Programmable DC Power Supply

PHX-D Series

Basic User Manual

GW INSTEK PART NO. 82HX-1000DBA1

ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

The information in this manual was correct at the time of printing. However, Good Will continues to improve its products and therefore reserves the right to change the specifications, equipment, and maintenance procedures at any time without notice.

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Basic User Manual

This manual is a simplified version. A detailed user manual is included on the supplied CD-ROM.

SAFETY INSTRUCTIONS

This instruction manual uses the various symbols below to indicate areas of caution.
Please thoroughly read and understand these symbols and their significance prior to use.

The section "For your safety" contains information on items not included with your purchased product.

■ This manual uses the following marks and symbols to assist you in the proper use of this product.

DANGER	Failure to observe precautions indicated by this symbol and improper use or handling of the product will result in serious injury or death.
WARNING	Failure to observe precautions indicated by this symbol and improper use or handling of the product may result in serious injury or death.
CAUTION	Failure to observe precautions indicated by this symbol and improper use or handling of the product may result in injury or property damage.

■ Items that must be observed are classified into the following marks.

	This mark indicates items that are "Prohibited".
	This mark indicates items that are "Mandatory".
	This mark indicates general "Caution".

■ Symbols used within this manual are described below.

	Contact with areas on the product indicated by this symbol may result in electric shock.
	Unplug the power supply plug from the outlet. If ■ There is abnormal noise or smell ■ Smoke appears ■ Water or foreign objects has entered the product continual use of the product may cause fire or electric shock.
	Dismantling or modification to the product is prohibited. Do not open the cover. ■ This may result in fire or electric shock. ■ For repairs and adjustments please contact your retailer.
	Protective Earth Terminal. Please make a connection in earth.
	Please connect for loads with earth terminals
	Direct Current (DC)
	Alternating Current (AC)
	AC and DC
	3-Phase Alternating Current

Caution

1. Reproduction of the material contained within this manual without notice is strictly prohibited.
2. Information contained within this manual may be altered without notification.
3. All material contained within this manual has been thoroughly examined. If by chance, any errors, suspicious items, or omissions are discovered, please contact Good Will Instrument.
4. Good Will Instrument Co., Ltd. shall undertake no responsibility, regardless of clause 2, for any impact this product may have on results.

For your safety

This product is a power supply system for business use, which uses an input power of AC342V~440V (three phase).
Please be forewarned that it is not produced as an electronic device for general home use.
Improper use of this product may result in injury, electric shock or death, and may also result in fire.
Please thoroughly read and understand this manual prior to use. Further, this product should only be handled by a specialist knowledgeable in electricity safety, or under the supervision of such a person.
Please read through this manual to ensure the proper placement and use environment for this product before turning on power.
If any problems arise, please unplug the power supply plug from the outlet power immediately and contact GW Instek.

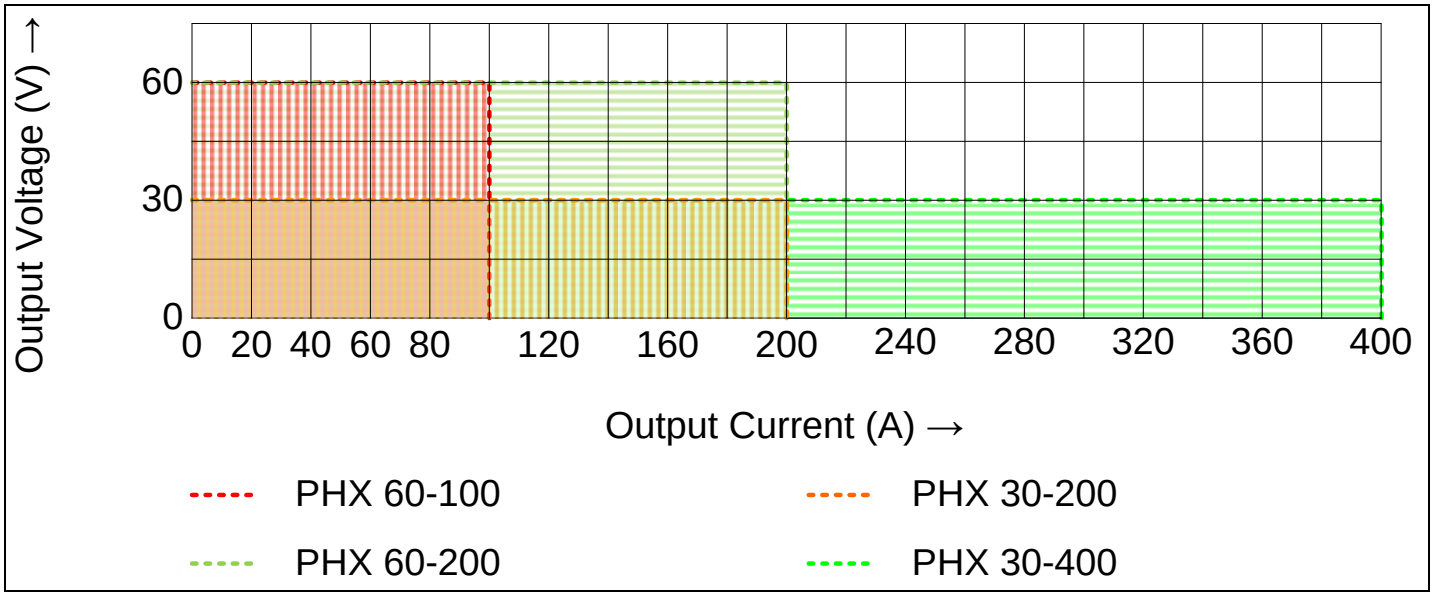
Caution

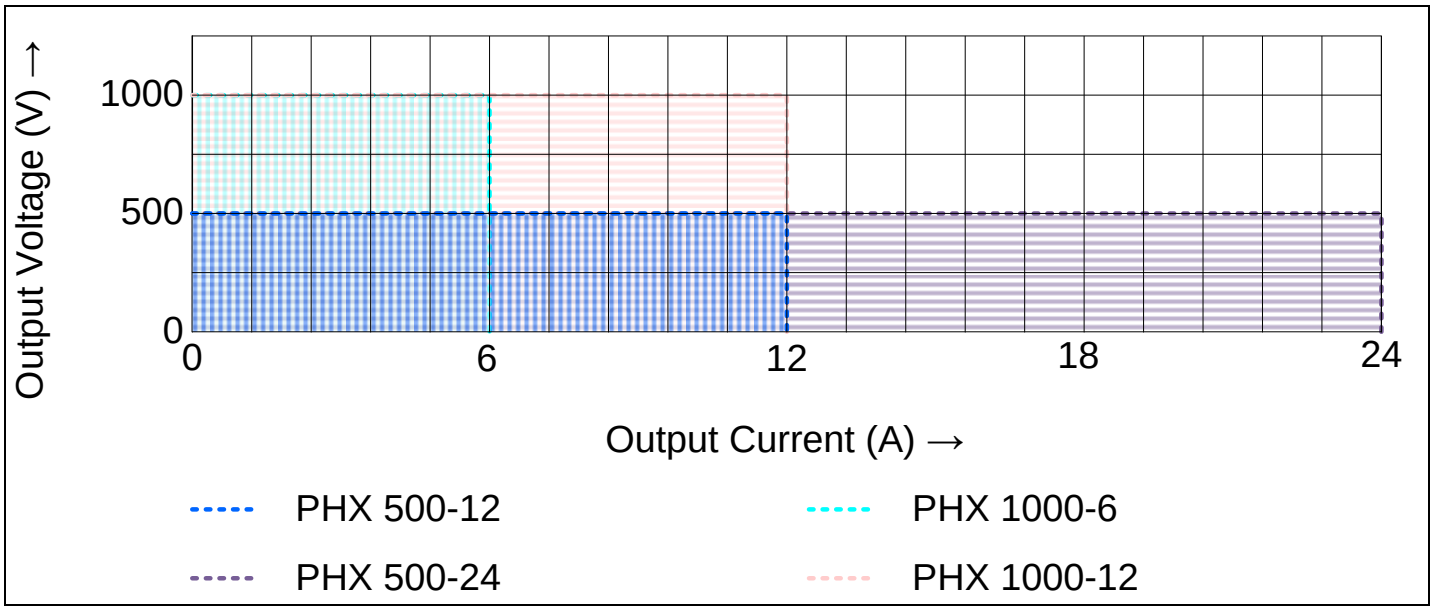
Using this product near receivers (radios, televisions, etc.) may interfere with reception.
Please do not use this product in any medical, nuclear, or work involving human life.

ABOUT THIS MACHINE

- **The PHX Series are the Switching DC Constant Voltage/Constant Current Power Supplies capable of changing from zero-volt and zero-ampere.**
- The PHX series allows the use of both the Constant Voltage and Constant Current modes, along with the ability to be able to freely set the power from zero to full scale.
- The PHX series, with full digital control, also grants settings with superior accurate reproduction.

[Output Voltage/Current Range]





Features

✧ Improved Parallel Operation (New Master/Slave)

Up to 10 PHX power supplies of the same voltage output type (maximum capacity 120 kW) can be operated in parallel.
Constant voltage transient recovery properties will not degrade, even when increasing the number of parallel units, due to the new master-slave method.

✧ Serial Communication Port Standardized System

Equipped with a multi-drop communication port, one RS-232C or RS-485 port is capable of controlling up to 31 units of supported models.
* Special cable (PHX-003)

✧ Useful Functions

☐ Memory
Saving and loading can be done for 3 sets of panel setting status. Tests such as voltage fluctuation test can be conducted by easy operation.

☐ Variable Slew Rate
Changes the slew rate for the rising and falling of the voltage/current.

☐ Startup Mode Selection
Equipped with a CC Priority Mode for loads with nonlinear V-I characteristics similar to diodes, this function is capable of preventing current overshoot when output is ON.

☐ Sequential ON/OFF
Sets the order outputs are toggled ON/OFF through a multi-connection cable.

✧ Protection Functions

Guards valuable loads and power supplies with Over Voltage Protection, Over Current Protection, Over Heating Protection, Excessive Input Current Protection, etc

✧ External Analog Control

Able to control ON-OFF output with external contact points, and voltages and currents based on external DC voltage (0~10V) and external resistance (0~∞ or 0~10kΩ)
* Full-scale and offset adjustments can be performed with the front panel dials.

✧ Analog Monitor

Outputs the output voltage and output current with 0~10V DC.
* Not suited for monitoring transient voltage/current waveforms.

✧ Status Alarm Output

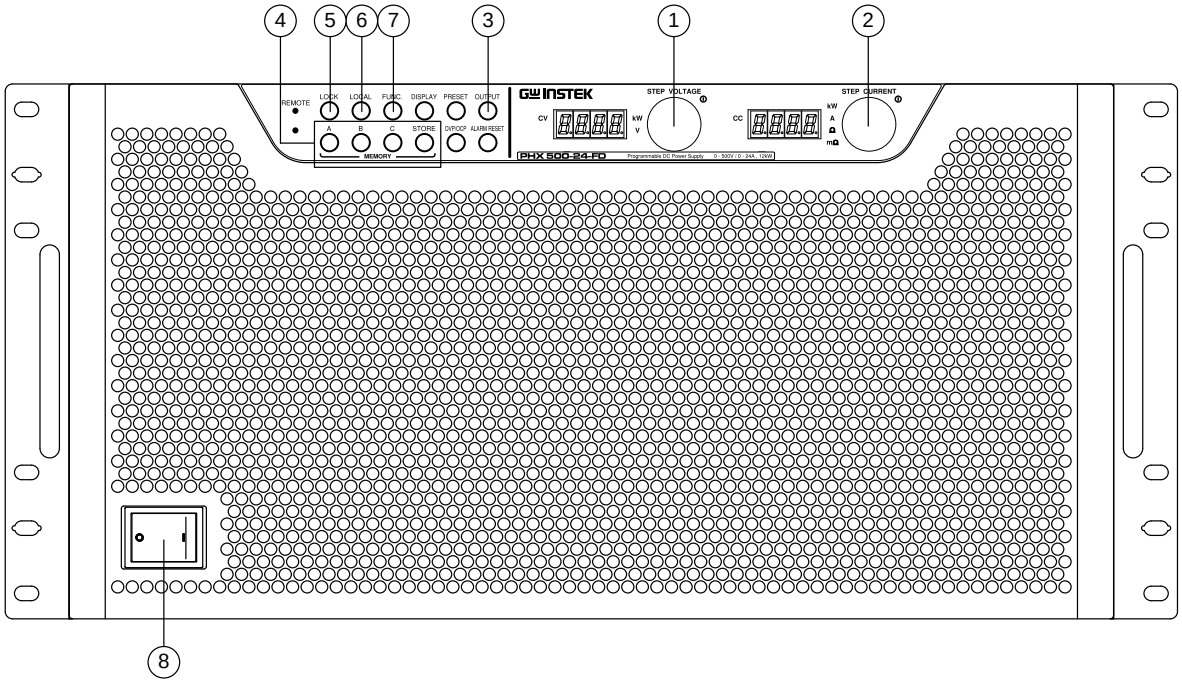
Outputs an alarm or operation status with a photocoupler output (open collector) insulated from outputs and the earth.

