
# PEL-3000E Series

## Programmable D.C. Electronic Load



## FEATURES

- 1~150V(PEL-3031E)Min. Operating Voltage(dc) : 1V at 60A, 0.5V at 30A
  2.5~500V(PEL-3032E)Min. Operating Voltage(dc) : 2.5V at 15A, 1.25V at 7.5A
- 7 Operating Modes : CC, CV, CR, CP, CC+CV, CR+CV, CP+CV
- Fast/Normal Sequence Function
- Soft Start
- Battery Discharge Test
- OCP, OPP Test Automation
- Max. Slew Rate : 2.5A/μs
- Dynamic Mode
- Protection : OVP, OCP, OPP, OTP, RVP, UVP
- Remote Sense
- Integrate Voltage, Current and Power Measurement Functions
- 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) and PEL-3032E provides 300W(2.5V~500V/15A) current sink capability. Inherited from the PEL-3000 series, PEL-3000E 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.

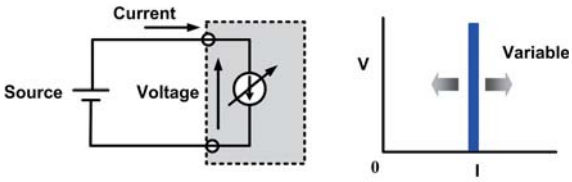
The PEL-3000E has seven operating modes. Among them, four basic operating modes are constant current, constant voltage, constant resistance, and constant power. Three other combined operating modes are constant current + constant voltage, constant resistance + constant voltage, constant power + constant 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 is the most flexible mean 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 built-in BATT Test Automation of PEL-3000E provides battery discharge applications with more flexible discharge stop setting as well as rise and fall Slew Rate for discharge current settings. OCP, OPP test Automation for DUT (ex. Power Supply), provide users with high resolution measurement values to verify DUT's activation point. Provide users with measurement results so as to help them determine whether DUT's actual over protection activation point meets the regulations. 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.

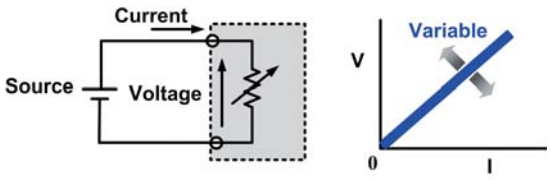
## A. OPERATING MODE

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.



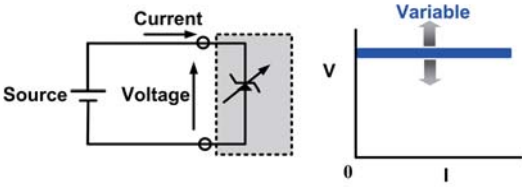

**CC Mode**

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.



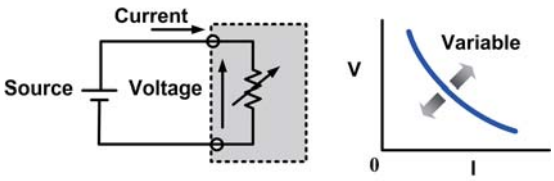

**C.R Mode**

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.



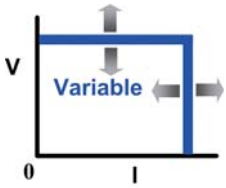

**C.V Mode**

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.

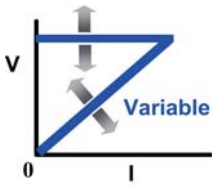



**C.P Mode**

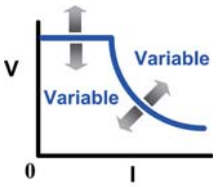
Under constant power mode, electronic load will sink load current, which is indirect proportion to input voltage to reach preset constant power requirement. Hence, the changes of input voltage will have indirect proportion effect on current sinking so as to reach constant power control.




