# DC Electronic Load

PEL-3000E

**QUICK START GUIDE**

**GWINSTEK PART NO. 82EL-3KE00MC1**

ISO-9001 CERTIFIED MANUFACTURER



**Good Will Instrument Co., Ltd. No. 7-1, Jhongsing Rd., Tucheng Dist., New Taipei City 236, Taiwan.**

# SAFETY INSTRUCTIONS

This section contains the basic safety symbols that may appear on the accompanying User Manual CD or on the instrument. For detailed safety instructions and precautions, please see the Safety Instructions chapter in the user manual CD.

## Safety Symbols

These safety symbols may appear in the user manual or on the instrument.

| | |
|---|---|
| Warning | Warning: Identifies conditions or practices that could result in injury or loss of life. |
| Caution | Caution: Identifies conditions or practices that could result in damage to the instrument or to other properties. |
| | DANGER High Voltage |
| | Attention Refer to the Manual |
| | Earth (ground) Terminal |
| | Frame or Chassis Terminal |
| | Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased. |

## Power Cord for the United Kingdom

When using the instrument in the United Kingdom, make sure the power cord meets the following safety instructions.

NOTE: This lead/appliance must only be wired by competent persons.

WARNING: THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in this lead are coloured in accordance with the following code:

| | |
|---|---|
| Green/ Yellow: | Earth |
| Blue: | Neutral |
| Brown: | Live (Phase) |

As the colours of the wires in main leads may not correspond with the coloured marking identified in your plug/appliance, proceed as follows:

The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with either the letter E, the earth symbol or coloured Green/Green & Yellow.

The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured Blue or Black.

The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.

If in doubt, consult the instructions provided with the equipment or contact the supplier.

This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, a cable of 0.75mm² should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A types, depending on the connection method used.

Any exposed wiring from a cable, plug or connection that is engaged in a live socket is extremely hazardous. If a cable or plug is deemed hazardous, turn off the mains power and remove the cable, any fuses and fuse assemblies. All hazardous wiring must be immediately destroyed and replaced in accordance to the above standard.

# GETTING STARTED

The Getting Started chapter introduces the instrument's main features, appearance, and set up procedure.

## Overview

The PEL-3000E is an economic, standalone, high performance DC electronic load positioned to test a wide range of different power sources. The DC electronic load is fully programmable to simulate anything from basic static loads to complex dynamic loads. The PEL-3000E is extremely robust and capable of molding to any test environment.

## Model Line Up

| Model | Operating Voltage (DC) | Current | Power |
|---|---|---|---|
| PEL-3031E | 1V-150V | 6A (Low range)<br>60A (High range) | 300W |
| PEL-3032E | 2.5V-500V | 1.5A (Low range)<br>15A (High range) | 300W |

## Main Features

| | |
|---|---|
| Performance | • High slew rates of up to 2.5A/µs for a fast response speed (PEL-3031E)<br>• High resolution – 16 bit |
| Features | • 7 operating modes: CC, CV, CR, CP, CC+CV, CR+CV, CP+CV<br>• Fully programmable with normal and fast sequences<br>• Soft start<br>• Dynamic mode<br>• OCP, OVP and other protection features<br>• Remote sense<br>• Integrated meter<br>• Rack-mountable |
| Interface | • USB<br>• RS-232 (optional)<br>• GPIB (optional)<br>• LAN (optional)<br>• External voltage or resistance control<br>• Rear panel trigger in/out BNC<br>• Analog external control |

## Package Contents and Accessories

**Standard Accessories**

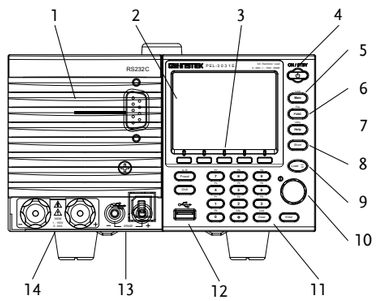
| Item | Part Number |
|---|---|
| User /Programming Manual CD | |
| Quick Start Guide (this document) | |
| Power Cord x1 | Region Dependent |
| Front terminal washers (M6) x2 | 61SF-062104N1 |
| Remote sense cables, red x1, black x1 | GTL-105A |