✧ Variable Internal esistance

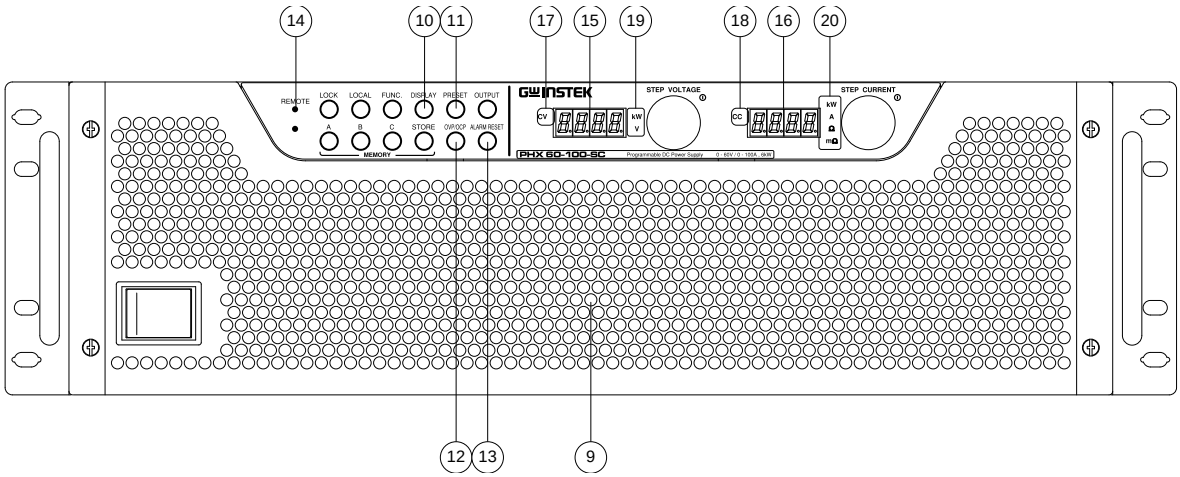
This function intentionally generates a voltage drop due to load current when running in Constant Voltage mode.
With this function, the power supply is capable of approximating an internal resistance of chemical batteries (during electric discharge) and I-V characteristics of solar/fuel cells.
* Restricted to direct current operations. Not suited for approximating transient effects.

Part Names and Functions

Front Panel (12kW models shown)



Front Panel Continued (6kW models shown)



①. VOLTAGE

Voltage Setting/Selection Dial

Selects the voltage, the OVP, and various other parameters. Press the dial to change the settings number place.

②. CURRENT

Current Setting/Selection Dial

Selects the current, the OCP, and various other parameters. Press the dial to change the settings number place.

③. OUTPUT

Output ON/OFF Toggle Key

Toggles output ON/OFF.
The factory default setting for the output, after inserting power, is OFF.
Lights when the output is set to ON.

④. MEMORY

Memory Display/Settings Key

Saving and loading can be done for the panel setting status with keys "A", "B", and "C". Also, depending on the Function item setting, this can be used to select One-Action or Two-Action loading method.

⑤. LOCK

LOCK Key

Locks panel from use.
Lights when Lock has been enabled.
Below are the 3 types of Lock settings. They can be changed by each function setting key (FUNC.).

- Locks everything but the LOCK key
- Locks everything but the OUTPUT and LOCK key
- Locks only the Voltage/Current Dial, PRESET, and FUNC. keys.

⑥. LOCAL

LOCAL Key

Switches between “LOCAL”, operated from the panel, and “REMOTE”, operated by control via serial data communication.

⑦.FUNC.

Function Key

Used for setting various functions
Lights when Function settings are available.

⑧.POWER

Input Power Switch

Toggles power ON/OFF

⑨.Ventilation Panels

Panels which allow cool air to enter and cool the product internally.

⑩.DISPLAY

Display Key

Toggles the displayed measurement information.
Can be toggled between 3 display modes: Voltage/Current, Voltage/Power, Power/Current.

⑪. PRESET

Preset Key

Used to set the output voltage and output current.
Lights when Preset settings are available.

⑫. OVP/OCP

Over Voltage Protection (OVP)/Over Current Protection (OCP) Key

Sets the trigger point for the OVP circuit and the OCP circuit.

⑬. ALARM RESET

Alarm Reset Key

Hold down for 1 second or more to cancel an alarm.

⑭. REMOTE

Remote Display Lamp

Lights when control has been transferred to an external computer, etc. being accessed via serial interface.

⑮. Number Display (Voltage)

Displays the output voltage and the output power. When setting functions with the Function key, the item number will be displayed.

⑯. Number Display (Current)

Displays the output current and the output power. When setting functions with the Function key, the parameter will be displayed.

⑰. CV

Constant Voltage Display Lamp

Lights when output is set to “ON” during constant voltage mode.

⑱. CC

Constant Current Display Lamp

Lights when output is set to “ON” during constant current mode.

⑲. kW, V

Measurement Unit Display Lamp

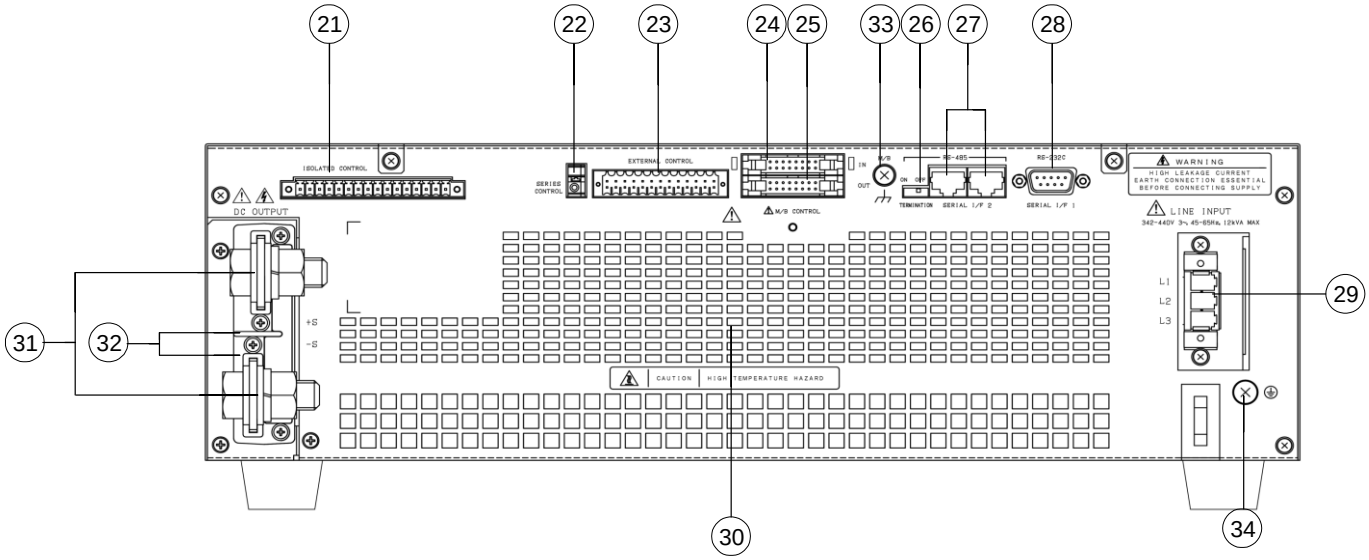
Lights when Number Display (voltage) displays a voltage/power value.

⑳. kW, A, Ω, mΩ

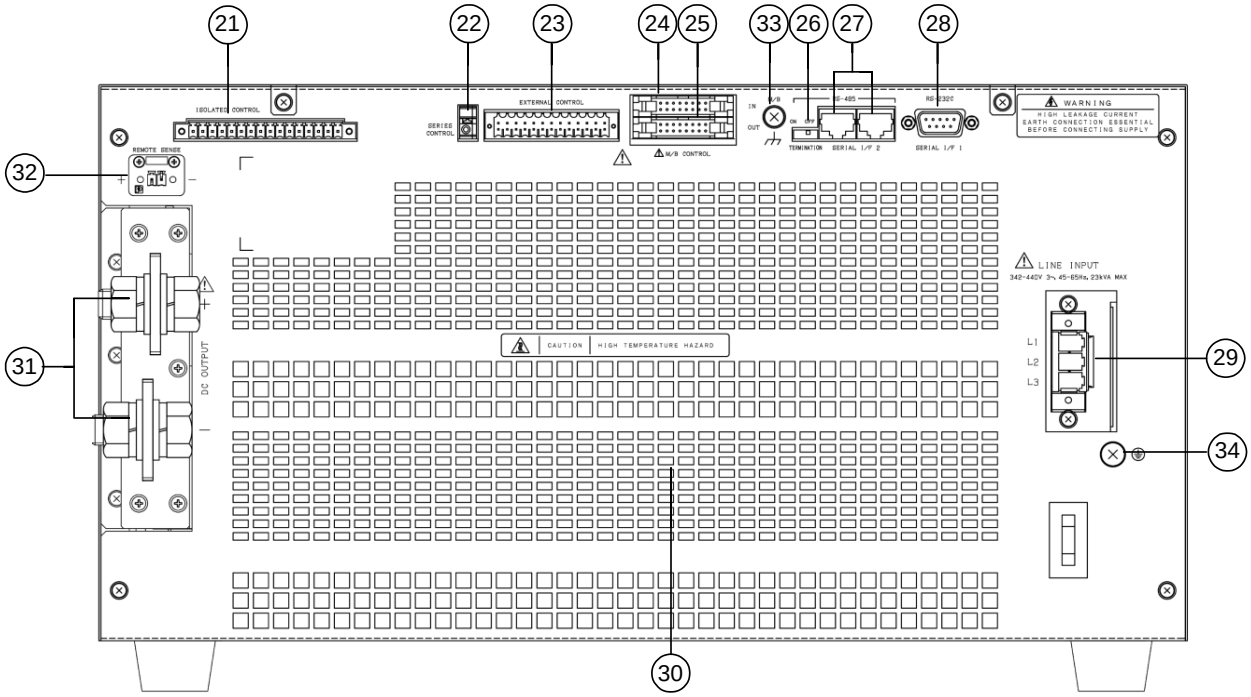
Measurement Unit Display Lamp

Lights when Number Display (current) displays a current/power value. Also, displays the unit of the corresponding resistance value when setting the Variable Internal Resistance function.

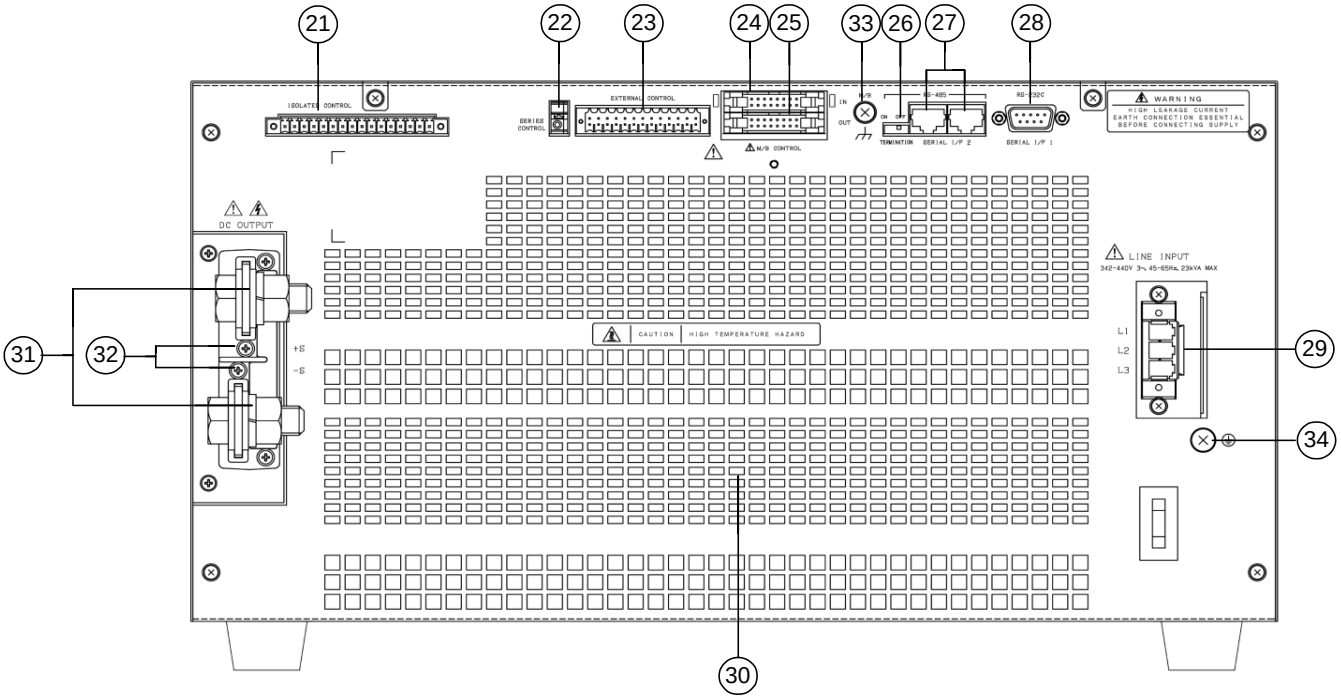
Rear Panel (PHX 30-200, PHX 60-100)



