



PEL-3000A/3000AH Series

Programmable DC Electronic Load

FEATURES

- Operating Voltage (DC) : 0 V to 150 V(PEL-3000A)/0 to 800 V(PEL-3000AH)
- Operating Mode : CC/CV/CR/CP/CC+CV/CR+CV/CP+CV
- Parallel Connection of Inputs for Higher Capacity (Max : 9,450 W)
- Support of High Slew Rate : Max 16 A/ μ s(PEL-3000A)/0.84 A/ μ s(PEL-3000AH)
- Run Program Function (Go/NoGo Test)
- Sequence Function for High Efficient Load Simulations
- Dynamic (Switching) Function : 0.0166 Hz to 20 kHz
- Soft Start Function : Off/On (1 ms to 200 ms, Res. 1 ms)
- Adjustable OCP/OVP/OPP/UVP Setting
- Short Circuit Function
- Timer Function : Elapsed Time of Load on
- Cut Off Time (Auto Load Off Timer) : 1 s to 999 h 59 min 59 s or Off
- External Channel Control/Monitoring Via Analog Control Connector
- Setup Memories : 100 sets
- 3.5 Inch TFT LCD Display
- Multi Interface : USB, RS-232/RS-485/LAN, GPIB(Optional)

GW INSTEK
Simply Reliable

Flexible Power Combinations, High-Speed and Versatile Load Simulations

The PEL-3000A Series, a single-channel, programmable DC electronic load with 0.01 mA current resolution and 16 A/ μ s current Slew Rate, is very ideal for testing SPS (Switching Power Supply) for commercial and industrial computers. The flexible power combination of PEL-3000A Series meets the test requirements of present high-power power supply. The PEL-3000AH Series programmable DC Electronic load, which not only inherited functions and features from the PEL-3000A Series but providing three current ranges for all PEL-3000AH Series and adding voltage monitor BNC terminals on the front panel. The PEL-3000AH Series, a single-channel, programmable DC electronic load with 800 V and 0.84 A/ μ s current Slew Rate, is ideal for the test of the high voltage devices such as DC/DC converters or high-voltage batteries. With respect to battery testing applications such as rechargeable battery for electrical tools, battery module and automobile battery, PEL-3000A(AH) Series has three stand-alone models to offer including 175 W, 350 W, 1050 W and Booster. By connecting Booster 2100 W units with master units, the maximum load capacity of the whole system can reach 9,450 W. Hence, the PEL-3000A(AH) Series fulfills various power testing requirements including medium to low power or high-power power supply.

The PEL-3000A(AH) Series has seven operating modes and three operating functions. Among the seven operating modes, four of them are basic operating modes, including constant current, constant voltage, constant resistance, and constant power, and the other three are advanced operating modes including constant current + constant voltage, constant resistance + constant voltage, and constant power + constant voltage. Users must first select operating mode and then operating function based upon the test requirements. Static, Dynamic and Sequence operating functions can be applied to different testing conditions including a fixed load level, switching between two levels or switching among more than two levels. Sequence function is divided into Fast Sequence and Normal Sequence according to the test time of each step. Both Dynamic and Sequence are to assist users to simulate the genuine load change. For instance, PEL-3000A(AH) Series can simulate HEV current consumption to make sure that automobile battery can supply HEV with sufficient power need on the road. By so doing, manufacturers can elevate product quality and reliability.

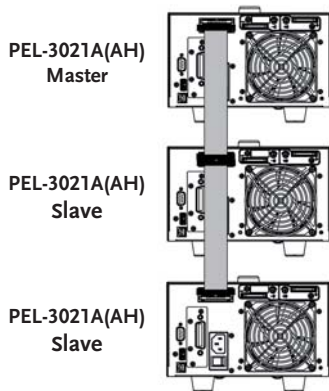
The Soft Start function of the PEL-3000A(AH) Series can set current rise time for the moment PEL-3000A(AH) Series is turned on to reduce the abnormal situation of the voltage drop of power supply under test. The adjustable Under Voltage Protection (UVP), GO/NO GO voltage input monitoring function, current monitoring function and Timer Function to control load activation time can be jointly applied to the characteristic tests of battery bleeding to avoid battery damage during bleeding operation. Based upon the functionalities described above, the PEL-3000A(AH) Series can test a vast variety of power supply ranging from the fundamental static sink current to complex dynamic load simulations so as to enhance product quality and reliability.

The single unit D.C Electronic Load of PEL-3000A(AH) Series

The PEL-3000A(AH) Series is a high speed, single channel and programmable D.C. electronic load and its power, functionality, parallel combination and size are listed on the following chart :

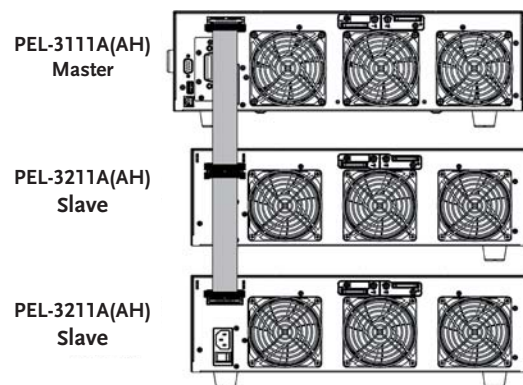
MODEL	PEL-3021A(AH)	PEL-3041A(AH)	PEL-3111A(AH)	PEL-3211A(AH)
Power	175 W	350 W	1,050 W	2,100 W Booster
Function	Full-function Single Unit	Full-function Single Unit	Full-function Single Unit	No control panel, can not be operated alone
Parallel Combination	Parallel with same model, 5 units the maximum	Parallel with same model, 5 units the maximum	Parallel with same model, 5 units the maximum Parallel with the maximum of four PEL-3211A(AH)s	Parallel with PEL-3111A(AH)
Size	Half Rack	Half Rack	Full Rack	Full Rack

A. OPERATING FUNCTION FOR MASTER AND SLAVE IN PARALLEL



Three PEL-3021A(AH) in Parallel

PEL-3000A(AH) Series connects with loads via MIL 20-pin interface and connecting cables to designate a master to control other slave units in parallel. One PEL-3111A(AH) and four PEL-3211A(AH) in parallel provide the maximum power of 9,450 W.