**CC+CV Mode**




**CR+CV Mode**




**CP+CV Mode**

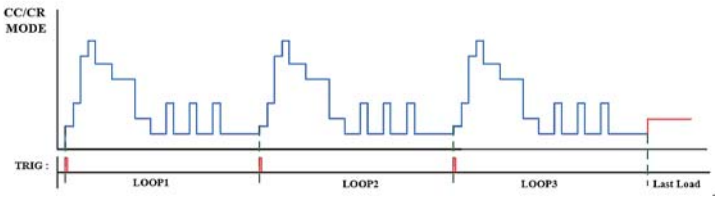
+CV mode can be selected under CC, CR or CP mode. When +CV mode function is turned on and electronic load sinks more current than the maximum current of power supply under test, electronic load will automatically switch to CV mode. It is because that the current sunk is the maximum current of power device. Therefore, power supply will switch to CC mode and PEL-3000E 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

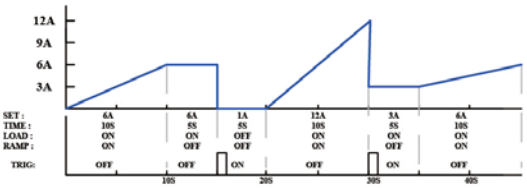
| Operation / Function | Static | Dynamic | Sequence | |
|---|---|---|---|---|
| | | | Fast | Normal |
| **Operating Condition Selection** | Single fixed condition | Selection between two conditions | Selection from more than two conditions | Selection from more than two conditions |
| **Operating Modes** | All modes | • Two conditions using same mode<br>• Support CC or CR mode | • Each condition must use same mode<br>• Support CC or CR mode | • Each condition is able to be used in different mode<br>• All modes |
| **Adjustable Condition Setting** | • Value A/ Value B<br>• Slew Rate | • Level 1/Level 2<br>• Timer 1/Timer 2<br>• Slew Rate 1/Slew Rate 2 | • Level • Others...<br>• Timer<br>• Slew Rate | • Level • Others...<br>• Timer<br>• Slew Rate |
| **Sequence Step Combination** | N/A | N/A | • 1 Sequence • 25μs/step<br>• 1,000 steps | • 10 Sequence • 1ms/step<br>• 1,000 steps |
| **Other Functions** | N/A | Trigger Out function | Trigger Out function | • Trigger Out function<br>• Ramp function |

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.

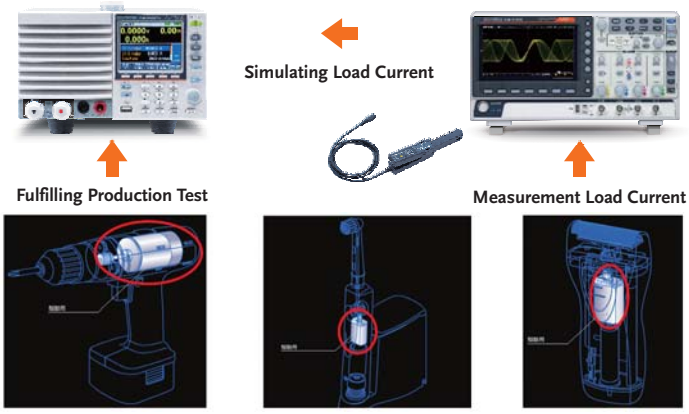
## C. FAST SEQUENCE & NORMAL SEQUENCE




Fast Sequence Diagram

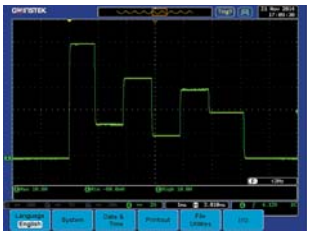



Normal Sequence Diagram




Power-driven Tools Simulation Test

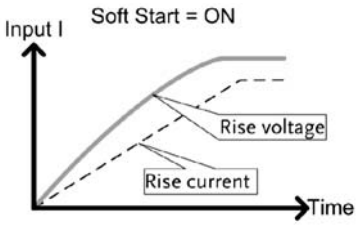
Set a complete sequence editing function to obtain following waveforms. Users can save development cost and time without using a PC to control electronic load and writing programs.



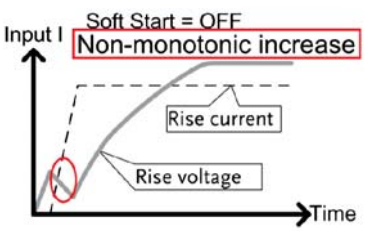
When operating the Sequence Function, PEL-3000E Series follows the time and load settings of step1, step2, step3, etc. so as to realize different load current variation.