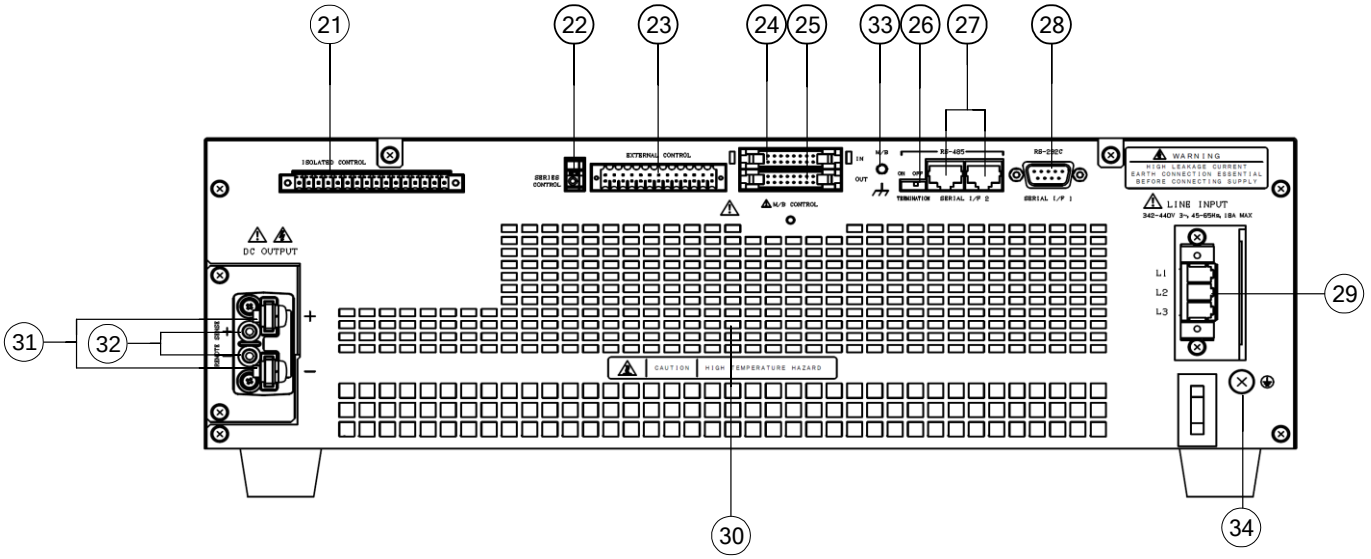
Rear Panel (PHX 30-400)



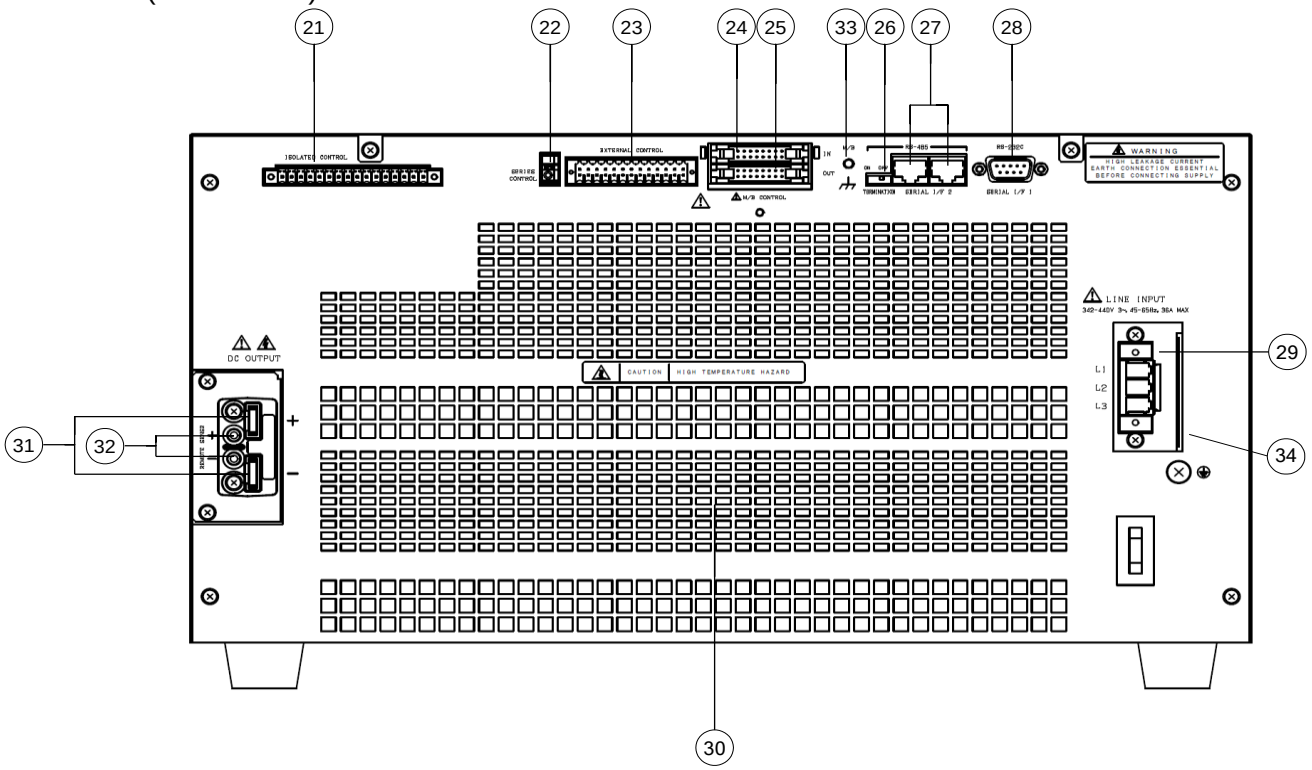
Rear Panel (PHX 60-200)



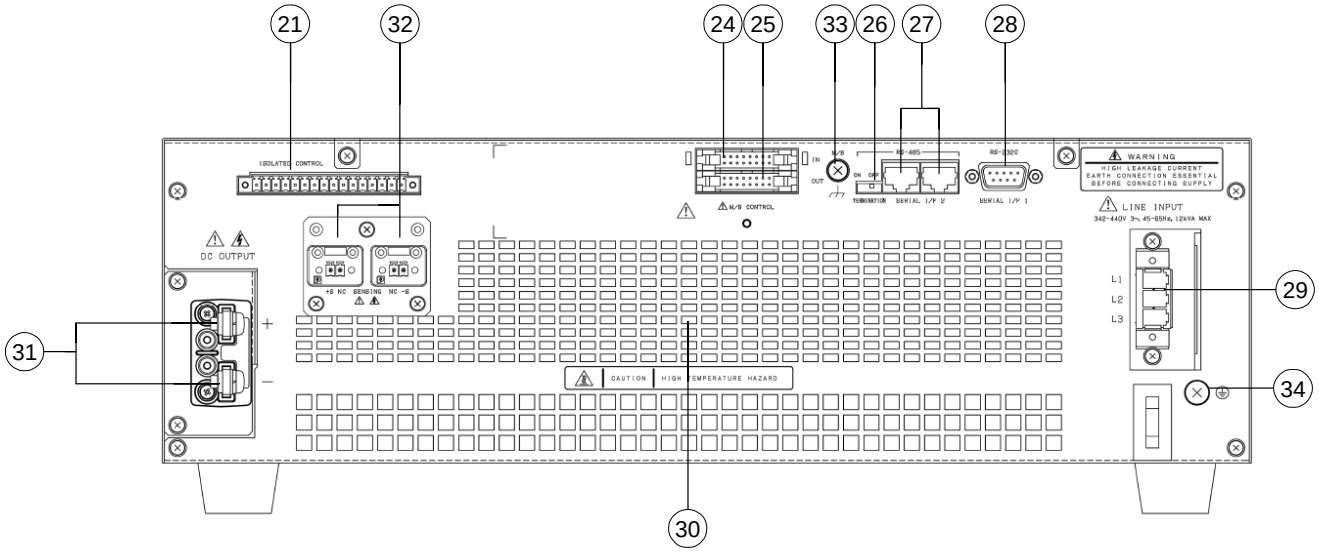
Rear Panel (PHX 500-12)



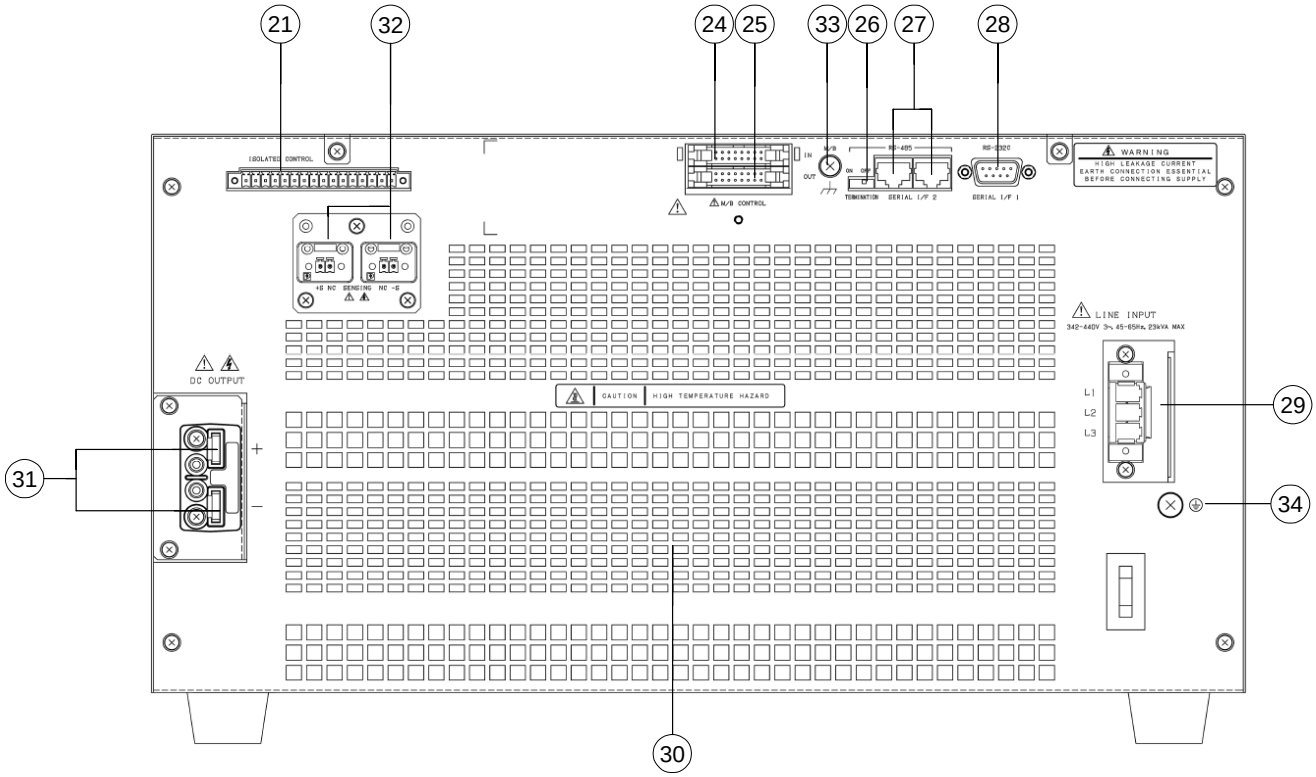
Rear Panel (PHX 500-24)



Rear Panel (PHX 1000-6)



Rear Panel (PHX 1000-12)



㉑. ISOLATED CONTROL

Insulation Control Connector

This is the Status/Alarm Output Connector.
It is used for external analog control input of insulation type, analog monitor output, and contact input. Only applicable for the 1000V models. Use the included specialized connectors.

㉒. SERIES CONTROL

Series Operation Control Connector

Connector for series connections. When using in the slave mode, connect with the Master unit's minus output terminal using wires.

㉓. EXTERNAL CONTROL

External Control Connector

Connectors for external analog control input and analog monitor output. Use the included specialized connectors.

㉔. Master/Booster CONTROL (IN)

Parallel Operation Control (Input) Connector

Control Signal Input Connector for parallel operations.

㉕. Master/Booster CONTROL (OUT)

Parallel Operation Control (Output) Connector

Control Signal Output Connector for parallel operations.

WARNING

Mandatory

As for parallel connection cables, be sure to use the special cable (PHX-001 for 30V/60V models, PHX-002 for 500V/1000V models).