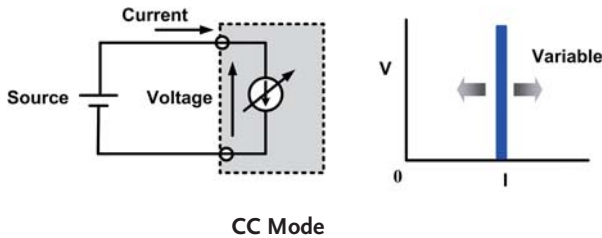
One PEL-3111A(AH) connects with two PEL-3211A(AH) in Parallel

Parallel arrangement allows users to flexibly select and apply different power arrangement which enhances equipment utilization efficiency to save R&D cost.

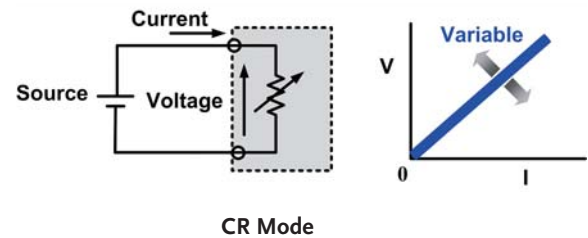
B. OPERATING MODE

The PEL-3000A(AH) 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.

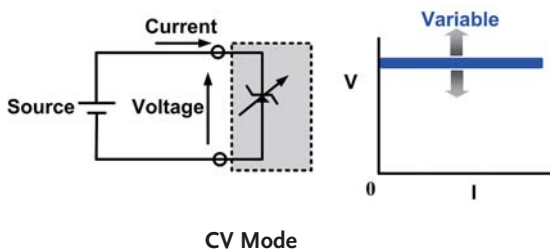
The input voltage range has two levels - high and low. The load current operating range has three levels - high, medium and low current levels which possess different resolution to meet test requirements of different power product specifications.



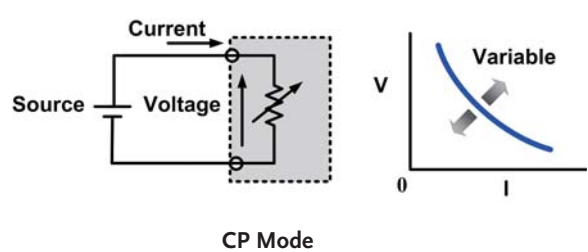
Under constant current mode, electronic load will sink the amount of current users has set. Different current settings via CC mode allow users to test the voltage changes of DC power supply which is called load regulation test.



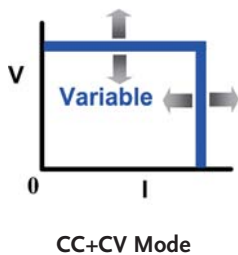
Under constant resistance mode, electronic load will sink load current, which is linearly direct proportion to input voltage. This mode can be utilized in testing voltage or the activation and current limit of power supply.



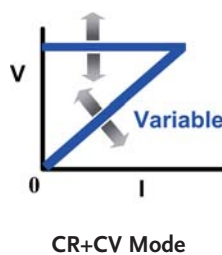
Under constant voltage mode, electronic load will sink sufficient current to regulate the voltage source to the set value. This mode allows users not only to test current limit function of power supply, but also to simulate battery operation in testing battery chargers.



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,



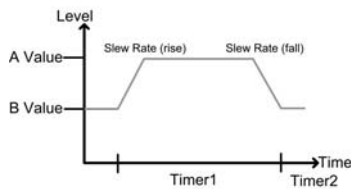
power supply will switch to CC mode and PEL-3000A(AH) will switch to CV mode to limit electronic load from sinking the total current of power supply so as to prevent power supply under test from damaging. Electronic load will cease operation once the voltage of DUT is lower than the set voltage under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

C. THREE OPERATING FUNCTIONS

The PEL-3000A(AH) series, according to different test conditions, step or continuous changes, test speeds, and selectable modes, has three operating functions: Static, Dynamic and Sequence, which can be separately applied on a fixed load test; between two loads; or among more than two loads. Detailed descriptions of these functions are as follows:

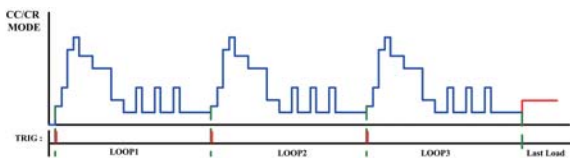
Static function provides a fixed load to test output stability of power supply. Switching load value A to B will be manually operated. Under Dynamic function, two test conditions can be switched automatically and every set of parameter includes Level, Timer and Slew Rate. Timer can be set to the fastest of 25 μ s to accommodate response time of different power supply and assist testing power supply output status when load is unstable in order to enhance products' reliability and quality.

Function	Operation		Sequence	
	Static	Dynamic	Fast	Normal
Operating Condition Selection	Single fixed condition	Selection between two conditions	Selection among more than two conditions	Selection from more than two conditions
Operating Modes	All modes	<ul style="list-style-type: none"> Two conditions using same mode CR, CC, CP modes 	<ul style="list-style-type: none"> Each condition must use same mode Support CC or CR mode 	<ul style="list-style-type: none"> Each condition using different mode All modes
Adjustable Condition Setting	<ul style="list-style-type: none"> A/B Value Slew Rate 	<ul style="list-style-type: none"> Level 1/Level 2 Timer 1/Timer 2 (25 μs) Slew Rate 1/Slew Rate 2 	<ul style="list-style-type: none"> Level Timer Slew Rate Others... 	<ul style="list-style-type: none"> Level Timer Slew Rate Others...
Sequence Step Combination	N/A	N/A	<ul style="list-style-type: none"> 1 Sequence 2560 steps 25 μs/step Res. 1 μs 	<ul style="list-style-type: none"> 10 Sequence 2560 steps 10 μs/step Res. 10 μs
Other Functions	N/A	N/A	<ul style="list-style-type: none"> Trigger Out function 	<ul style="list-style-type: none"> Trigger Out function Ramp function



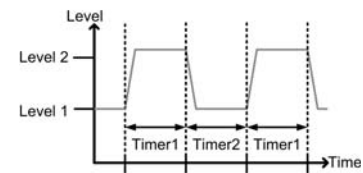
Static Mode

In Sequence function, waveforms of load current edited by Fast Sequence are steps and every step can reach the fastest of 25 μ s



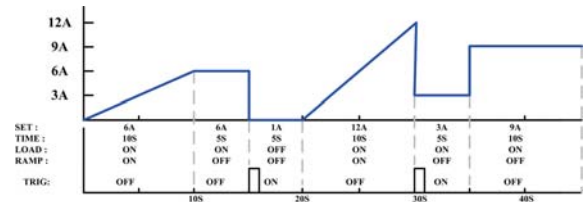
Fast Sequence Diagram

Normal Sequence provides RAMP function to users, according to their requirements, to select between slope and step method under set time to sink current.