**Optional Accessories**

| Item | Part Number |
|---|---|
| GPIB cable, 2.0m | GTL-248 |
| USB cable, Type A - Type B | GTL-246 |
| Dust filter | PEL-010 |
| GPIB card | PEL-004 |
| LAN card | PEL-018 |
| Rack mount frame for PEL-3000 series (JIS) | GRA-414-J |
| Rack mount frame for PEL-3000 series (EIA) | GRA-414-E |

| Factory Installed Optional | Part number | Description |
|---|---|---|
| | RS-232 | RS-232 interface |

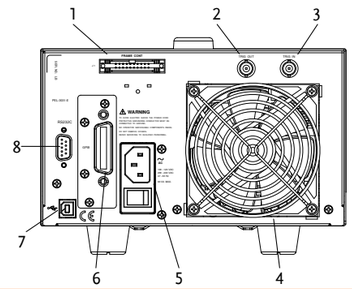
## Front Panel




**Description**

| | | | |
|---|---|---|---|
| 1. | Air inlet | 2. | LCD Display |
| 3. | Function keys | 4. | Power key |
| 5. | Main/Local key | 6. | FUNC/File key |
| 7. | Help/Utility key | 8. | Short key |
| 9. | Load On/Off | 10. | Scroll wheel |
| 11. | Number pad, Clear/Lock and Enter keys | 12. | USB port, Preset and Shift keys |
| 13. | Sense-, Sense+ terminals | 14. | Input terminals |

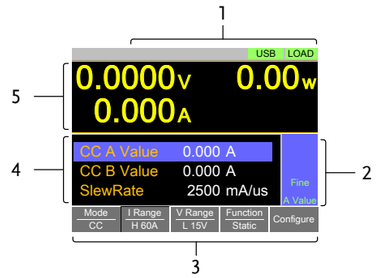
## Rear Panel




**Description**

| | | | |
|---|---|---|---|
| 1. | J1 Frame control ports | 2. | TRIG OUT BNC |
| 3. | TRIG IN BNC | 4. | Exhaust fan |
| 5. | Power socket and switch | 6. | GPIB (optional) |
| 7. | USB device port | 8. | RS232C (Factory installed optional) |

## Display Overview




**Description**

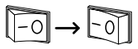
| | | | |
|---|---|---|---|
| 1. | Main frame status panel | 2. | Operation status panel |
| 3. | Soft keys | 4. | Setting area |
| 5. | Measurement area | | |

## First Time Use Instructions

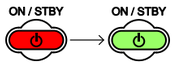
Use the following procedures when first using the PEL-3000E to power up the instrument, restore the factory default settings and check the firmware version. Lastly, the Conventions section will introduce you to the basic operating conventions used throughout the user manual.

## Power Up

1. Insert the AC power cord into the power socket.
2. Turn the power switch on from the rear panel. (O → —)



3. If the unit doesn't turn on, press the ON/STBY key on the front panel.
   - The ON/STBY key will go from standby (red) to ON (green).




4. The unit will show the splash screen and then load the settings from when the unit was last powered down.

## Load Default Settings

When first using the PEL-3000E, recall the factory default settings to ensure the unit is in a known state. See the user manual for a list of the default settings.

1. Press Shift + FUNC (File).
2. Select *Media/Default [F1]*.
3. Select *Factory Default [F2]*.
4. Press *Factory Default [F2]* again to confirm.

## Updating the Firmware

The PEL-3000E allows the firmware to be updated by end-users. Before using the PEL-3000E, please check the GW Instek website or ask your local distributor for the latest firmware. Before updating the firmware, please check the firmware version.

### View Firmware Version

1. Press Shift + Help (Utility).
2. Select *System/Info[F1]*.
3. The system information is listed in the display.
   - Model: PEL-303XE
   - Serial Number: XXXXXXXX
   - Firmware Ver.: 1.XX
   - GW Instek website address.

### Firmware update

1. Press Shift + FUNC (File).
2. Select *USB* with the *Media [F1]* soft-key.
3. Press the *File Utility [F5]* soft-key.
4. Select the *.UPG upgrade file and press *Select[F1]* twice. Once to select the file and once to confirm.
5. Wait for the update to complete and reset the power.