㉖. TERMINATION

Termination Resistor ON/OFF Switch

When controlling one unit of this product via serial port, please set the termination toggle switch to ON.
When using 2 or more power supplies, please set the first and last units' termination resistor ON/OFF switch to ON (set other units' ones to OFF).

㉗. SERIAL I/F 2

Serial Port/Multi-Channel Connectors

Connectors for when controlling multiple PHX Series units or for controlling RS-485 type, serial ports. Connected with special cable. (PHX-003)

㉘. SERIAL I/F 1

Serial Port Connector

Connector for connecting computers etc. with serial cables (RS-232C).

㉙. LINE INPUT

Input Connector

This is the connector that connects the power of this product.

CAUTION

Mandatory

Use the input power cable hat is included in the product or a better ones.

㉚. Ventilation Discharge Opening

Ventilation discharge opening for cooling the product internally.

㉛. DC OUTPUT

Output Terminal

㉜. REMOTE SENSE

Sensing Terminal

DC Output Terminal.

CAUTION

Mandatory

A Crimp-Style Terminal must be used. Please be sure to tighten all attachment screws.
After connecting, attach the output terminal cover before use.

Terminal for Remote Sensing

㉝. Master/Booster Frame Ground (M/B FG)

FG terminal for parallel connection cable

This is the terminal for connecting the frame ground of parallel connection cable.

㉞. PROTECTIVE EARTH TERMINAL (M4)

PREPARATION AND CONNECTION

Unpacking

When unpacking, please verify the following accessory items are included. Also, please verify that there are no scratches or indentations present on the power supply's exterior.

① Input Connector ---------- 1 item

② Output Terminal Cover (All models except PHX 30-400) ---------- 1 package
- Output Terminal Cover 2 items (Identical Shape)
- Supporter for attaching cover 1 item
- M3x6mm screws 2 items

③ Output Terminal Cover (PHX 30-400 only) ---------- 1 package
- Output Terminal Cover
- M3x6mm screws 6 items

④ Output Terminal Bolt (Attached to power supply)
(PHX 30-200, PHX 30-400, PHX 60-100, PHX 60-200 only) ---------- 2 items
- M12x30mm bolt 1 item
- M12 flat-washer 2 items
- M12 spring-washer 1 item
- M12 nut 1 item

⑤ Output Terminal Screws (Attached to power supply)
(PHX 500-12, PHX 500-24, PHX 1000-6, PHX 1000-12 only) ---------- 2 items
- M5x10mm screws

⑥ Insulation Tube (PHX 30-400 only) ---------- 2 items

⑦ Wire Band (PHX 30-400 only) ---------- 4 items

⑧ Connector for Remote Sensing (PHX 30-400 only) ---------- 1 item

⑨ Connector for Remote Sensing (PHX 1000-6, PHX 1000-12 only) ---------- 2 items

⑩ Cover for Remote Sensing (PHX 1000-6, PHX 1000-12 only) ---------- 1 package
- Cover for Remote Sensing x 1 unit
- M3x6mm screws 2 items

⑪ Dummy Connector (Attached to Master/Boost control of power supply) ---------- 2 items

⑫ Insulation Control Connector (Attached to isolated control of power supply) ---------- 1 item

⑬ External Control Connector (Attached to external control of power supply)
(PHX 30-200, PHX 30-400, PHX 60-100, PHX 60-200, PHX 500-12, PHX 500-24) ---------- 1 item

⑭ Parallel Connection Terminal Cover
(PHX 60-100, PHX 60-200, PHX 500-12, PHX 500-24, PHX 1000-6, PHX 1000-12) ---------- 1 package

⑮ CD-ROM (Includes User Manual and Basic User Manual) ---------- 1 copy

Placement

To ensure proper and safe use of this product, please observe the following.

WARNING

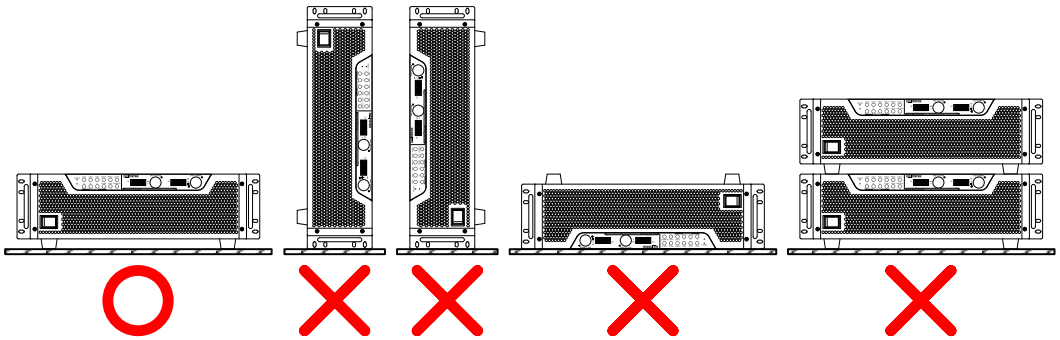
Prohibited — Do not use in areas exposed to rain and water.

Prohibited — Do not place in areas in which flammable gases are present.

Prohibited — Do not insert any metallic pins, wires, screws, etc. in the front ventilation panels and in the rear fan motor. Doing so may result in electric shock and/or fire.

CAUTION

Prohibited — This product was designed to be used in stable areas. Do not use or place in areas prone to vibration.
Improper placement of the power supply may result in damage. Please see below for proper placement.
How to place:



CAUTION

Mandatory — Use only in areas with a room temperature of 0~50℃, humidity of 20~90%RH, and which is absent of any corrosive gases.

Prohibited — This power supply uses a forced air cooling system. Do not obstruct the front ventilation panels and rear ventilation discharge opening. If affixing to a rack, attach ventilation panels or others to the rear of the rack to prevent exhaust from staying inside the rack.

Mandatory — If using in environment where electric conductive contamination occurs, considerations needs to be taken such as intaking air using duct.

Caution — Using this product near receivers (radios, televisions, etc.) may interfere with reception.

Connecting the Power Supply

This product operates on a 342V to 440V and 45Hz to 65Hz three-phase AC power supply.
To ensure proper and safe use of this product, please observe the following.

DANGER

Mandatory — Verify that the input power supply (power supply AC 342V to 440V) is turned off when wiring input terminals.

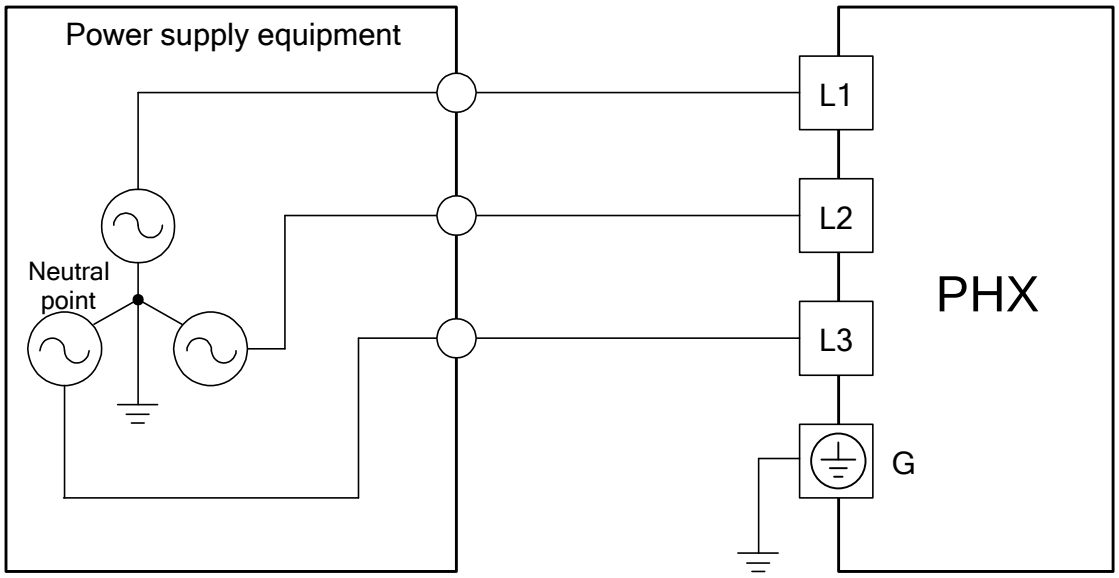
Mandatory — A noise filter is built into the device to prevent EMI (Electromagnetic Interference).
Due to this, even the slightest amount of leaked current may result in electric shock if not properly grounded.
For safety reasons, please ground the device.

CAUTION

Mandatory — Please use input power within ranges of 342V to 440V and 45Hz to 65Hz (three-phase).
The nominal power supply voltage is displayed near the rear input connector platform.

Since it becomes a cause of failure, please do not use it with the electric supply source line in which each voltage between phase groundings (Between L1-G, Between L2-G, and Between L3-G) is higher than AC254V.

Mandatory



Please ground the neutral point.

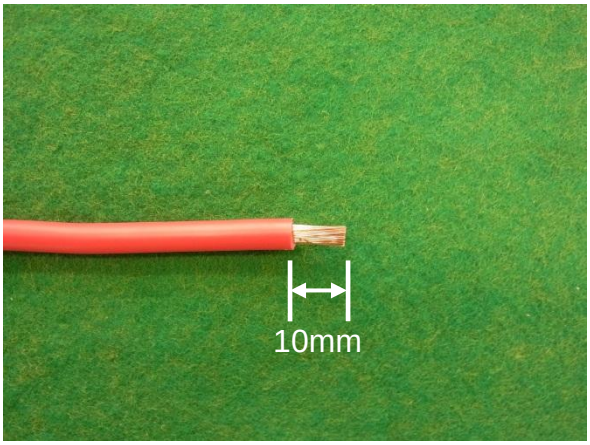
Mandatory — Please connect to a power supply capable of providing the maximum electric power consumption.

Mandatory — For wiring to the connector platform, be sure to connect it tightly.
Fastening loosely may cause heating and burnout of the connector platform.

Mandatory — The cross-section area of the wiring material should be sufficient against load current.
Please refer to the Appendix "Loaded Current vs Recommended Conductor Area" in the user manual when you select the wiring material.
Maximum Input Current is displayed near the input terminals at rear side.

Connecting the Input Power Source

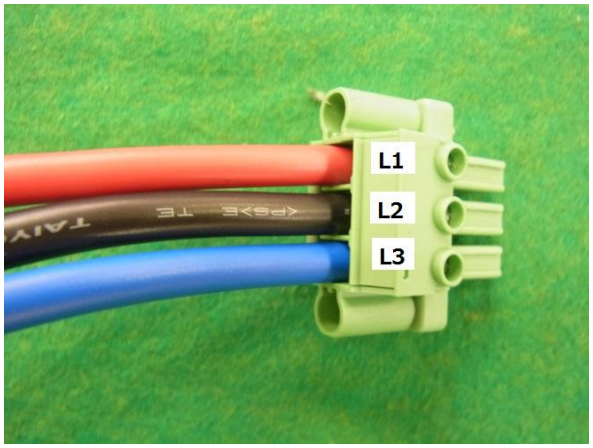
① Strip 10mm of the cable covering.



② Insert a cable in the hole of the connector.

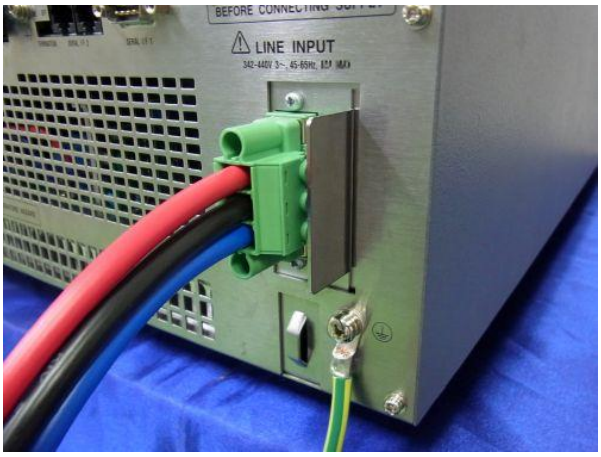
③Please fix the cable by tightening the screw so that the cable does not fall out.

④ Insert other cables in the connector and fix the cables tightly in the same manner.



⑤Attach the cable to protective earth terminal.

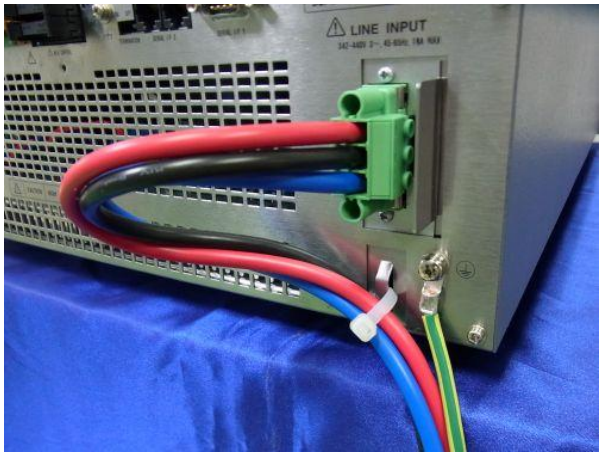
⑥ Insert the input cables from step ④ into the input terminal firmly.