Dynamic Mode

to provide the high slew rate for electronic loads.



Normal Sequence Diagram

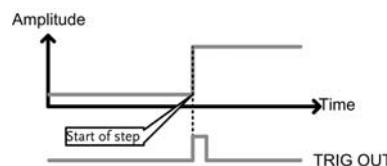
By applying a complete sequence editing function, users can control electronic load without using a computer or writing a program so as to save cost and time of R&D.

D. TRIGGER SIGNAL AND CURRENT MONITORING (IMON)

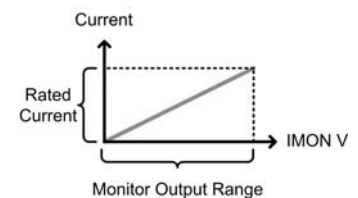


BNC connectors on the front panel

The front panel of PEL-3000A(AH), via BNC connectors provides two output signals, which are Trigger Signal and IMON. Under Dynamic or Sequence function, the moment the load current setting is changed BNC on the front panel will output a 4.5 V and 2 μ s pulse voltage. This trigger signal can be set to open or close for every step. Users can use trigger signal to synchronize other devices inside the system.



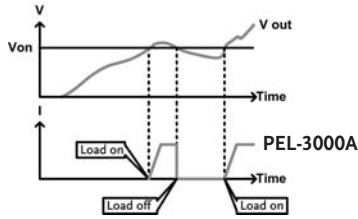
TRIG OUT = ON



IMON OUTPUT

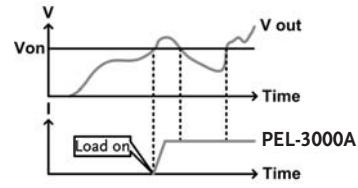
Current monitoring signals, using a BNC connector to compare with the full scale of real load current, output 0 V to 1 V (0 V to 10 V for PEL-3000AH) at high and low current levels and 0 V to 0.1 V (0 V to 1 V for PEL-3000AH) at medium current level. Therefore, users can monitor load current change without using current probe to save cost.

E. VON VOLTAGE AND VON LATCH FUNCTION



Von Latch = OFF

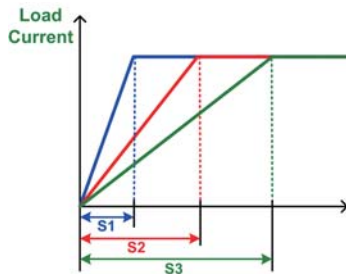
Von Voltage is the threshold voltage for electronic load to activate or terminate sinking current. When Von Latch is set to off, electronic load operation will be activated if input voltage is higher than Von Voltage and electronic load operation will be terminated if input voltage is lower than Von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

F. SOFT START



Three different load waveforms of Soft Start Time

Soft Start regulates the time of current rising from 0 to preset value during the moment load is activated. This function is to prevent voltage from dropping due to the fast transient rising speed of load current. Sudden voltage drop will result in an unsuccessful activation of electronic load or DUT and a damaged DUT.

G. PROTECTION MODES

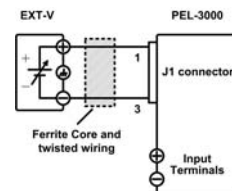
Functions	Protection	OCP	OVP	OPP	OTP	UVP	RVP
Adjustable Thresholds		✓	✓	✓	Fixed	✓	N/A
Load Off		✓	✓	✓	N/A	✓	Fixed
Limit Function		✓	N/A	✓	N/A	N/A	N/A

The PEL-3000A(AH) 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. The related settings and selections are as above: Take UVP as an example. In battery bleeding tests, electronic load will cease operation if battery voltage is lower than the set protective threshold value in order to prevent battery from over bleeding.

H. ANALOG CHANNEL CONTROL



Rear Panel

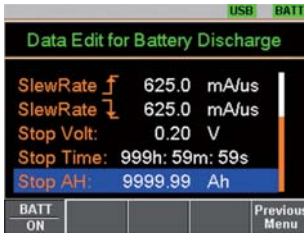


External Voltage Connection

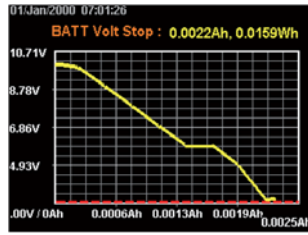
The PEL-3000A(AH) Series provides the external analog channel control function, which allows users to connect J1 and J2 MIL 20 pin standard connectors on the rear panel to input voltage or to connect resistance to control electronic load operation. Input voltage is limited to the range of 0 V to 10 V; connecting resistance

is limited to the range of 0 Ω to 10 kΩ; and related to load level are 0 to 100%. For instance, when operating PEL-3021 under CC mode and 35 A, external input voltage is 1 V and sink current is 3.5 A. Users can integrate this function into test system and utilize signals generated from the test system to control PEL-3000A(AH) Series.

I. BATT TEST AUTOMATION



BATT Test Automation Editing



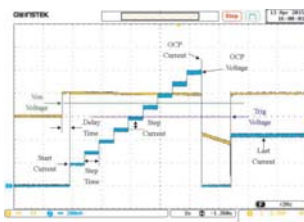
Waveform of TEST Result

Sample of Data Log

The built-in BATT Test Automation of PEL-3000A(AH) 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.