Ramp function of PEL-3000E Series is able to set the current transition. When turned on, the current takes on a slope form; when turned off, the current takes on a step form.

## D. SOFT START



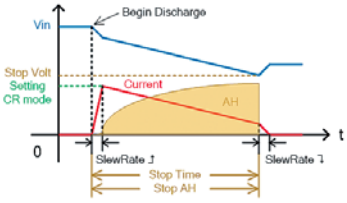

The Soft Start function of PEL-3000E Series allows users to determine the rise time of current sink that is to decide how much time is required to reach electronic load's set current, resistance or power value. PEL-3000E's soft start function prevents inrush current and surge voltage from happening on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



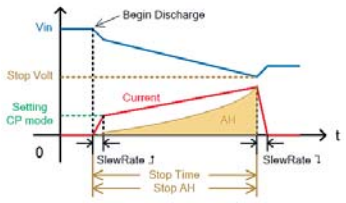

For instance, test applications using a power supply, LED and a DC load (activate the soft start function) can prevent inrush current and surge voltage from causing damages on LED.

## E. BATT TEST AUTOMATION


CC Mode




CR Mode

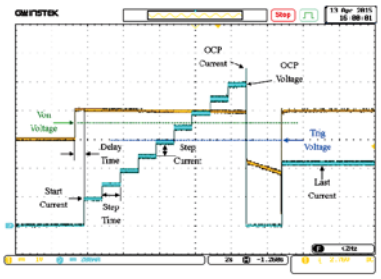



CP Mode


BATT Test Automation Editing

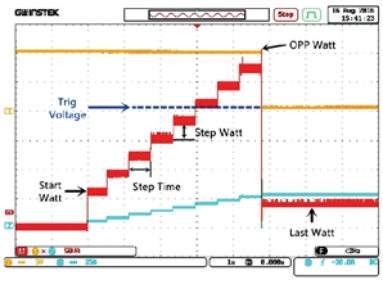
The built-in BATT Test Automation of PEL-3000E provides battery discharge applications with more flexible discharge stop time setting as well as rise and fall Slew Rate for discharge current settings. Under CP, CC or CR mode, the conditions for stop discharge can be set respectively. For instance, set the input voltage for stop discharge current, the execution time for discharge current or total discharge current*time (AH) to satisfy the verification of battery capability.

## F. OCP TEST AUTOMATION



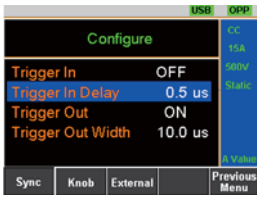

OCP test Automation for DUT(Power Supply), Provide users with high resolution OCP measurement values to verify DUT's OCP activation point. Provide users with measurement results so as to help them determine whether DUT's actual OCP activation point meets the regulations. Test the value of OCP by setting load current increment from start current to stop current. OCP's activation point can be accurately measured.

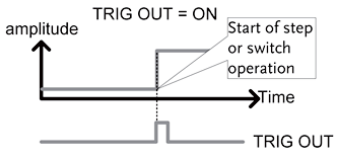
## G. OPP TEST AUTOMATION

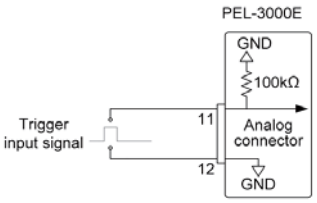



OPP test Automation for DUT(Power Supply), Provide users with high resolution OPP measurement values to verify DUT's OPP activation point. Provide users with measurement results so as to help them determine whether DUT's actual OPP activation point meets the regulations. Test the value of OPP by setting power increment from start power to stop power. OPP's activation point can be accurately measured.

## H. TRIGGER IN/OUT BNC



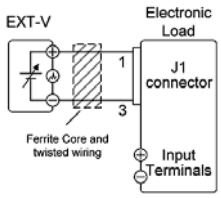




Trigger In/Out function could be turned on or off by CONFIGURE setting of PEL-3000E. The Trigger Input can be set the delay time while the Trigger Out Pulse Width can be set as well.