⑦ Tighten the upper and lower screws and fix the inserted connector so that is does not fall off. (The picture shows tightening the upper screw.)

⑧ The picture shows tightening the lower screw.

⑨ Bundle and fix the input cables with a cable-tie so that they don't become loose.

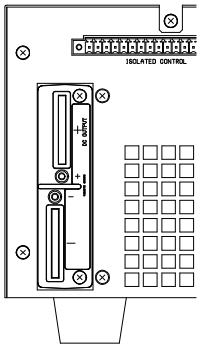


CAUTION

When the cables are removed, please turn off the input power switch (POWER) and remove the input connector after the confirmation of no power supply from the feeding device. Then remove grounding cable in the end.

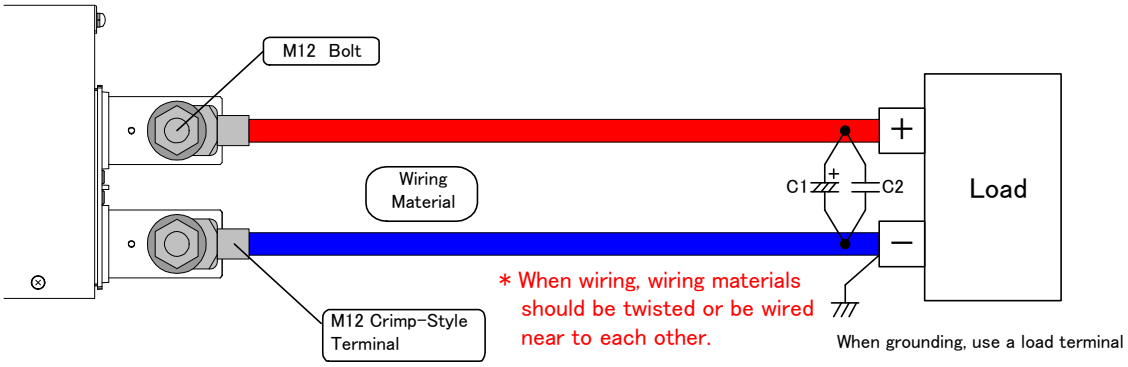
Connecting Loads (PHX 30-200 and 60V Models)

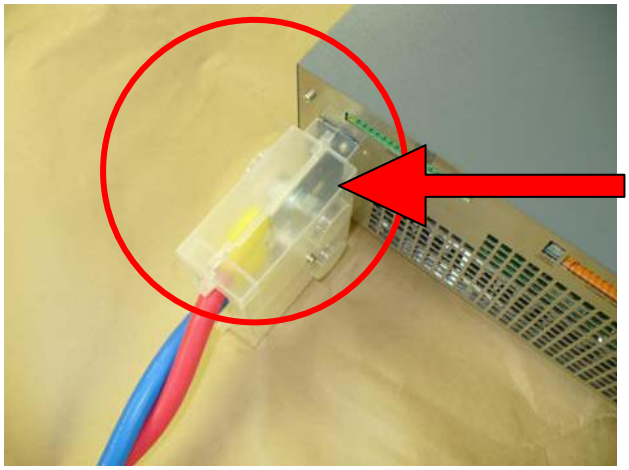
For wiring to the output terminal, please attach the M12 crimp-style terminal and be sure to tightly fasten the M12 bolts.



MEMO

- Twisting wires can minimize the ripple and noise at the load terminal.
- The noise level can be lowered to be smaller than the standard value by connecting the C1 and C2 close to the load terminal.
  Use C1 and C2 that are small and with high-frequency impedance, and connect the lead wire cutting it as short as possible.
  C1: Electrolytic Capacitor 100 to 1000 μF
  C2: Film Capacitor 1 to 10 μF.





Mandatory

After wiring, be sure to set the attached output terminal cover.

Output Terminal Cover

DANGER


Mandatory

Verify that the main power supply for the power supply is turned off when connecting loads.


Prohibited

Do not wire loads when voltage is being outputted from the power supply.

CAUTION


Mandatory

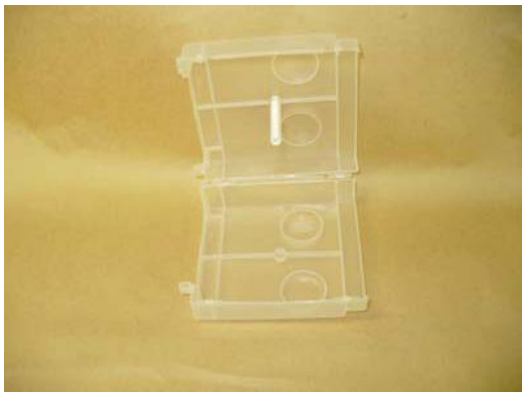
Use wires with sufficient cross section areas for load currents.
For selecting wires, **refer to the Appendix "Load Current vs Recommended Cross Section Area" in the user manual**.


Mandatory

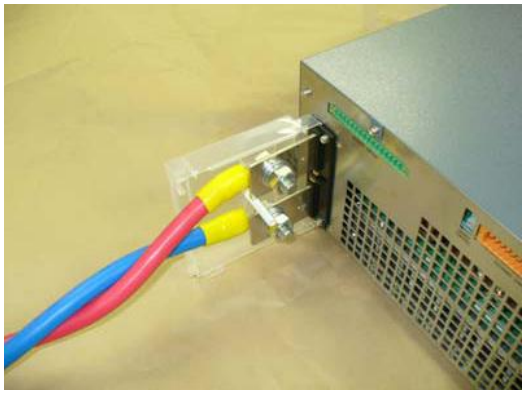
Attach crimp-style terminals to wires and securely fasten.
If insecurely fastened, wires may become deformed or burn out due to the generated heat at connection points.

Attaching the Output Terminal Cover

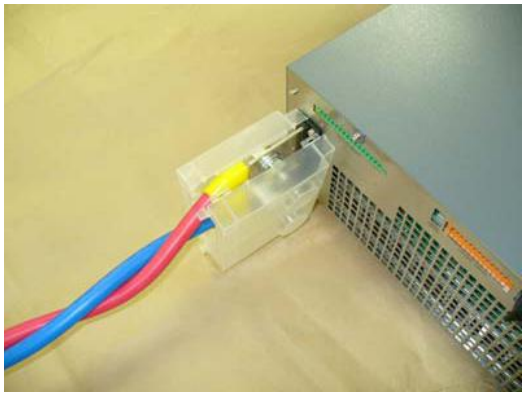
1. Attach a supporter for attaching cover on one output terminal cover (both covers are identical in shape).
   *. Insert the supporter for attaching into the center part of the inside of the output terminal cover and fix it in place by screwing an M3x6mm from outside.



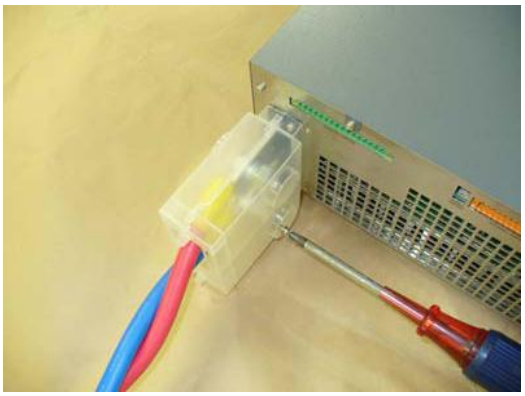
2. Fix the output terminal cover to which the supporter for attaching cover has been attached on the left-side grooves of the output terminal.



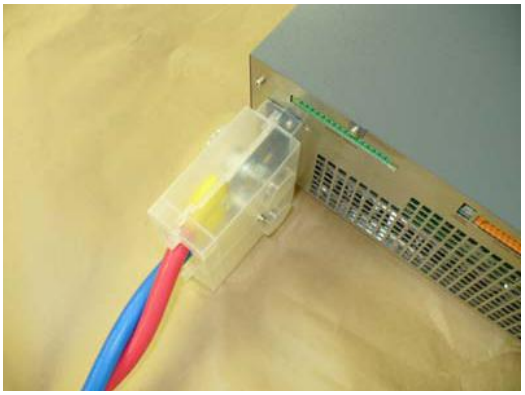
3. Fix the other output terminal cover on the right-side grooves of the output terminal.



4. Fasten the output terminal covers with an M3X6mm screw.

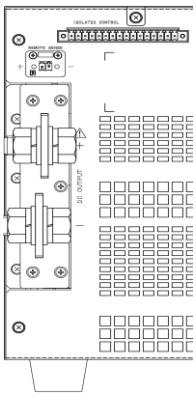


5. Attaching the output terminal cover is completed.



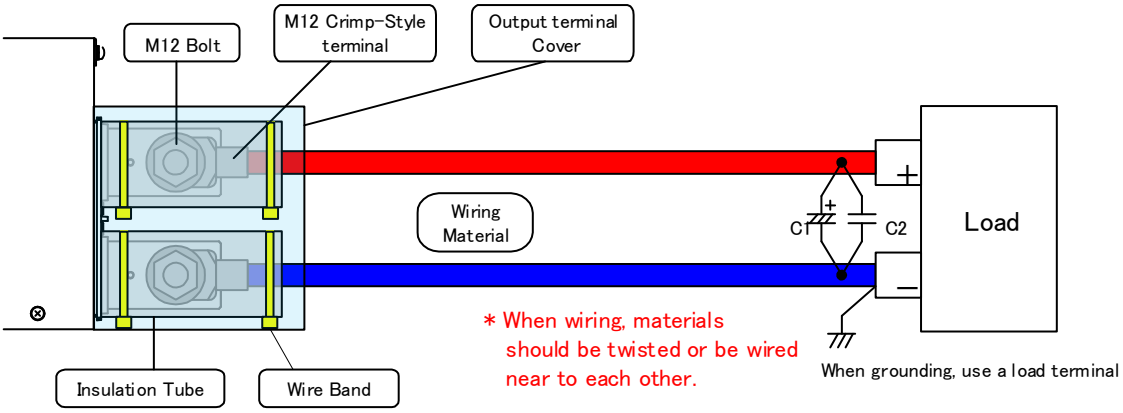
Connecting Loads (PHX 30-400 only)

For wiring to the output terminal, please attach the M12 crimp-style terminal and be sure to tightly fasten the M5 bolts.



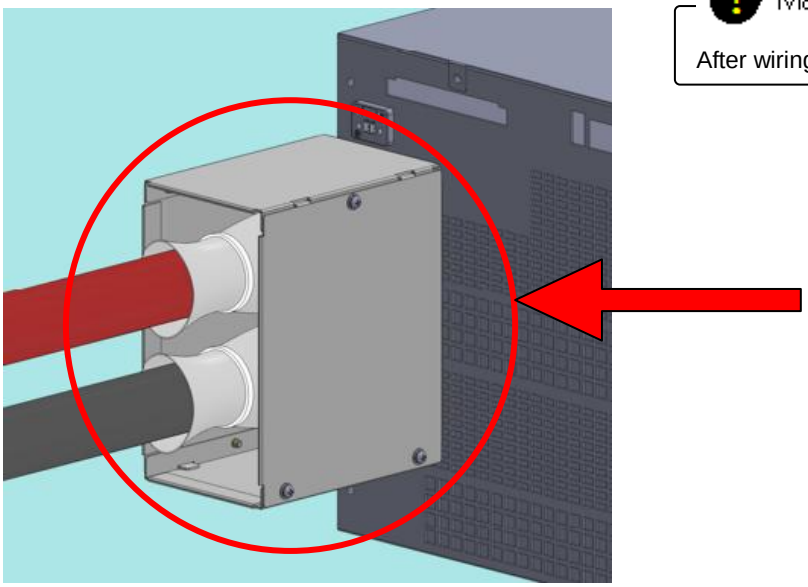
MEMO

- Twisting wires can minimize the ripple and noise at the load terminal.
- The noise level can be lowered to be smaller than the standard value by connecting the C1 and C2 close to the load terminal.
  Use C1 and C2 that are small and with high-frequency impedance, and connect the lead wire cutting it as short as possible.
  C1: Electrolytic Capacitor 100 to 1000 μF
  C2: Film Capacitor 1 to 10 μF.



Mandatory

After wiring, be sure to set the attached output terminal cover.



DANGER

Mandatory — Verify that the main power supply for the power supply is turned off when connecting loads.

Prohibited — Do not wire loads when voltage is being outputted from the power supply.