J. 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. It also provides users with measurement results so as to help them determine whether DUT's actual OCP activation point meets the regulations. It can test the value of OCP by setting load current increment from start current to stop current. OCP's activation point can be accurately measured.

K. OPP TEST AUTOMATION



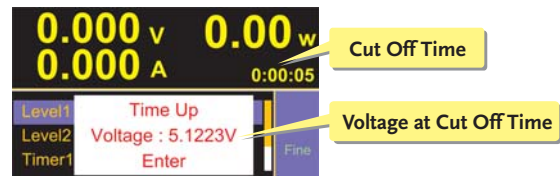
OPP test Automation for DUT(Power Supply), provide users with high resolution OPP measurement values to verify DUT's OPP activation point. It also provides users with measurement results so as to help them determine whether DUT's actual OPP activation point meets the regulations. It can test the value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

L. TIMER FUNCTIONS



Elapsed Time

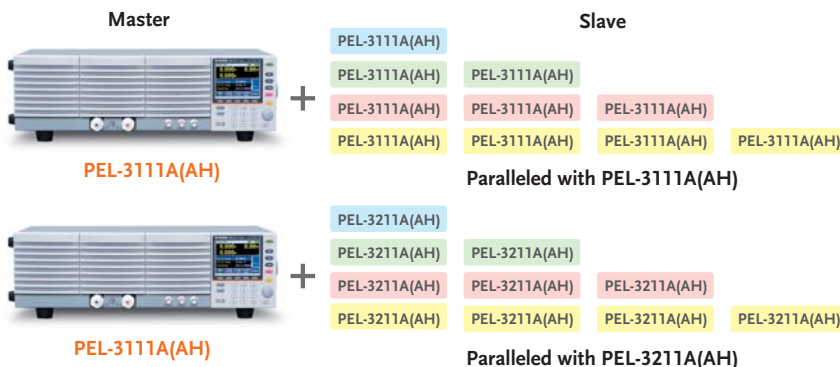
The PEL-3000A(AH) Series provides count time and cut off time functions. The display screen will show present activation time when electronic load is activated. When electronic load operation is terminated count time will stop and the total operation time will be shown on the display screen. The activation time of cut off time can be set to the maximum length of 999 h 59 min 59 s. When electronic load is activated



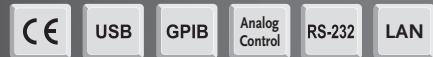
Voltage at Cut Off Time

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.

M. MASTER/SLAVE PARALLEL CONTROL

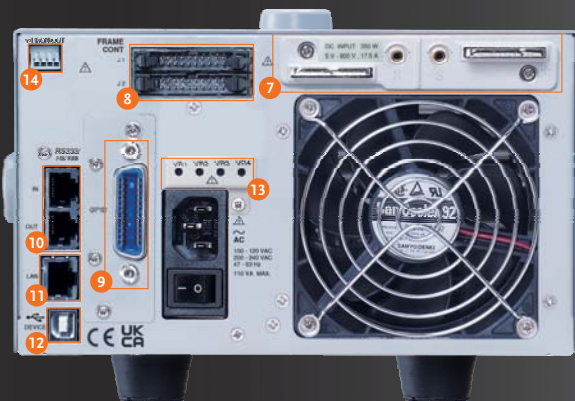


PEL-3111A(AH) can be used as either master or Slave. PEL-3111A(AH) can also be connected in parallel with PEL-3211A(AH) (Booster unit). Customers, based upon their DUT requirements, can collocate different models to meet their power requirements. The system collocation connection and terminals are all copper bar structure. When the Master/Slave control mode is selected, Master will automatically calculate current sunk as soon as load has been activated. The system will automatically distribute current to each Master/Slave unit. For Master/Slave parallel collocation, users only enter settings and edit programs on Master. Logically speaking, Master/Slave parallel collocation can be regarded as one single load unit. Therefore, this collocation can safely provide load capacity with actual current and power in the respective level. Parallel collocation can also meet different current and power requirements.



PEL-3000A Series

1. ON / STBY
2. LCD Display
3. Function Keys
4. Operation Key
5. Front Panel Input Terminals
6. I MON, TRIG OUT Terminals
7. Rear Panel Inputs Terminals
8. Frame Control Ports, J1, J2
9. GPIB (Optional)
10. RS-232/RS-485
11. LAN
12. USB Device



PEL-3000AH Series

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8. Frame Control Ports, J1, J2
9. GPIB (Optional)
10. RS-232/RS-485
11. LAN
12. USB Device
13. Variable Resistor
14. I MON / V MON