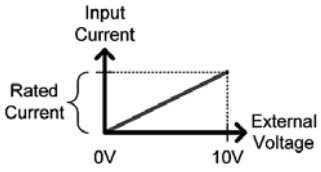
The trigger output signal is generated every time a switching operation is performed such as Dynamic mode or Fast/Normal sequence is executed when the trig out parameter is enabled. The trigger output signal from TRIG OUT BNC is a 4.5V pulse of at least 2us with an impedance of 500ohm. The common potential is connected to the chassis potential. The signal threshold level is TTL.

The TRIG IN BNC on the rear panel is used to resume a sequence after a pause. This action is useful to synchronize the execution of a sequence with another device. To resume a pause sequence, apply a high signal for 10us or more. The TRIG IN BNC is pulled down to earth internally using a 100Kohm resistor.

## I. ANALOG EXTERNAL CONTROL

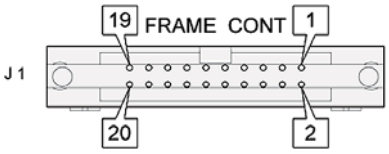



**External Voltage Control**

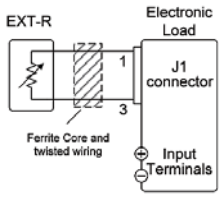



**CC Mode**

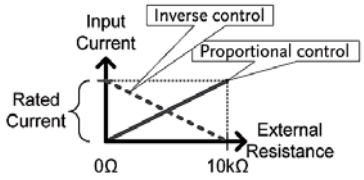
**Input current = rated current x (external voltage/10)**




**J1 Connector**




**External Resistance Control**




**CC Mode**

**Proportional Control:Input current = rated current x (external resistance/10K ohm)**

**Inverse Control:Input current = rated current x (1- external resistance/10k ohm)**

The PEL-3000E series provides the external analog channel control function, which allows users to connect J1 connectors on the rear panel to input voltage or to connect resistance to control electronic load operation. Users can integrate this function into test system and utilize signals generated from the test system to control PEL-3000E.

## J. PROTECTION MODES

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

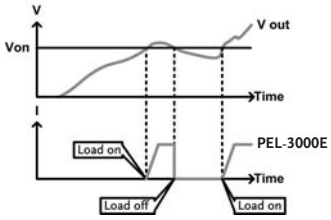
The PEL-3000E series provides many protective functions including over current protection (OCP), over voltage protection (OVP), over power protection (OPP), over temperature protection (OTP) and under voltage protection (UVP). Except for OTP, all thresholds of protective functions are adjustable. When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

CE USB GPIB Analog Control

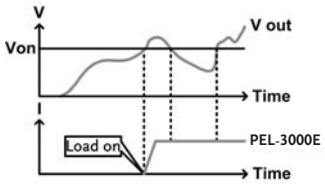
1. Power Key
2. Short
3. Load On/Off
4. Scroll wheel
5. USB
6. Sense +/-
7. Input terminals
8. LCD Display
9. Function keys
10. Analog control ports
11. Triggr out port
12. Trigger in port
13. Power socket
14. GPIB (optional)
15. USB device

## K. 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



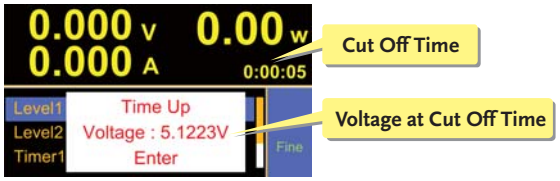

**Von Latch = ON**

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.