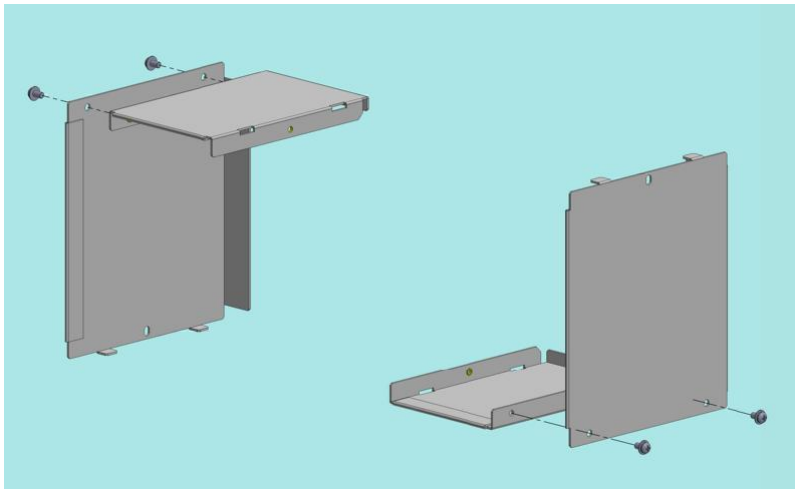
CAUTION

Mandatory — Use wires with sufficient cross section areas for load currents.
For selecting wires, **refer to the Appendix "Load Current vs Recommended Cross Section Area" in the user manual**.

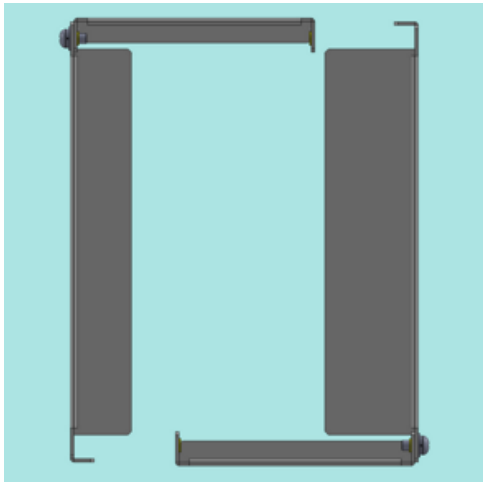
Mandatory — Attach crimp-style terminals to wires and securely fasten.
If insecurely fastened, wires may become deformed or burn out due to the generated heat at connection points.

Attaching the Output Terminal Cover

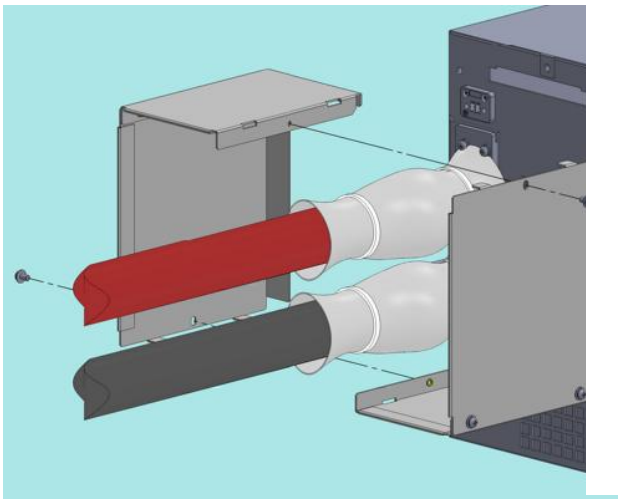
1. Prepare the output terminal cover by joining the wire bands together using four M3 x 6mm screws.

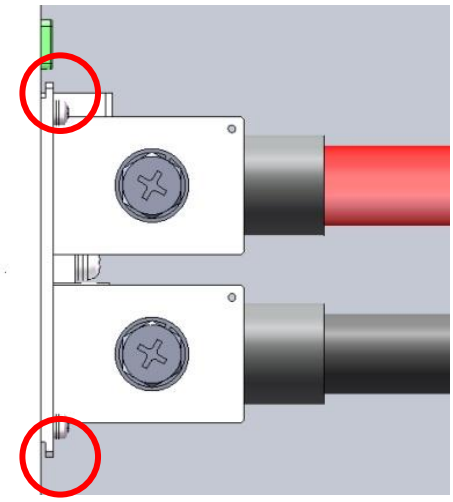


2. The upper and lower output terminal cover can be checked from the front of the cover. Please refer to the following.

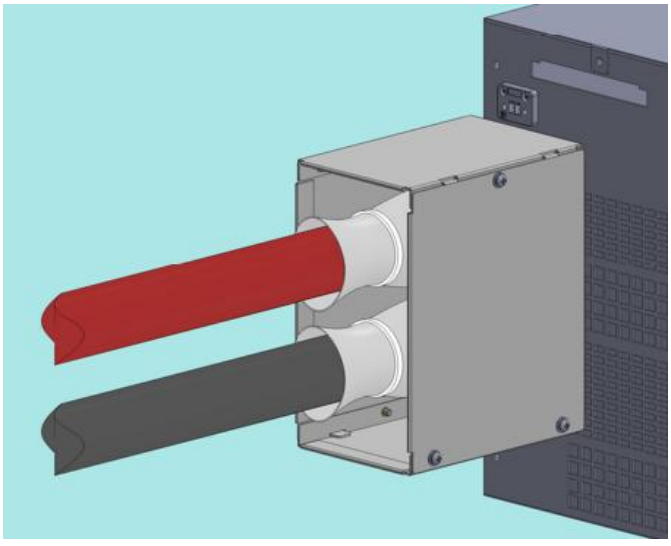


3. Snap the terminal covers together at the top and bottom along the groove on the terminal.



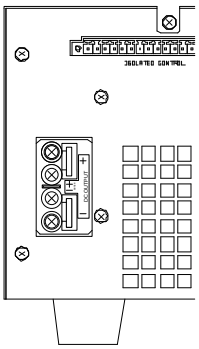


4. To finish the installation, use the 2 M3 x 6mm screws to fix the top and bottom terminal covers together.



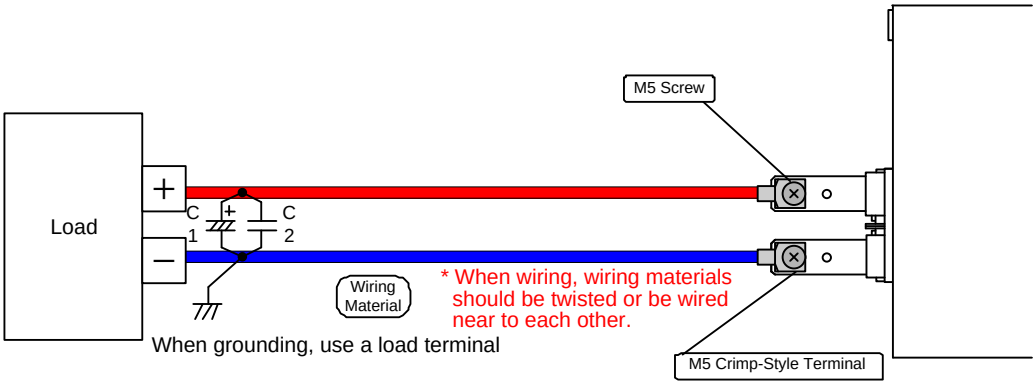
Connecting Loads (PHX 500V and 1000V Models)

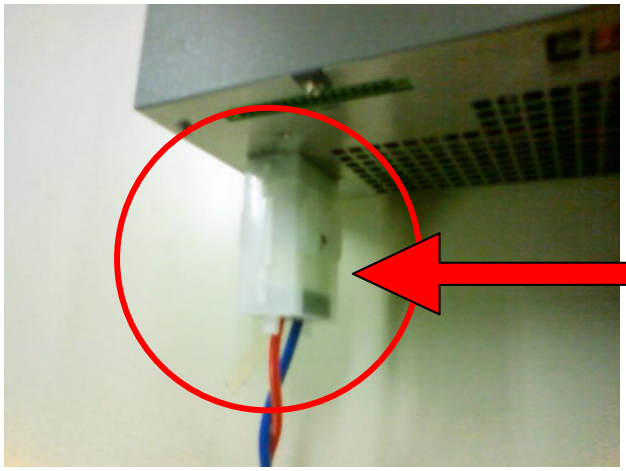
For wiring to the output terminal, please attach the M5 crimp-style terminal and be sure to tightly fasten the M5 screws.



MEMO

- Twisting wires can minimize the ripple and noise at the load terminal.
- The noise level can be lowered to be smaller than the standard value by connecting the C1 and C2 close to the load terminal.
  Use C1 and C2 that are small and with high-frequency impedance, and connect the lead wire cutting it as short as possible.
  C1: Electrolytic Capacitor 100 to 1000 μF
  C2: Film Capacitor 1 to 10 μF.





Mandatory

After wiring, be sure to set the attached output terminal cover.

Output Terminal Cover

DANGER


Mandatory

Verify that the main power supply for the power supply is turned off when connecting loads.


Prohibited

Do not wire loads when voltage is being outputted from the power supply.

CAUTION


Mandatory

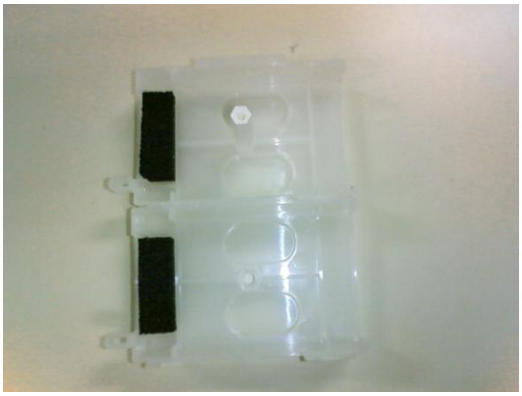
Use wires with sufficient cross section areas for load currents.
For selecting wires, **refer to the Appendix "Load Current vs Recommended Cross Section Area" in the user manual**.


Mandatory

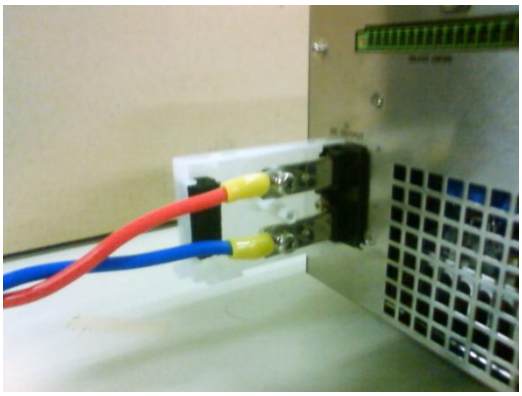
Attach crimp-style terminals to wires and securely fasten.
If insecurely fastened, wires may become deformed or burn out due to the generated heat at connection points.

Attaching the Output Terminal Cover

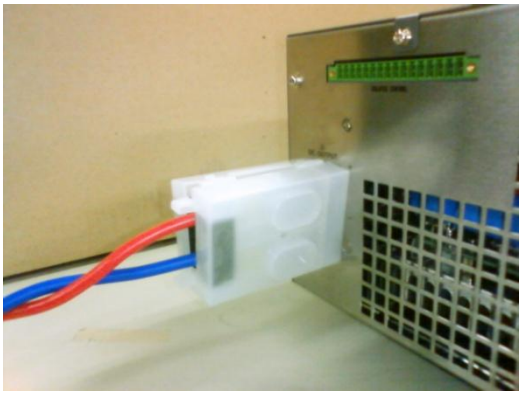
1. Attach a supporter for attaching cover on one output terminal cover (both covers are identical in shape).
   *. Insert the supporter for attaching into the center part of the inside of the output terminal cover and fix it in place by screwing an M3x6mm from outside.



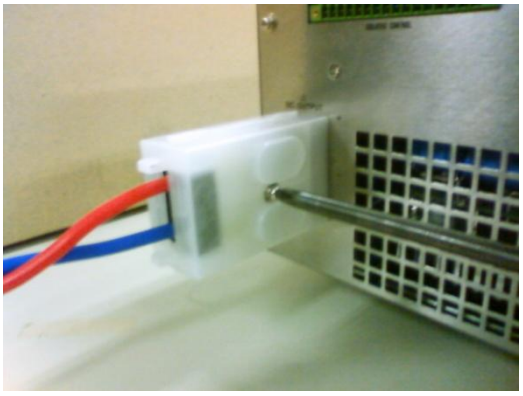
2. Fix the output terminal cover to which the supporter for attaching cover has been attached on the left-side grooves of the output terminal.



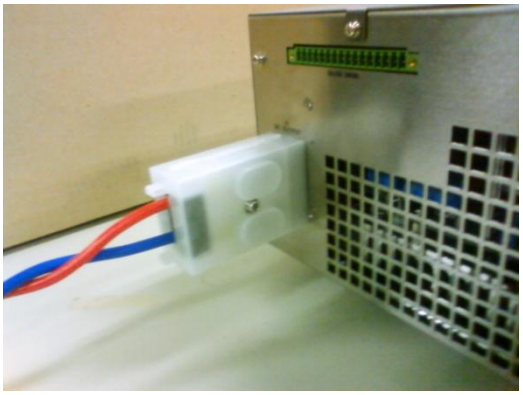
3. Fix the other output terminal cover on the right-side grooves of the output terminal.