SPECIFICATIONS

Model	PEL-3021A			PEL-3041A			PEL-3111A			PEL-3211A			
Voltage	0 V to 150 V			0 V to 150 V			0 V to 150 V			0 V to 150 V			
Current	35 A			70 A			210 A			420 A			
Power	175 W			350 W			1050 W			2100 W			
Input Resistance	500 kΩ			500 kΩ			500 kΩ			500 kΩ			
Min. Operating	0.75 V at 17.5 A 1.5 V at 35 A			0.75 V at 35 A 1.5 V at 70 A			0.75 V at 105 A 1.5 V at 210 A			0.75 V at 210 A 1.5 V at 420 A			
CONSTANT CURRENT MODE (CC)													
Operating Range	H, M, L	0 A to 35 A	0 A to 3.5 A	0 A to 0.35 A	0 A to 70 A	0 A to 7 A	0 A to 0.7 A	0 A to 210 A	0 A to 21 A	0 A to 2.1 A	0 A to 420 A	0 A to 42 A	N/A
Accuracy of Setting	H, M	$\pm(0.2\% \text{ of set} + 0.1\% \text{ of F.S.}^{*1}) + \text{Vin}^{*2}/500 \text{ k}\Omega$										$\pm(1.2\% \text{ of set} + 1.1\% \text{ of F.S.}^{*1})$	
Accuracy of Setting	L	$\pm(0.2\% \text{ of set} + 0.1\% \text{ of F.S.}^{*1}) + \text{Vin}^{*2}/500 \text{ k}\Omega$										N/A	
Accuracy of Setting(Parallel)		$\pm(1.2\% \text{ of set} + 1.1\% \text{ of F.S.}^{*1})$										$\pm(1.2\% \text{ of set} + 1.1\% \text{ of F.S.}^{*1})$	
Resolution	H, M, L	1 mA	0.1 mA	0.01 mA	2 mA	0.2 mA	0.02 mA	10 mA	1 mA	0.1 mA			N/A
CONSTANT RESISTANCE MODE (CR)													
Operating Range ^{*4}	H		23.3336 S to 400 μS (42.857 mΩ to 2.5 kΩ)			46.6672 S to 800 μS (21.428 mΩ to 1.25 kΩ)			140.0016 S to 2.4 mS (7.1427 mΩ to 416.6667 Ω)			280.0032 S to 4.8 mS (3.5714 mΩ to 208.3334 Ω)	
		Range	2.33336 S to 40 μS (428.566 mΩ to 25 kΩ)			4.6667 S to 80 μS (214.28 mΩ to 12.5 kΩ)			14.0001 S to 242.4 μS (71.427 mΩ to 4.16667 kΩ)			28.00032 S to 484.8 μS (35.7135 mΩ to 2.083334 kΩ)	
	M		2.33336 S to 40 μS (428.566 mΩ to 25 kΩ)			4.6667 S to 80 μS (214.28 mΩ to 12.5 kΩ)			14.0001 S to 242.4 μS (71.427 mΩ to 4.16667 kΩ)			28.00032 S to 484.8 μS (35.7135 mΩ to 2.083334 kΩ)	
		Range	2.33336 S to 40 μS (428.566 mΩ to 25 kΩ)			4.6667 S to 80 μS (214.28 mΩ to 12.5 kΩ)			14.0001 S to 242.4 μS (71.427 mΩ to 4.16667 kΩ)			28.00032 S to 484.8 μS (35.7135 mΩ to 2.083334 kΩ)	
	L		0.233336 S to 4 μS (4.28566 Ω to 250 kΩ)			0.46667 S to 8 μS (2.1428 Ω to 125 kΩ)			1.40001 S to 24.24 μS (714.27 mΩ to 41.6667 kΩ)			N/A	
Accuracy of Setting ^{*5}	H, M	$\pm(0.5\% \text{ of set}^{*6} + 0.5\% \text{ of F.S.}^{*1}) + \text{Vin}^{*2}/500 \text{ k}\Omega$										$\pm(1.2\% \text{ of set} + 1.1\% \text{ of F.S.}^{*1})$	
Accuracy of Setting ^{*5}	L	$\pm(0.5\% \text{ of set}^{*6} + 0.5\% \text{ of F.S.}^{*1}) + \text{Vin}^{*2}/500 \text{ k}\Omega$										N/A	
Parallel		$\pm(1.2\% \text{ of set} + 1.1\% \text{ of F.S.}^{*1})$										N/A	
Resolution	H, M, L	400 μS	40 μS	4 μS	800 μS	80 μS	8 μS	2.4 mS	240 μS	24 μS			N/A
CONSTANT VOLTAGE MODE (CV)													
Operating Range	Range	H	1.5 V to 150 V									1.5 V to 150 V	
		L	1.5 V to 15 V									1.5 V to 15 V	
Accuracy of Setting ^{*7}	H, L		$\pm(0.1\% \text{ of set} + 0.1\% \text{ of F.S.})$									N/A	
		L	10 mV/1 mV									N/A	
CONSTANT POWER MODE (CP)													
Operating Range	Range	H	17.5 W to 175 W			35 W to 350 W			105 W to 1050 W			210 W to 2100 W	
		M	1.75 W to 17.5 W			3.5 W to 35 W			10.5 W to 105 W			21 W to 210 W	
		L	0.175 W to 1.75 W			0.35 W to 3.5 W			1.05 W to 10.5 W			N/A	
Accuracy of Setting ^{*8}	H, M, L	$\pm(0.6\% \text{ of set} + 1.4\% \text{ of F.S.}^{*9}) + (\text{Vin}^{*2})^2/500 \text{ k}\Omega$										N/A	
Resolution	H, M, L	10 mW	1 mW	0.1 mW	10 mW	1 mW	0.1 mW	100 mW	10 mW	1 mW			N/A
