ul>

The PEL-3000E series, according to different test conditions, step or continuous changes, test speeds, and selectable modes, has three operating functions: Static, Dynamic and Sequence.

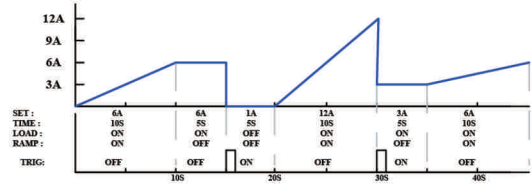
## C. FAST SEQUENCE & NORMAL SEQUENCE



Fast Sequence Diagram



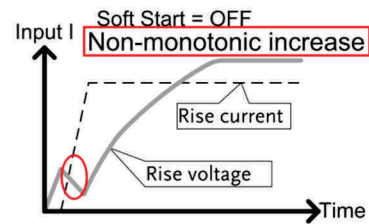
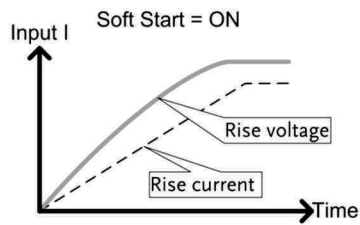
Power-driven Tools Simulation Test



Normal Sequence Diagram

Set a complete sequence editing function to obtain following waveforms. Users can save development cost and time without using a PC to control electronic load and writing programs.

## D. SOFT START



The Soft Start function of PEL-3000E allows users to determine the rise time of current sink that is to decide how much time is required to reach electronic load's set current, resistance or power value. PEL-3000E's soft start function prevents inrush current and surge voltage from happening on DUT.

For instance, test applications using a power supply, LED and a DC load (activate the soft start function) can prevent inrush current and surge voltage from causing damages on LED.

## E. PROTECTION MODES

Function \ Protection	OCP	OVP	OPP	OTP	UVP
Adjustable Thresholds	✓	✓	✓	N/A	✓
Load Off	✓	✓	✓	Fixed	✓
Limit Function	✓	N/A	✓	N/A	N/A

The PEL-3000E series provides many protective functions including over current protection (OCP), over voltage protection (OVP), over power protection (OPP), over temperature protection (OTP) and under voltage protection (UVP). Except for OTP, all thresholds

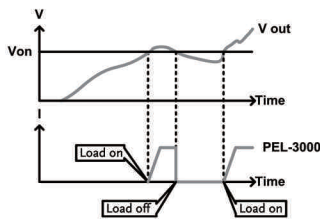
of protective functions are adjustable. When protective function is activated, electronic load will send out warning signal and terminate operation. Other than protective functions, Limit function can also be utilized to maintain electronic load in operation at a preset value.

## PANEL INTRODUCTION



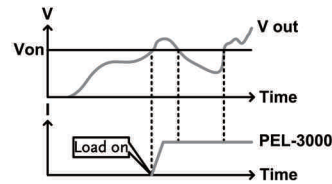
1. Power Key
2. Short
3. Load On/Off
4. Scroll wheel
5. USB
6. Sense +/-
7. Input terminals
8. LCD Display
9. Function keys
10. Analog control ports
11. Trigger out port
12. Trigger in port
13. Power socket
14. GPIB (optional)
15. USB device

## F. VON VOLTAGE AND VON LATCH FUNCTION



Von Latch = OFF

Von Voltage is the threshold voltage for electronic load to activate or terminate sinking current. When Von Latch is set to off, electronic load operation will be activated if input voltage is higher than Von Voltage and electronic load operation will be terminated if input voltage is lower than Von Voltage. When Von



Von Latch = ON

Latch is set to on, electronic load operation will be activated if input voltage is higher than Von Voltage and will continue operation even input voltage is lower than Von Voltage. Von Voltage function can test the transient maximum current capability provided by power supply.

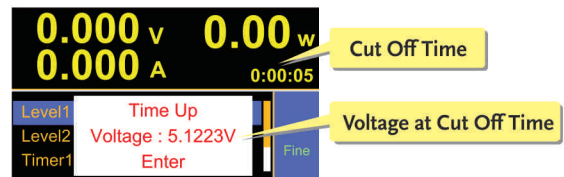
## G. TIMER FUNCTIONS



Elapsed Time

The PEL-3000 series provides count time and cut off time functions. The display screen will show present activation time when electronic load is activated. When electronic load operation is terminated count time will stop and the total operation time will be shown on the display screen.

The activation time of cut off time can be set to the maximum length of 999h 59min 59s. When electronic load is activated



Voltage at Cut Off Time

this function will start counting time. Electronic load will cease operation (load off) and show the final input voltage on the screen when preset time is reached. Timer function can provides information and application related to time. Users can obtain the total time of limiting electronic load operation to increase the agility of electronic load tests.