4. Fasten the output terminal covers with an M3X6mm screw.



5. Attaching the output terminal cover is completed.



BASIC USAGE

Startup Display

Once power is turned on (POWER switch pushed to ON), the output voltage will be displayed in the Number Display (voltage) and the model name and the total output capacity (in kW) will be displayed in the Number Display (current).

Number Display (Voltage): Output Voltage Display
Number Display (Current): Model Display

Number Display (Voltage): Output Voltage Display
Number Display (Current): Total Output Capacity

Measurement Display

If the total output capacity differs from that of the previous startup due to changes of parallel connection configuration, the error code “E011” will be displayed on the Number Display (voltage) and the current total output capacity will appear blinking on the Number Display (current).
After confirming the total output capacity, if you hold down the “FUNC.” key for more than 2 seconds to approve the current total output capacity, it returns to the measurement display mode.

MEMO

Models
●PHX30-200-SD: 06-- ●PHX30-200-FD: 06F- ●PHX30-400-SD: 12-- ●PHX30-400-FD: 12F-
●PHX60-100-SD: 06-- ●PHX60-100-FD: 06F- ●PHX60-200-SD: 12-- ●PHX60-200-FD: 12F-
●PHX500-12-SD: 06-- ●PHX500-12-FD: 06F- ●PHX500-24-SD: 12-- ●PHX500-24-FD: 12F-
●PHX1000-6-SD: 06-I ●PHX1000-6-FD: 06FI ●PHX1000-12-SD: 12-I ●PHX1000-12-FD: 12FI

Default Settings

Factory settings and settings after initialization are as follows:

Settings Item (6kW Models)	PHX 30-200	PHX 60-100	PHX 500-12	PHX 1000-6
Constant Voltage Set Value	0.00V	0.00V	0.0V	0V
Constant Current Set Value	210.0A	105.0A	12.60A	6.300A
Over Voltage Protection (OVP) Set Value	33.00V	66.00V	550.0v	1100V
Over Current Protection (OCP)	220.0A	110.0A	13.20A	6.600A
Settings Values in Memory A,B,C	Same with the above CV set values, CC set values, OVP set values, OCP set values			
Function Settings	See page 42 on Default Values for Function Settings (excluding section 20~39 Calibration Values)			

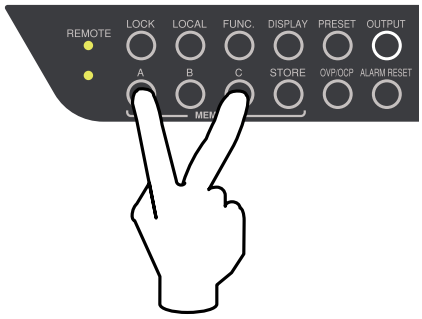
Settings Item (12kW Models)	PHX 30-400	PHX 60-200	PHX 500-24	PHX 1000-12
Constant Voltage Set Value	0.00V	0.00V	0.0V	0V
Constant Current Set Value	420.0A	210.0A	25.20A	12.60A
Over Voltage Protection (OVP) Set Value	33.00V	66.00V	550.0A	1100V
Over Current Protection (OCP)	440.0A	220.0A	26.40A	13.20A
Settings Values in Memory A,B,C	Same with the above CV set values, CC set values, OVP set values, OCP set values			
Function Settings	See page 42 on Default Values for Function Settings (excluding section 20~39 Calibration Values)			

Returning Factory Settings

All power supply settings can be initialized.

Step 1: Turn the POWER switch ON while holding down the MEMORY keys “A” and “C”.
Step 2: Release the keys “A” and “C” once the Number Display lights up.

Each setting returns to the factory setting.



Backing-Up Settings

This power supply saves all settings in non-volatile memory (EEPROM) just before the POWER switch is turned off or immediately before power is cut off.
All previous settings will remain the same when power is turned on again.
∗ No batteries are used. There is no need to replace batteries.

Operating as Constant Voltage Power Supply

Please verify that the settings for Over Voltage Protection (OVP) circuit (page 48) and Over Current Protection (OCP) circuit (page 50) are in effect.

Turn the POWER switch ON to startup the power supply.

The voltage measurement value will be displayed in the Number Display (voltage) and the current measurement value will be displayed in the Number Display (current). The lamp “V” and “A” will light.
(If parameters for FUNCTION settings item 52 is set to 1, PRESET value will be displayed)

MEMO

When POWER is turned OFF for the top or bottom Number Display, the Number Display will be displayed in the same manner when POWER is turned on again.
* The "kW" lamp will light when the power is displayed.

Press the PRESET key

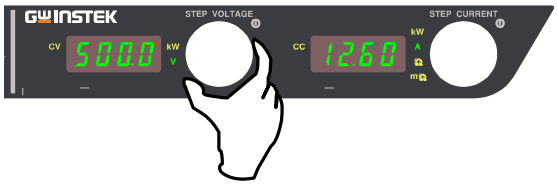
PRESET lamp will light.
Press the PRESET key again if you wish to discontinue and return to the measurement display mode.
The voltage PRESET value will be displayed in the Number Display (voltage) and the current limit PRESET value will be displayed in the Number Display (current).

Turn the VOLTAGE dial to adjust the Constant Voltage Set Value

(Turn the dial right to raise or left to lower the set value.)

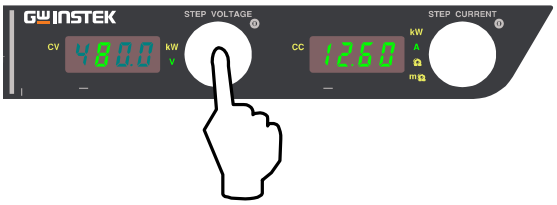
MEMO

Press the VOLTAGE dial to display the current number position. The selected number will be brightened. Press to change position.
If all 4 places are brightened, numbers will change from the lowest place.



If the parameter for FUNCTION item 50 is set to 0, press the PRESET key again. The output voltage will be updated once the PRESET mode has been exited.

If the parameter for FUNCTION item 50 is set to 1, promptly change the set value using the VOLTAGE dial.

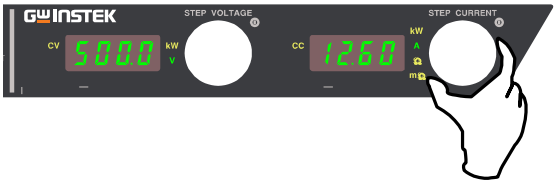


Turn the CURRENT dial to adjust the Current Limit Value

Set a value greater than the required load current.
(Turn the dial right to raise or left to lower the set value.)

MEMO

If the current limit value is set to a value lower than the required load current, the current will be restricted and the constant current will be used. (CC lamp lights)



⇒Continued on next page

Press the PRESET key to finalize settings.

Confirms PRESET settings and returns to the measurement display mode.

Press the OUTPUT key.

Outputs with the set settings. The OUTPUT and CV lamps will light.

MEMO

While the PRESET lamp is lit, all other keys not mentioned in the above setting procedures cannot be used. (The OUTPUT key is valid.)

Operating as Constant Current Power Supply

Please verify that the settings for Over Voltage Protection (OVP) circuit (page 48) and Over Current Protection (OCP) circuit (page 50) are in effect.

Turn the POWER switch ON to startup the power supply.

The voltage measurement value will be displayed in the Number Display (voltage) and the current measurement value will be displayed in the Number Display (current). The lamp “V” and “A” will light.
(If parameters for FUNCTION settings item 52 is set to 1, PRESET value will be displayed)

MEMO

When POWER is turned OFF for the top or bottom Number Display, the Number Display will be displayed in the same manner when POWER is turned on again.
* The "kW" lamp will light when the power is displayed.

Press the PRESET key

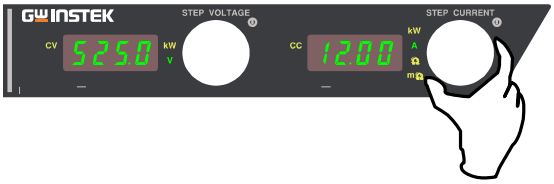
PRESET lamp will light.
Press the PRESET key again if you wish to discontinue and return to the measurement display mode.
The voltage limit PRESET value will be displayed in the Number Display (voltage), and the current PRESET value will be displayed in the Number Display (current).

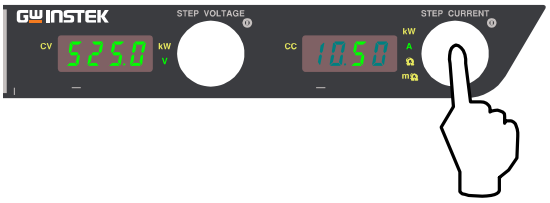
Turn the CURRENT dial to adjust the Constant Current Set Value.

(Turn the dial right to raise or left to lower the set value.)

MEMO

Press the CURRENT dial to display the current number position. The selected number will be brightened. Press to change position.
If all 4 places are brightened, numbers will change from the lowest place.





If the parameter for FUNCTION item 50 is set to 0, press the PRESET key again. The output current will be updated once the PRESET mode has been exited.

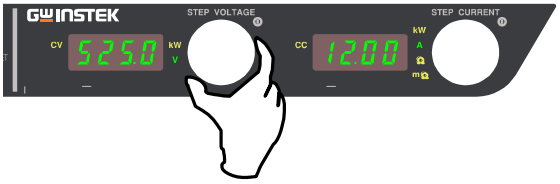
If the parameter for FUNCTION item 50 is set to 1, promptly change the set value using the CURRENT dial.

Turn the VOLTAGE dial to adjust the Voltage Limit Value

(Turn the dial right to raise or left to lower the set value.)

MEMO

If the voltage limit value is set to a value lower than the required load voltage, the voltage will be restricted and the constant voltage will be used. (CV lamp lights)



⇒Continued on next page

Press the PRESET key to finalize settings.

Confirms PRESET settings and returns to the measurement display.

Press the OUTPUT key.

Outputs with the set settings. The "OUTPUT" and the “CC” lamp will light.

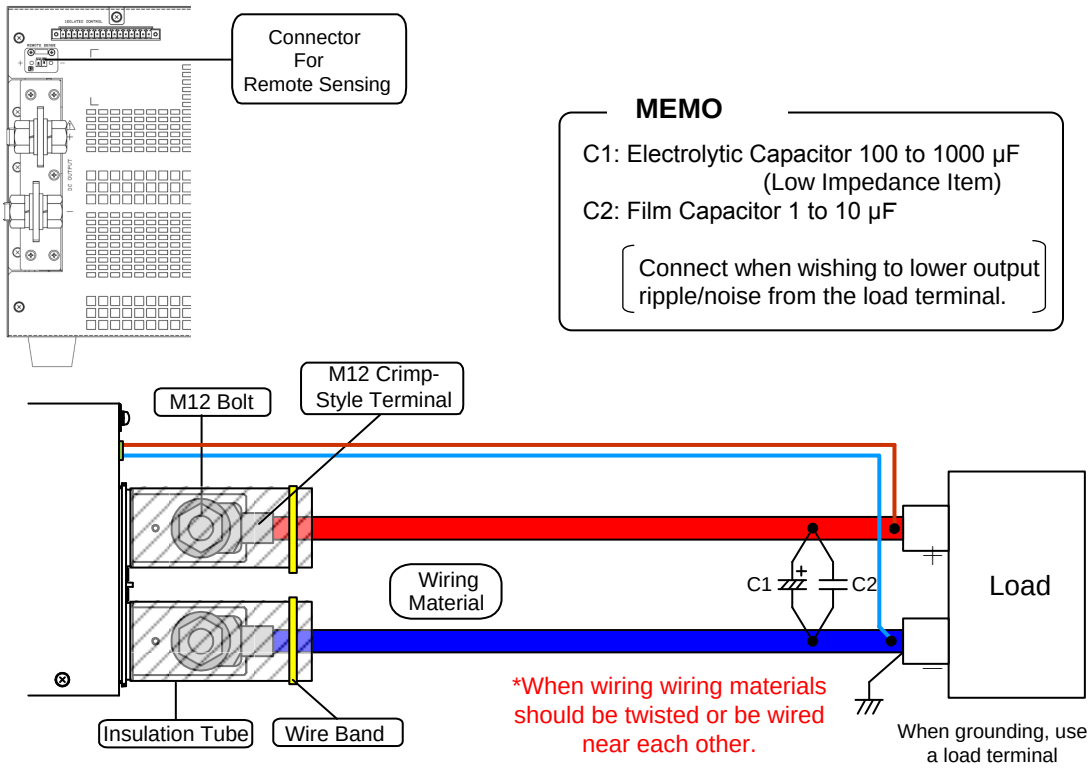
MEMO

While the "PRESET" lamp is lit, all other keys not mentioned in the above setting procedures cannot be used. (The OUTPUT key is valid.)

Remote Sensing

Remote sensing is used for solving problems with voltage drop between the output terminal and load due to wiring by compensating for the voltage drop. Remote sensing is able to compensate voltages up to 5V per direction (one-way).
Wire as shown in the diagram below.