PARALLEL Mode													
Capacity		875 W			1750 W			5250 W			PEL-3111A with 4 booster units : Max. 9.45 kW		
SLEW RATE													
Operation Mode		CC, CR			CC, CR			CC, CR			N/A		
Setting Range (CC mode) ^{*10}	Range	H	2.5 mA/μs to 2.5 A/μs			5 mA/μs to 5 A/μs			16.02 mA/μs to 16.002 A/μs			N/A	
		M	250 μA/μs to 250 mA/μs			500 μA/μs to 500 mA/μs			1.602 mA/μs to 1.6002 A/μs			N/A	
		L	25 μA/μs to 25 mA/μs			50 μA/μs to 50 mA/μs			160.2 μA/μs to 160.02 mA/μs			N/A	
Setting Range (CR Mode) ^{*10}	Range	H	250 μA/μs to 250 mA/μs			500 μA/μs to 500 mA/μs			1.602 mA/μs to 1.6002 A/μs			N/A	
		M	25 μA/μs to 25 mA/μs			50 μA/μs to 50 mA/μs			160.2 μA/μs to 160.02 mA/μs			N/A	
		L	2.5 μA/μs to 2.5 mA/μs			5 μA/μs to 5 mA/μs			16.02 μA/μs to 16.002 mA/μs			N/A	
Accuracy of Setting ^{*9}	H, M, L	$\pm(10\% \text{ of set} + 5 \mu\text{s})$										N/A	
Resolution (Setting Range) ^{*10}			1 mA(250 mA/μs to 2.5 A/μs)			2 mA(500 mA/μs to 5 A/μs)			6 mA(1.6 A/μs to 16 A/μs)			N/A	
			100 μA(25 mA/μs to 250 mA/μs)			200 μA(50 mA/μs to 500 mA/μs)			600 μA(160 mA/μs to 1.6 A/μs)			N/A	
			10 μA(2.5 mA/μs to 25 mA/μs)			20 μA(5 mA/μs to 50 mA/μs)			60 μA(16 mA/μs to 160 mA/μs)			N/A	
			1 μA(250 μA/μs to 2.5 mA/μs)			2 μA(500 μA/μs to 5 mA/μs)			6 μA(1.6 mA/μs to 16 mA/μs)			N/A	
			100 nA(25 μA/μs to 250 μA/μs)			200 nA(50 μA/μs to 500 μA/μs)			600 nA(160 μA/μs to 1.6 mA/μs)			N/A	
			10 nA(2.5 μA/μs to 25 μA/μs)			20 nA(5 μA/μs to 50 μA/μs)			60 nA(16 μA/μs to 160 μA/μs)			N/A	
METER													
Voltmeter		$\pm(0.1\% \text{ of rdg} + 0.1\% \text{ of F.S.})$										N/A	
Ammeter	Accuracy	$\pm(0.2\% \text{ of rdg} + 0.3\% \text{ of F.S.}^{*11})$										N/A	
Ammeter(Parallel Operation)		$\pm(1.2\% \text{ of rdg} + 1.1\% \text{ of F.S.})$										N/A	
DYNAMIC MODE													
Operation Mode		CC, CR and CP											
T1 & T2		0.025 ms to 10 ms/Resolution : 1 μs 10 ms to 60 s/Resolution : 1 ms											
Accuracy		$\pm 100 \text{ ppm of setting}$											
Slew Rate (CC Mode)	Range	H	2.5 mA/μs to 2.5 A/μs			5 mA/μs to 5 A/μs			16 mA/μs to 16 A/μs			N/A	
		M	250 μA/μs to 250 mA/μs			500 μA/μs to 500 mA/μs			1.6 mA/μs to 1.6 A/μs			N/A	
		L	25 μA/μs to 25 mA/μs			50 μA/μs to 50 mA/μs			160 μA/μs to 160 mA/μs			N/A	
Slew Rate (CR Mode)	Range	H	250 μA/μs to 250 mA/μs			500 μA/μs to 500 mA/μs			1.6 mA/μs to 1.6 A/μs			N/A	
		M	25 μA/μs to 25 mA/μs			50 μA/μs to 50 mA/μs			160 μA/μs to 160 mA/μs			N/A	
		L	2.5 μA/μs to 2.5 mA/μs			5 μA/μs to 5 mA/μs			16 μA/μs to 16 mA/μs			N/A	
Current Accuracy		$\pm 0.4\% \text{ F.S.}$			$\pm 0.4\% \text{ F.S.}$			$\pm 0.4\% \text{ F.S.}$			$\pm(1.2\% \text{ of set} + 1.1\% \text{ of F.S.})$		
PROTECTION FUNCTION													
Functions		Overvoltage protection(OVP), Overcurrent protection(OCP), Overpower protection(OPP), Overheat protection(OTP), Undervoltage protection(UVP), Reverse voltage protection(RVP)											
GENERAL													
Input Range		90 Vac to 132 Vac/180 Vac to 250 Vac Single-phase; 47 Hz to 63 Hz											
Power(Max.)		90 VA			110 VA			190 VA			230 VA		
Interface		Standard : USB, RS-232/RS-485, LAN, Optional : GPIB											
Dimensions (W x H x D)		213.8 mm x 124 mm x 400.5 mm			213.8 mm x 124 mm x 400.5 mm			427.8 mm x 124 mm x 400.5 mm			427.7 mm x 127.8 mm x 553.5 mm		
Weight		Approximate 6 kg			Approximate 7 kg			Approximate 17 kg			Approximate 23 kg		