## L. TIMER FUNCTIONS


**Elapsed Time**

The PEL-3000E 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

| | | PEL-3031E | | PEL-3032E | |
|---|---|---|---|---|---|
| | Model | | | | |
| | Power | 300W | 300W | 300W | 300W |
| | Range | Low | High | Low | High |
| | Voltage | 1 ~ 150V | 1 ~ 150V | 2.5 ~ 500V | 2.5 ~ 500V |
| | Current | 0 ~ 6A | 0 ~ 60A | 0 ~ 1.5A | 0 ~ 15A |
| | Min. Operating Voltage(dc) | 1V ~ 6A | 1V ~ 60A | 2.5V ~ 1.5A | 2.5V ~ 15A |
| STATIC MODE | Constant Current Mode | | | | |
| | Range | 0 ~ 6A | 0 ~ 60A | 0 ~ 1.5A | 0 ~ 15A |
| | Setting Range | 0 ~ 6.12A | 0 ~ 61.2A | 0 ~ 1.53A | 0 ~ 15.3A |
| | Resolution | 0.2mA | 2mA | 0.05mA | 0.5mA |
| | Accuracy | (T*1)±(0.1% of set + 0.1% of F.S)+Vin/500kΩ (Full scale of high range) | (T*1)±(0.1% of set + 0.2% of F.S)+Vin/500kΩ (Full scale of high range) | (T*1)±(0.1% of set + 0.1% of F.S)+Vin/500kΩ (Full scale of high range) | (T*1)±(0.1% of set + 0.2% of F.S)+Vin/500kΩ (Full scale of high range) |
| | Constant Resistance Mode | | | | |
| | Range | 60S ~ 0.002S(0.01666Ω ~ 500Ω)(300W/15V) ; 6S ~ 0.0002S(0.1666Ω ~ 5kΩ)(300W/150V) | | 6S ~ 0.0002S(0.16666Ω ~ 5kΩ)(300W/50V) ; 0.6S ~ 0.00002S(1.6666Ω ~ 50kΩ)(300W/500V) | |
| | Setting Range | 60S ~ 0.002S(0.01666Ω ~ 500Ω )(300W/15V) ; 6S ~ 0.0002S(0.1666Ω ~ 5kΩ)(300W/150V) | | 6S ~ 0.0002S(0.16666Ω ~ 5kΩ )(300W/50V) ; 0.6S ~ 0.00002S(1.6666Ω ~ 50kΩ)(300W/500V) | |
| | Resolution(30000 Steps) | 0.002S(15V) ; 0.0002S(150V) | | 0.0002S(50V) ; 0.00002S(500V) | |
| | Accuracy | (T*1)±(0.3% of set + 0.6S) + 0.002mS | | (T*1)±(0.3% of set + 0.06S) + 0.002mS | |
| | Constant Voltage Mode | | | | |
| | Range | 1 ~ 15V | 1 ~ 150V | 2.5 ~ 50V | 2.5 ~ 500V |
| | Setting Range | 0 ~ 15.3V | 0 ~ 153V | 0 ~ 51V | 0 ~ 510V |
| | Resolution | 0.5mV | 5mV | 1mV | 10mV |
| | Accuracy | (T*1)±(0.1% of set + 0.1% of F.S) (Full scale of Low range) | (T*1)±(0.1% of set + 0.1% of F.S) (Full scale of High range) | (T*1)±(0.1% of set + 0.1% of F.S) (Full scale of Low range) | (T*1)±(0.1% of set + 0.1% of F.S) (Full scale of High range) |
| | Constant Power Mode | | | | |
| | Range | 0W ~ 30W(6A) | 0W ~ 300W(60A) | 0W ~ 30W(1.5A) | 0W ~ 300W(15A) |
| | Setting Range | 0W ~ 30.6W | 0W ~ 306W | 0W ~ 30.6W | 0W ~ 306W |
| | Resolution | 1mW | 10mW | 1mW | 10mW |
| | Accuracy | (T*1)±(0.6 % of set + 1.4 % of f.s (Full scale of H range)) + Vin∧2/500 kΩ | | | |
| DYNAMIC MODE | General | | | | |
| | T1& T2 | 0.05mS ~ 30mS/Res : 1μS; 30mS ~ 30S/Res : 1mS | | 0.05mS ~ 30mS/Res : 1μS; | 30mS ~ 30S/Res : 1mS |
| | Accuracy | 1μS/1mS ± 200ppm | 1μS/1mS ± 200ppm | 1μS/1mS ± 200ppm | 1μS/1mS ± 200ppm |
| | Slew Rate (Accuracy 10%) | 0.001 ~ 0.25A/μS | 0.01 ~ 2.5A/μS | 0.25 ~ 62.5mA/μS | 2.5 ~ 625mA/μS |
| | Slew Rate Resolution | 0.001A/μS | 0.01A/μS | 0.25mA/μS | 2.5mA/μS |