## SPECIFICATIONS

	Power Range Voltage Current Min. Operating Voltage(dc)	300W Low 1 ~ 150V 0 ~ 6A 1V ~ 6A	300W High 1 ~ 150V 0 ~ 60A 1V ~ 60A
STATIC MODE	Constant Current Mode Range Setting Range Resolution Accuracy	0 ~ 6A 0 ~ 6.12A 0.2mA (T <sup>*1</sup> ) ± (0.1% of set + 0.1% of F.S) + Vin/500kΩ (Full scale of high range)	0 ~ 60A 0 ~ 61.2A 2mA (T <sup>*1</sup> ) ± (0.1% of set + 0.2% of F.S) + Vin/500kΩ (Full scale of high range)
	Constant Resistance Mode Range Setting Range Resolution(30000 Steps) Accuracy	60S ~ 0.002S(0.01666Ω ~ 500Ω) (300W/15V) ; 6S ~ 0.0002S(0.1666Ω ~ 5kΩ) (300W/150V) 60S ~ 0.002S(0.01666Ω ~ 500Ω) (300W/15V) ; 6S ~ 0.0002S(0.1666Ω ~ 5kΩ) (300W/150V) 0.002S(15V) ; 0.0002S(150V) (T <sup>*1</sup> ) ± (0.3% of set + 0.6S) + 0.002mS	
	Constant Voltage Mode Range Setting Range Resolution Accuracy	1 ~ 15V 0 ~ 15.3V 0.5mV (T <sup>*1</sup> ) ± (0.1% of set + 0.1% of F.S) (Full scale of Low range)	1 ~ 150V 0 ~ 153V 5mV (T <sup>*1</sup> ) ± (0.1% of set + 0.1% of F.S) (Full scale of High range)
	Constant Power Mode Range Setting Range Resolution Accuracy	3W ~ 30W(6A) 0W ~ 30.6W 1mW (T <sup>*1</sup> ) ± (0.6 % of set + 1.4 % of f.s (Full scale of H range)) + Vin/2/500 kΩ	30W ~ 300W(60A) 0W ~ 306W 10mW
DYNAMIC MODE	General T1 & T2 Accuracy Slew Rate (accuracy 10%) Slew Rate Resolution Slew Rate Accuracy of Setting	0.05mS ~ 30mS/Res : 1μS ; 30mS ~ 30S/Res : 1mS 1μS/1mS ± 200ppm 0.001 ~ 0.25A/μS 0.001A/μS ±(10% + 15μs) *1 Time to reach from 10 % to 90 % when the current is varied from 2 % to 100 % (20 % to 100 % in L range) of the rated current.	0.05mS ~ 30mS/Res : 1μS ; 30mS ~ 30S/Res : 1mS 1μS/1mS ± 200ppm 0.01 ~ 2.5A/μS 0.01A/μS
	Constant Current Mode Current Setting Range Current Resolution Current Accuracy	0 ~ 6A 0 ~ 6.12A 0.2mA ±0.8% F.S.	0 ~ 60A 0 ~ 61.2A 2mA ±0.8% F.S.
	Constant Resistance Mode Range Setting Range Resistance Resolution Resistance Accuracy	60S ~ 0.002S(0.01666Ω ~ 500Ω) (300W/15V) ; 6S ~ 0.0002S(0.1666Ω ~ 5kΩ) (300W/150V) 60S ~ 0.002S(0.01666Ω ~ 500Ω) (300W/15V) ; 6S ~ 0.0002S(0.1666Ω ~ 5kΩ) (300W/150V) 30000 steps ±(1%set + 0.6S) + 0.002mS	
MEASUREMENT	Voltage Readback Range Resolution Accuracy	0 ~ 15V 0.5mV (T <sup>*1</sup> ) ± (0.1% of rdg+0.1% of F.S)(Full scale of Low range)	0 ~ 150V 5mV (T <sup>*1</sup> ) ± (0.1% of rdg+0.1% of F.S)(Full scale of High range)
	Current Readback Range Resolution Accuracy	0 ~ 6A 0.2mA (T <sup>*1</sup> ) ± (0.1% of rdg+0.1% of F.S)(Full scale of High range)	0 ~ 60A 2mA (T <sup>*1</sup> ) ± (0.1% of rdg+0.2% of F.S)(Full scale of High range)
GENERAL	Trigger In/out Terminal(BNC) Current Monitor Output Analog External Control Soft Start Sequence(Normal/Fast) Preset Data Protection	YES YES YES YES YES 10 Sets OCP, OPP, UVP, OVP, OTP, REV	
OTHER	Power Source Interface Dimensions & Weight	100 ~ 120VAC/ 200 ~ 240VAC, 47 ~ 63Hz USB, GPIB(Optional), Analog external control 213.8(W) x 124.0(H) x 400.5(D)mm, Approx. 7.5Kg	

Note : \*1 - If the ambient temperature is over 30 °C or below 20 °C, then T = ± | t - 25 °C | x 100ppm/°C x Set  
If the ambient temperature is in the range of 20°C~30°C, then T = 0 (t is the ambient temperature)

Specifications subject to change without notice. ELC3000EGD1BH

### ORDERING INFORMATION

**PEL-3031E** 300W Programmable D.C. Electronic Load

### ACCESSORIES

CD ROM(User Manual, Programming Manual, Quick Start Guide)x1, Power Cord (Region dependent), Front Terminal Washers-spring Washer(M6)x2, GTL-105A Remote Sense Cables, Red x 1, Black x 1

### OPTIONAL ASSESSORIES

**GTL-248** GPIB cable, 2.0m  
**GTL-246** USB cable, Type A – Type B  
**PEL-010** Dust Filter  
**PEL-004** GPIB option

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