- Note : *1 Full scale of H range .
 *2 Vin: input terminal voltage of electronic load .
 *3 M range applies to the full scale of H range .
 *4 Siemens[S] = Input current[A] / Input voltage[V] = 1/resistance[Ω]
 *5 Converted value at the input current. At the sensing point during remote sensing under the operating range of the input voltage. operation.
 *6 set = Vin/Rset .
 *7 At the sensing point during remote sensing under the operating range of the input voltage. It is also applied for the condition of the parallel operation.
 *8 It is not applied for the condition of the parallel operation.
 *9 Time to reach from 10 % to 90 % when the current is varied from 2 % to 100 % (20 % to 100 % in M range) of the rated current.
 *10. Minimum setting range and resolution will change in parallel (Detail please reference user manual)

SPECIFICATIONS

Model	PEL-3021AH			PEL-3041AH			PEL-3111AH			PEL-3211AH			
Voltage	0 V to 800 V			0 V to 800 V			0 V to 800 V			0 V to 800 V			
Current	8.75 A			17.5 A			52.5 A			105 A			
Power	175 W			350 W			1050 W			2100 W			
Input Resistance	3.24 MΩ			3.24 MΩ			3.24 MΩ			3.24 MΩ			
Min. Operating	5 V at 8.75 A 2.5 V at 4.375 A			5 V at 17.5 A 2.5 V at 8.75 A			5 V at 52.5 A 2.5 V at 26.25 A			5 V at 105 A 2.5 V at 52.5 A			
CONSTANT CURRENT MODE (CC)													
Operating Range	H, M, L	0 A to 8.75 A	0 A to 875 mA	0 A to 87.5 mA	0 A to 17.5 A	0 A to 1.75 A	0 A to 175 mA	0 A to 52.5 A	0 A to 5.25 A	0 A to 525 mA	0 A to 105 A	0 A to 10.5 A	0 A to 1.05 A
Accuracy of Setting	H, M	$\pm(0.2\% \text{ of set} + 0.1\% \text{ of F.S.}^{*1}) + \text{Vin}^{*2}/3.24 \text{ M}\Omega$											
Accuracy of Setting	L	$\pm(0.2\% \text{ of set} + 0.1\% \text{ of F.S.}^{*1}) + \text{Vin}^{*2}/3.24 \text{ M}\Omega$											
Accuracy of Setting(Parallel)	$\pm(1.2\% \text{ of set} + 1.1\% \text{ of F.S.}^{*3})$												
Resolution	H, M, L	300 μA	30 μA	3 μA	0.6 mA	60 μA	6 μA	2 mA	200 μA	20 μA	N/A		
CONSTANT RESISTANCE MODE (CR)													
Operating Range ^{*4}	H	1.75 S to 30 μS (571 mΩ to 33.3 kΩ)			3.5 S to 60 μS (285 mΩ to 16.6 kΩ)			10.5 S to 180 μS (95.2 mΩ to 5.55 kΩ)			21 S to 360 μS (47.6 mΩ to 2.777 kΩ)		
		M	175 mS to 3 μS (5.71 Ω to 333 kΩ)			350 mS to 6 μS (2.85 Ω to 166 kΩ)			1.05 S to 18 μS (95.2 mΩ to 55.5 kΩ)			2.1 S to 36 μS (47.6 mΩ to 27.77 kΩ)	
	L		17.5 mS to 0.3 μS (57.1 Ω to 3.33 MΩ)			35 mS to 0.6 μS (28.5 Ω to 1.66 MΩ)			105 mS to 1.8 μS (9.52 Ω to 555 kΩ)			210 mS to 3.6 μS (4.762 Ω to 277.7 kΩ)	
		Accuracy of Setting ^{*5}	H, M	$\pm(0.5\% \text{ of set}^{*5} + 0.5\% \text{ of F.S.}^{*1}) + \text{Vin}^{*2}/3.24 \text{ M}\Omega$									
Accuracy of Setting ^{*5}	L	$\pm(0.5\% \text{ of set}^{*5} + 0.5\% \text{ of F.S.}^{*1}) + \text{Vin}^{*2}/3.24 \text{ M}\Omega$											
Parallel	$\pm(1.2\% \text{ of set} + 1.1\% \text{ of F.S.}^{*3})$												
Resolution	H, M, L	30 μS	3 μS	0.3 μS	60 μS	6 μS	0.6 μS	180 μS	18 μS	1.8 μS	N/A		
CONSTANT VOLTAGE MODE (CV)													
Operating Range	Range	H	5 V to 800 V									5 V to 800 V	
		L	5 V to 80 V									5 V to 80 V	
Accuracy of Setting ^{*7}	H, L	$\pm(0.2\% \text{ of set} + 0.2\% \text{ of F.S.})$											
	H, L	20 mV/2 mV											
CONSTANT POWER MODE (CP)													
Operating Range	H	17.5 W to 175 W			35 W to 350 W			105 W to 1050 W			210 W to 2100 W		
	M	1.75 W to 17.5 W			3.5 W to 35 W			10.5 W to 105 W			21 W to 210 W		
	L	0.175 W to 1.75 W			0.35 W to 3.5 W			1.05 W to 10.5 W			N/A		
Accuracy of Setting ^{*8}	H, M, L	$\pm(0.6\% \text{ of set} + 1.4\% \text{ of F.S.}^{*3}) + (\text{Vin}^{*2})/3.24 \text{ M}\Omega$											
Resolution	H, M, L	10 mW	1 mW	0.1 mW	10 mW	1 mW	0.1 mW	100 mW	10 mW	1 mW	N/A		
PARALLEL Mode													
Capacity	875 W			1750 W			5250 W			PEL-3111AH with 4 booster units : Max. 9.45 kW			
SLEW RATE													
Operation Mode	CC, CR												
Setting Range (CC mode) ^{*10}	H	0.14 mA/μs to 140 mA/μs			0.28 mA/μs to 280 mA/μs			0.84 mA/μs to 840 mA/μs			N/A		
	M	14 μA/μs to 14 mA/μs			28 μA/μs to 28 mA/μs			84 μA/μs to 84 mA/μs			N/A		
	L	1.4 μA/μs to 1.4 mA/μs			2.8 μA/μs to 2.8 mA/μs			8.4 μA/μs to 8.4 mA/μs			N/A		
Setting Range (CR Mode) ^{*10}	H	14 μA/μs to 14 mA/μs			28 μA/μs to 28 mA/μs			84 μA/μs to 84 mA/μs			N/A		
	M	1.4 μA/μs to 1.4 mA/μs			2.8 μA/μs to 2.8 mA/μs			8.4 μA/μs to 8.4 mA/μs			N/A		
	L	0.14 μA/μs to 140 μA/μs			0.28 μA/μs to 280 μA/μs			0.84 μA/μs to 840 μA/μs			N/A		
Accuracy of Setting ^{*9}	H, M, L	$\pm(10\% \text{ of set} + 25\%)$											
Resolution (Setting Range) ^{*10}	50 μA(14 mA/μs to 140 mA/μs)		100 μA(28 mA/μs to 280 mA/μs)			300 μA(84 mA/μs to 840 mA/μs)			N/A				
	5 μA(1.4 mA/μs to 14 mA/μs)		10 μA(2.8 mA/μs to 28 mA/μs)			30 μA(8.4 mA/μs to 84 mA/μs)			N/A				
	0.5 μA(140 μA/μs to 1.4 mA/μs)		1 μA(280 μA/μs to 2.8 mA/μs)			3 μA(840 μA/μs to 8.4 mA/μs)			N/A				
	50 nA(14 μA/μs to 140 μA/μs)		0.1 μA(28 μA/μs to 280 μA/μs)			0.3 μA(84 μA/μs to 840 μA/μs)			N/A				
	5 nA(1.4 μA/μs to 14 mA/μs)		10 nA(2.8 μA/μs to 28 mA/μs)			30 nA(8.4 μA/μs to 84 mA/μs)			N/A				
	0.5 nA(0.14 μA/μs to 1.4 mA/μs)		1 nA(0.28 μA/μs to 2.8 mA/μs)			3 nA(0.84 μA/μs to 8.4 mA/μs)			N/A				
METER													
Voltmeter	$\pm(0.1\% \text{ of rdg} + 0.1\% \text{ of F.S.})$												
Ammeter	Accuracy	$\pm(0.2\% \text{ of rdg} + 0.3\% \text{ of F.S.}^{*11})$											
Ammeter(Parallel Operation)	$\pm(1.2\% \text{ of rdg} + 1.1\% \text{ of F.S.})$												
DYNAMIC MODE													
Operation Mode	CC, CR and CP												
T1 & T2	0.025 ms to 10 ms/Resolution : 1 μs 10 ms to 60 s/Resolution : 1 ms												
Accuracy	$\pm 100 \text{ ppm of setting}$												
Slew Rate (CC Mode)	H	0.14 mA/μs to 140 mA/μs			0.28 mA/μs to 280 mA/μs			0.84 mA/μs to 840 mA/μs			N/A		
	M	14 μA/μs to 14 mA/μs			28 μA/μs to 28 mA/μs			84 μA/μs to 84 mA/μs			N/A		
	L	1.4 μA/μs to 1.4 mA/μs			2.8 μA/μs to 2.8 mA/μs			8.4 μA/μs to 8.4 mA/μs			N/A		
Slew Rate (CR Mode)	H	14 μA/μs to 14 mA/μs			28 μA/μs to 28 mA/μs			84 μA/μs to 84 mA/μs			N/A		
	M	1.4 μA/μs to 1.4 mA/μs			2.8 μA/μs to 2.8 mA/μs			8.4 μA/μs to 8.4 mA/μs			N/A		
	L	0.14 μA/μs to 140 μA/μs			0.28 μA/μs to 280 μA/μs			0.84 μA/μs to 840 μA/μs			N/A		
Current Accuracy	$\pm 0.4\% \text{ F.S.}$			$\pm 0.4\% \text{ F.S.}$			$\pm 0.4\% \text{ F.S.}$			$\pm(1.2\% \text{ of set} + 1.1\% \text{ of F.S.})$			
PROTECTION FUNCTION													
Functions	Overvoltage protection(OVP), Overcurrent protection(OCP), Overpower protection(OPPP), Overheat protection(OTP), Undervoltage protection(UVP), Reverse voltage protection(RVP)												
GENERAL													
Input Range	90 Vac to 132 Vac/180 Vac to 250 Vac Single-phase; 47 Hz to 63 Hz												
Power(Max.)	90 VA			110 VA			190 VA			230 VA			
Interface	Standard : USB, RS-232/RS-485, LAN, Optional : GPIB												
Dimensions (W x H x D)	213.8 mm x 124 mm x 400.5 mm			213.8 mm x 124 mm x 400.5 mm			427.8 mm x 124 mm x 400.5 mm			427.7 mm x 127.8 mm x 553.5 mm			
Weight	Approximate 9 kg			Approximate 10 kg			Approximate 20 kg			Approximate 28 kg			