| | Slew Rate Accuracy of Setting | ±(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. | | | |
| | Constant Current Mode | | | | |
| | Current | 0 ~ 6A | 0 ~ 60A | 0 ~ 1.5A | 0 ~ 15A |
| | Setting Range | 0 ~ 6.12A | 0 ~ 61.2A | 0 ~ 1.53A | 0 ~ 15.3A |
| | Current Resolution | 0.2mA | 2mA | 0.05mA | 0.5mA |
| | Current Accuracy | ±0.8% F.S. | ±0.8% F.S. | ±0.8% F.S. | ±0.8% F.S. |
| | Constant Resistance Mode | | | | |
| | Range | 60S ~ 0.002S(0.01666Ω ~ 500Ω)(300W/15V) 6S ~ 0.0002S(0.1666Ω ~ 5kΩ )(300W/150V) | | 6S ~ 0.0002S(0.16666Ω ~ 5kΩ)(300W/50V) 0.6S ~ 0.00002S(1.6666Ω ~ 50kΩ )(300W/500V) | |
| | Setting Range | 60S ~ 0.002S(0.01666Ω ~ 500Ω )(300W/15V) 6S ~ 0.0002S(0.1666Ω ~ 5kΩ )(300W/150V) | | 6S ~ 0.0002S(0.16666Ω ~ 5kΩ )(300W/50V) 0.6S ~ 0.00002S(1.6666Ω ~ 50kΩ )(300W/500V) | |
| | Resistance Resolution | 30000 steps | | 30000 steps | |
| | Resistance Accuracy | (T*1)±(1%set + 0.6S) + 0.002mS | | (T*1)±(1%set + 0.06S) + 0.002mS | |
| MEASUREMENT | Voltage Readback Range | 0 ~ 15V | 0 ~ 150V | 0 ~ 50V | 0 ~ 500V |
| | Resolution | 0.5mV | 5mV | 2mV | 20mV |
| | Accuracy | (T*1)±(0.1% of rdg+0.1% of F.S) (Full scale of Low range) | (T*1)±(0.1% of rdg+0.1% of F.S) (Full scale of High range) | (T*1)±(0.1% of rdg+0.1% of F.S) (Full scale of Low range) | (T*1)±(0.1% of rdg+0.1% of F.S) (Full scale of High range) |
| | Current Readback Range | 0 ~ 6A | 0 ~ 60A | 0 ~ 1.5A | 0 ~ 15A |
| | Resolution | 0.2mA | 2mA | 0.05mA | 0.5mA |
| | Accuracy | (T*1)±(0.1% of rdg+0.1% of F.S) (Full scale of High range) | (T*1)±(0.1% of rdg+0.2% of F.S) (Full scale of High range) | (T*1)±(0.1% of rdg+0.1% of F.S) (Full scale of High range) | (T*1)±(0.1% of rdg+0.2% of F.S) (Full scale of High range) |
| GENERAL | Trigger In/out Terminal(BNC) | YES | | | |
| | Current Momitor Output | YES | | | |
| | Analog External Control | YES | | | |
| | Soft Start | YES | | | |
| | Sequence(Normal/Fast) | YES | | | |
| | BATT Test Automation | YES | | | |
| | OCP Autotest Function | YES | | | |
| | OPP Autotest Function | YES | | | |
| | Preset Data | 10 Sets | | | |
| | Protection | OCP, OPP, UVP, OVP, OTP, RVP | | | |
| OTHER | Power Source | 100 ~ 120VAC/ 200 ~ 240VAC, 47 ~ 63Hz | | | |
| | Interface | USB, GPIB(Option), Analog control | | | |
| | Dimensions & Weight | 213.8(W) x 124.0(H) x 400.5(D)mm, Approx. 7.5Kg | | | |

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

Specifications subject to change without notice. EL-3000EGD1BH

## ORDERING INFORMATION

**PEL-3031E** 150V/60A/300W Programmable Single-channel D.C. Electronic Load
**PEL-3032E** 500V/15A/300W Programmable Single-channel D.C. Electronic Load

## ACCESSORIES

Quick Start Guide, CD ROM (User Manual, Programming Manual)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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