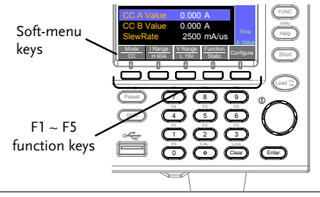
⚠ Warning: Do not turn the load generator off or remove the USB memory when the firmware is being read or upgraded.

## Conventions

The following conventions are used throughout the user manual. Read the conventions below for a basic grasp of how to operate the PEL-3000E menu system using the front panel keys.

### Soft-menu keys

The F1 to F5 function keys at the bottom of the display correspond directly to the soft-menu keys on top.




### Select Sub Menu

Configure

Pressing this type of soft-menu key will enter a submenu.

### Toggle Parameter or State

Mode — Function/Item
CC — Parameter or State

This type of soft-menu icon has the function/item on the top of the label and the selected setting or mode on the bottom of the label.

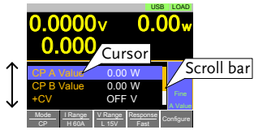
Repeatedly press the associated function key (F1-F5) to cycle through each setting.

For some parameters, a popup window will also appear. Selection of the setting is the same. Repeatedly pressing the relevant function key (F1-F5) will cycle through each setting.

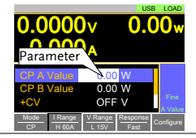
### Parameter Input

The scroll wheel, Enter key and number pad can be used to edit parameter values.

1. Use the scroll wheel to move the cursor to the desired parameter.
   - A scroll bar is shown when there are additional parameters off-screen.




2. Press the Enter key to select the parameter.
3. Then use the number pad* or scroll wheel** to edit the parameter value.

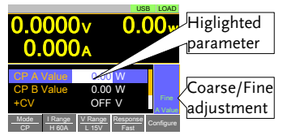



### Clearing a Value*

*When editing a parameter with the number pad, pressing the Clear key will restore the parameter to the previous value.

### Coarse/Fine Adjustment**

**When a parameter is highlighted (step 3 above) pressing the scroll wheel will toggle the scroll wheel resolution between fine and coarse.



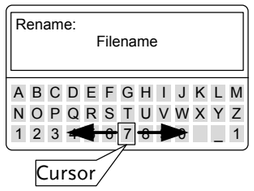

Note: There is a second method of fine adjustment that allows you to edit parameters one digit value at a time using the scroll wheel. This is called Cursor mode. Please see the user manual for more information.

### Entering Alphanumeric Characters

When renaming files, creating memos or notes, you will be required to enter alphanumeric characters when the character entry screen appears.

- Only alphanumeric characters as well as space [ ], underscore [_] and minus [-] characters are allowed.

1. Use the scroll wheel to move the cursor to the desired character.




2. Press the Enter key or *Enter Character[F1]* to select a character.
3. To delete a character, press *Back Space[F2]*.
4. To save the file name or memo, press *Save[F3]*.

# SPECIFICATIONS

The following are the basic specifications for the PEL-3000E. For detailed specifications, please see the user manual.

## Overall

| Model | PEL-3031E | | PEL-3032E | |
|---|---|---|---|---|
| Power | 300W | | 300W | |
| Range | Low | High | Low | High |
| Voltage | 1-150V | | 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

| Range | Low | High | Low | High |
|---|---|---|---|---|
| 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) | |
| Constant Resistance Mode | | | | |
| Range | 60S-0.002S (0.01666Ω-500Ω) (300W/15V) | | 6S-0.0002S (0.16666Ω-5kΩ) (300W/50V) | |
| | 6S-0.0002S (0.1666Ω-5kΩ) (300W/150V) | | 0.6S-0.00002S (1.6666Ω-50kΩ) (300W/500V) | |
| Setting Range | 60S-0.002S (0.01666Ω -500Ω) (300W/15V) | | 6S-0.0002S (0.16666Ω -5kΩ) (300W/50V) | |
| | 6S-0.0002S (0.1666Ω-5kΩ) (300W/150V) | | 0.6S-0.00002S (1.6666Ω-50kΩ) (300W/500V) | |
| Resolution (30000 steps) | 0.002S(15V) | | 0.0002S(50V) | |
| | 0.0002S(150V) | | 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) | |
| Input Current Variation *2 | 12mV | | 40mV | |
| Constant Power Mode | | | | |
| Range | 3-30W (6A) | 30-300W (60A) | 3-30W (1.5A) | 30-300W (15A) |
| Setting range | 0-30.6W | 0-306W | 0-30.6W | 0-306W |
| Resolution | 1mW | 10mW | 1mW | 10mW |
| Accuracy | (T*1) ± (0.6 % of set + 1.4 % of f.s (Full scale of H range)) + Vin2/500kΩ | | | |