- Note : *1 Full scale of H range .
*2 Vin: input terminal voltage of electronic load .
*3 M range applies to the full scale of H range .
*4 $\text{Siemens[S]} = \text{Input current[A]} / \text{Input voltage[V]} = 1/\text{resistance[}\Omega\text{]}$
*5 Converted value at the input current. At the sensing point during remote sensing under the operating range of the input voltage. operation.
*6 $\text{set} = \text{Vin}/\text{Rset}$.
*7 At the sensing point during remote sensing under the operating range of the input voltage. It is also applied for the condition of the parallel operation.
*8 It is not applied for the condition of the parallel operation.
*9 Time to reach from 10 % to 90 % when the current is varied from 2 % to 100 % (20 % to 100 % in M range) of the rated current.
*10. Minimum setting range and resolution will change in parallel (Detail please reference user manual)

ORDERING INFORMATION

PEL-3021A	(150 V/35 A/175 W) Single-Channel Programmable DC Electronic Load
PEL-3041A	(150 V/70 A/350 W) Single-Channel Programmable DC Electronic Load
PEL-3111A	(150 V/210 A/1050 W) Single-Channel Programmable DC Electronic Load
PEL-3211A	(150 V/420 A/2100 W) 2100 W Booster for PEL-3111 only
PEL-3021AH	(800 V/8.75 A/175 W) Single-Channel Programmable DC Electronic Load
PEL-3041AH	(800 V/17.5 A/350 W) Single-Channel Programmable DC Electronic Load
PEL-3111AH	(800 V/52.5 A/1050 W) Single-Channel Programmable DC Electronic Load
PEL-3211AH	(800 V/105 A/2100 W) 2100 W Booster for PEL-3111H only

ACCESSORIES

Quick Start Guide, Power Cord

PEL-011	Load Input Terminal Cover
PEL-012	Terminal Fittings Kits
PEL-013	Flexible Terminal Cover
PEL-014	J1/J2 Protection Plug

Front Terminal Washers

GTL-255 Frame Link Cable 300 mm (for linking units that are stacked).

Note that this accessories is optional for the PEL-3021A(AH) or PEL-3041A(AH).

OPTIONAL ACCESSORIES

CR123A	3 V Lithium Battery for Clock.	PEL-010	Dust Filter
GRA-413-E	Rack mount bracket for booster PEL-3211A/AH (EIA)	PEL-004	GPIB Option
GRA-413-J	Rack mount bracket for booster PEL-3211A/AH (JIS)	PEL-005	Connect Cu Plate
GRA-414-E	Rack Mount Kit (EIA), 19", 3U Size for PEL-3021A(AH)/3041A(AH)/3111A(AH)	PEL-006	Connect Cu Plate
GRA-414-J	Rack Mount Kit (JIS), 19", 3U Size for PEL-3021A(AH)/3041A(AH)/3111A(AH)	PEL-007	Connect Cu Plate
GTL-246	USB Cable Type A- Type B	PEL-008	Connect Cu Plate
GTL-248	GPIB Cable, 2.0 m	PEL-009	Connect Cu Plate
GTL-259	RS-232 Cable with DB9 connector to RJ45	PEL-010	Dust Filter
GTL-260	RS-485 Cable with DB9 connector to RJ45	PEL-004	GPIB Option
GTL-261	Serial Master Cable+Terminator, 0.5 m	PEL-005	Connect Cu Plate
GTL-262	RS-485 Slave cable	PEL-006	Connect Cu Plate
		PEL-007	Connect Cu Plate
		PEL-008	Connect Cu Plate
		PEL-009	Connect Cu Plate
		PEL-010	Dust Filter

FREE DOWNLOAD

Driver LabView Driver

Specifications subject to change without notice.

PEL-3000A/3000AHGD1BH

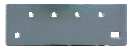
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PEL-005



PEL-006



PEL-007



PEL-008



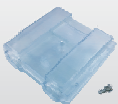
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PEL-010



PEL-011



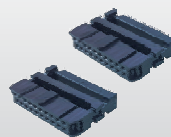
PEL-012



PEL-013



PEL-014



GTL-255



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