*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 is in the range of 20 ~ 30°C, then T = 0 (t is the ambient temperature)
*2: With respect to a change in the current of 10% to 100% of the rating at an input voltage of 1V or 2.5V (during remote sensing).

## Dynamic Mode

| Range | Low | High | Low | High |
|---|---|---|---|---|
| General | | | | |
| T1 & T2 | 0.05mS - 30mS / Res : 1uS | | | |
| | 30mS - 30S / Res : 1mS | | | |
| Accuracy | 1uS / 1mS ± 200ppm | | | |
| Slew Rate (Accuracy 10%) | 0.001-0.25A/uS | 0.01-2.5A/uS | 0.25-62.5mA/uS | 2.5-625mA/uS |
| Slew Rate Resolution | 0.001A/uS | 0.01A/uS | 0.25mA/uS | 2.5mA/uS |
| Slew Rate Accuracy of Setting*1 | ±(10% + 15us) | | ±(10% + 15us) | |
| Constant Voltage Mode | | | | |
| Range | Low | High | Low | High |
| 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. | | | |
| Constant Resistance Mode | | | | |
| Resistance | 60S-0.002S (0.01666Ω-500Ω) (300W/15V) | | 6S-0.0002S (0.16666Ω-5kΩ) (300W/50V) | |
| | 6S-0.0002S (0.1666Ω-5kΩ) (300W/150V) | | 0.6S-0.00002S (1.6666Ω-50kΩ) (300W/500V) | |
| Setting range | 60S-0.002S (0.01666Ω-500Ω) (300W/15V) | | 6S-0.0002S (0.16666Ω-5kΩ) (300W/50V) | |
| | 6S-0.0002S (0.1666Ω-5kΩ) (300W/150V) | | 0.6S-0.00002S (1.6666Ω-50kΩ) (300W/500V) | |
| Resistance Accuracy | 30000 Steps ±(1%set + 0.6S)+0.002mS | | 30000 Steps ±(1%set + 0.06S)+0.002mS | |

*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.

## Declaration of Conformity

We
**GOOD WILL INSTRUMENT CO., LTD.**
declare that the below mentioned product
**Type of Product:** Programmable Electronic Load
**Model Number:** PEL-3000E
is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility (2014/30/EU), Low Voltage Directive (2014/35/EU), WEEE (2012/19/EU) and RoHS (2011/65/EU).
For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Directive, the following standards were applied:
◎ EMC

| EN 61326-1<br>EN 61326-2-1 | Electrical equipment for measurement, control and laboratory use -- EMC requirements (2013) |
|---|---|
| Conducted & Radiated Emission<br>EN 55011: 2009+A1:2010 Class A | Electrical Fast Transients<br>EN 61000-4-4: 2012 |
| Current Harmonics<br>EN 61000-3-2: 2014 | Surge Immunity<br>EN 61000-4-5: 2006 |
| Voltage Fluctuations<br>EN 61000-3-3: 2013 | Conducted Susceptibility<br>EN 61000-4-6: 2014 |
| Electrostatic Discharge<br>EN 61000-4-2: 2009 | Power Frequency Magnetic Field<br>EN 61000-4-8: 2010 |
| Radiated Immunity<br>EN 61000-4-3: 2006+A1:2008+A2:2010 | Voltage Dip/ Interruption<br>EN 61000-4-11: 2004 |
| Low Voltage Equipment Directive 2014/35/EU | |
| Safety Requirements | EN 61010-1: 2010<br>EN 61010-2-030: 2010 |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