For PHX 30-400:



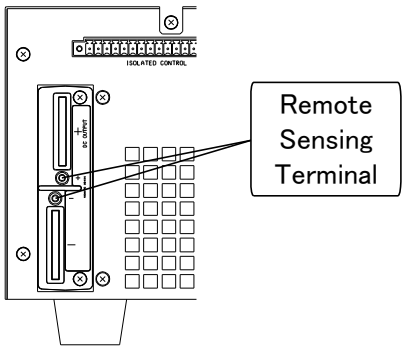
DANGER

Turn POWER switch OFF before wiring to the output terminal.

CAUTION

- While using remote sensing, do not switch output lines using switches, etc. Doing so may lead to damaging the power supply.
- Because the output terminal's voltage is detected by the OVP circuit, please set the voltage value of the OVP to include the voltage drop amount (round trip) of the wires outputting the voltage you wish to protect.

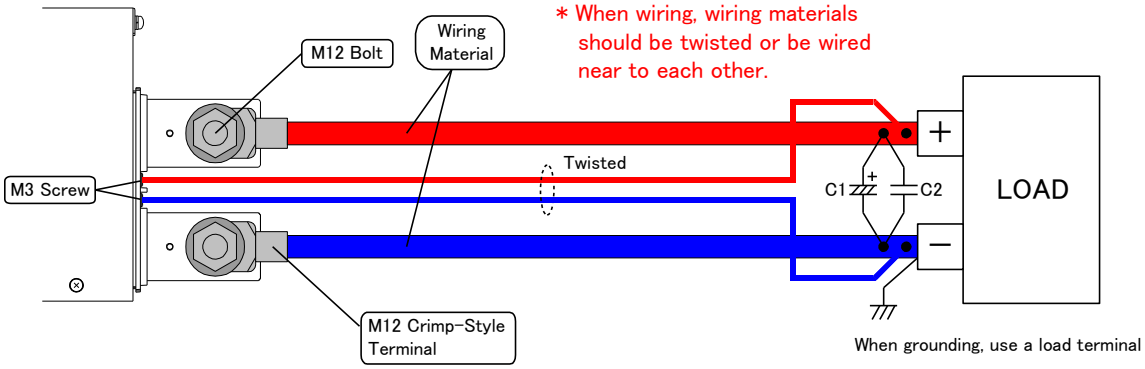
For PHX 30-200, 60-100 and PHX 60-200:



MEMO

C1: Electrolytic Capacitor 100 to 1000 μF
(Low Impedance Item)
C2: Film Capacitor 1 to 10 μF

Connect when wishing to lower output ripple/noise from the load terminal.



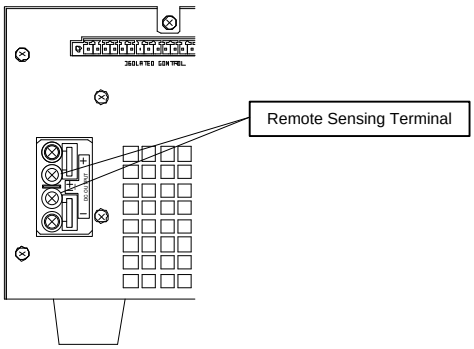
DANGER

Turn POWER switch OFF before wiring to the output terminal.

CAUTION

- While using remote sensing, do not switch output lines using switches, etc. Doing so may lead to damaging the power supply..
- Because the output terminal's voltage is detected by the OVP circuit, please set the voltage value of the OVP to include the voltage drop amount (round trip) of the wires outputting the voltage you wish to protect.

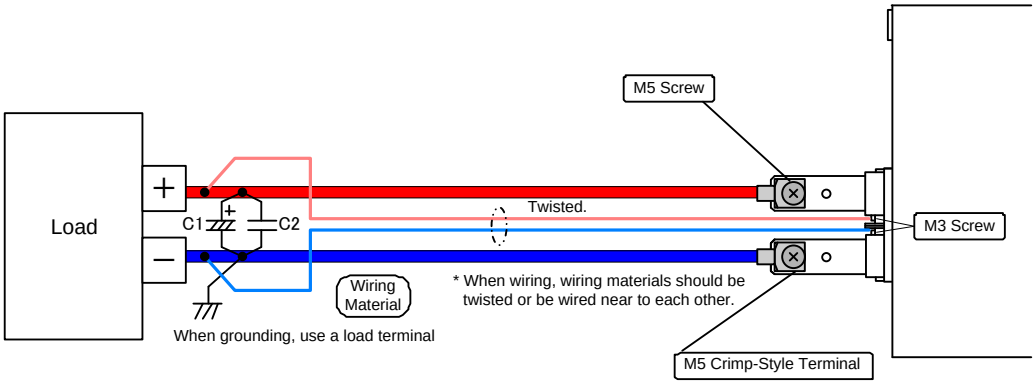
For PHX 500-12 and PHX 500-24:



MEMO

C1: Electrolytic Capacitor 100 to 1000 µF
(Low Impedance Item)
C2: Film Capacitor 1 to 10 µF

Connect when wishing to lower output ripple/noise from the load terminal.



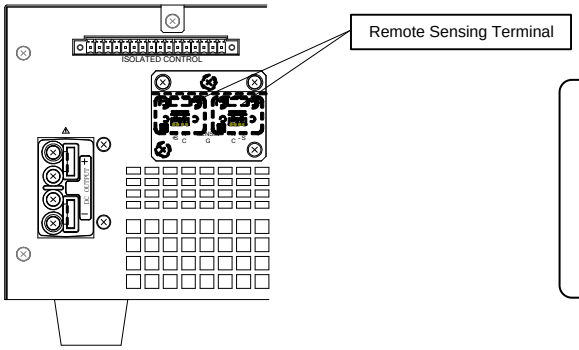
DANGER

Turn POWER switch OFF before wiring to the output terminal.

CAUTION

- While using remote sensing, do not switch output lines using switches, etc. Doing so may lead to damaging the power supply.
- Because the output terminal's voltage is detected by the OVP circuit, please set the voltage value of the OVP to include the voltage drop amount (round trip) of the wires outputting the voltage you wish to protect.

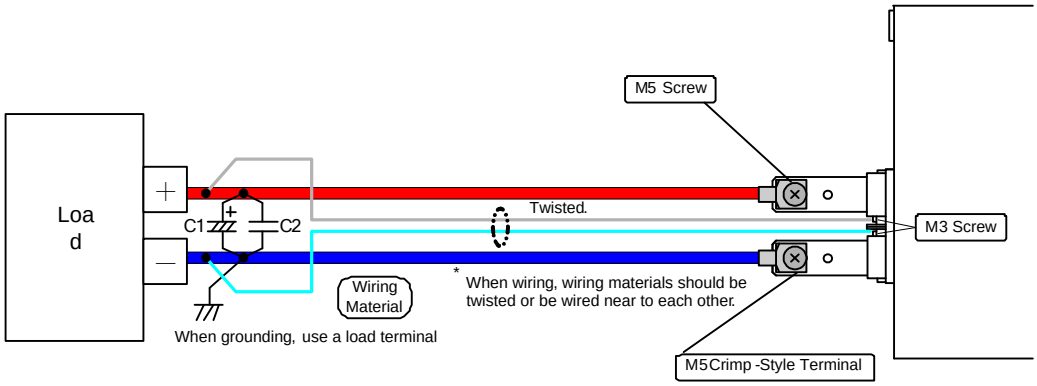
For PHX 1000-6 and PHX 1000-12:



MEMO

C1: Electrolytic Capacitor 100 to 1000 μF
(Low Impedance Item)
C2: Film Capacitor 1 to 10 μF

Connect when wishing to lower output ripple/noise from the load terminal.



DANGER

Turn POWER switch OFF before wiring to the output terminal.

CAUTION

- While using remote sensing, do not switch output lines using switches, etc. Doing so may lead to damaging the power supply.
- Because the output terminal's voltage is detected by the OVP circuit, please set the voltage value of the OVP to include the voltage drop amount (round trip) of the wires outputting the voltage you wish to protect.

Function Settings

This section covers setting parameters for various functions. Parameters that can be set are the device address, bitrate, parity, Output ON/OFF Toggle at external contact, selection of external analog control, OUTPUT settings when POWER is ON, voltmeter and ammeter display when OUTPUT is OFF, etc.
For details, see the FUNCTION Settings Items List. (page 42).

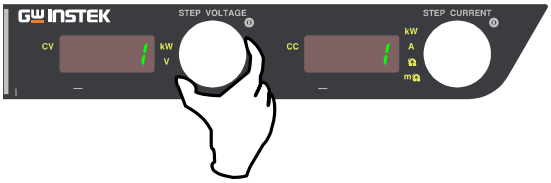
Setting Functions

Setting Procedures

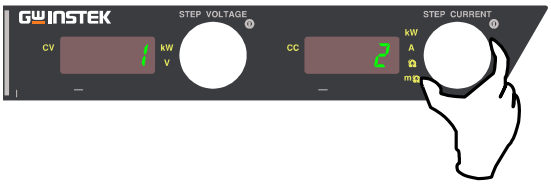
Press the Function "FUNC." key.

The FUNC. lamp will light.
The Setting Item Number will be displayed in the Number Display (voltage) and the parameter will be displayed in the Number Display (current).

Select the Item Number with the VOLTAGE dial.



Change the Parameter with the CURRENT dial.



Press the FUNC. key again to finalize settings.

The Number Display (voltage) and the Number Display (current) will return to the measurement display mode.
It is possible to continue to change other setting items without pressing the FUNC. key.
In this case, press the FUNC. key to confirm settings once changes are finished.

MEMO

The settings of the device address, the bitrate, and the parity can be changed by turning off the POWER switch after finishing setting using the FUNC key and turning on the power switch again.

Settings Items List

[FUNCTION Settings Items]

Item No.		Settings Item	Parameters and their Ranges	Default Value
0	General Functions	Firmware Version	Ex: 1.00 (Cannot be changed)	
1		Startup Mode Selection	0=CV Priority (High Speed) 1=CV Priority (Medium Speed) 2=CV Priority (Low Speed) 3=CV Slew Rate 4=CC Priority (High Speed) 5=CC Priority (Medium Speed) 6=CC Priority (Low Speed) 7=CC Slew Rate	2=CV Priority (Low Speed) * This function can only be set for full-featured “F” type models.
2		CV Slew Rate Rising	PHX 30-200: 0.01V/s ~ 60.00V/s PHX 30-400: 0.01V/s ~ 60.00V/s PHX 60-100: 0.1V/s ~ 120.0V/s PHX 60-200: 0.1V/s ~ 120.0V/s PHX 500-12: 1V/s~1000V/s PHX 500-24: 1V/s ~ 1000V/s PHX 1000-6: 1V/s ~ 2000V/s PHX 1000-12: 1V/s ~ 2000V/s	PHX 30-200: 60V/s PHX 30-400: 60V/s PHX 60-100: 120.0V/s PHX 60-200: 120.0V/s PHX 500-12: 1000V/s PHX 500-24: 1000V/s PHX 1000-6: 2000V/s PHX 1000-12: 2000V/s
3		CV Slew Rate Falling	PHX 30-200: 0.01V/s ~ 60.00V/s PHX 30-400: 0.01V/s ~ 60.00V/s PHX 60-100: 0.1V/s ~ 120.0V/s PHX 60-200: 0.1V/s ~ 120.0V/s PHX 500-12: 1V/s~1000V/s PHX 500-24: 1V/s ~ 1000V/s PHX 1000-6: 1V/s ~ 2000V/s PHX 1000-12: 1V/s ~ 2000V/s	* This function can only be set for full-featured “F” type models.
4		CC Slew Rate Rising	PHX 30-200: 0.1A/s ~ 400.0A/s PHX 30-400: 0.1A/s ~ 800.0A/s PHX 60-100: 0.1A/s ~ 200.0A/s PHX 60-200: 0.1A/s ~ 400.0A/s PHX 500-12: 0.01A/s ~ 24.00A/s PHX 500-24: 0.01A/s ~ 48.00A/s PHX 1000-6: 0.01A/s ~ 12.00A/s PHX 1000-12: 0.01A/s ~ 24.00A/s	PHX 60-100: 200.0A/s PHX 60-200: 400.0A/s PHX 30-200: 400.0A/s PHX 30-400: 800.0A/s PHX 500-12: 24.00A/s PHX 500-24: 48.00A/s PHX 1000-6: 12.00A/s PHX 1000-12: 24.00A/s
5		CC Slew Rate Falling	PHX 30-200: 0.1A/s ~ 400.0A/s PHX 30-400: 0.1A/s ~ 800.0A/s PHX 60-100: 0.1A/s ~ 200.0A/s PHX 60-200: 0.1A/s ~ 400.0A/s PHX 500-12: 0.01A/s ~ 24.00A/s PHX 500-24: 0.01A/s ~ 48.00A/s PHX 1000-6: 0.01A/s ~ 12.00A/s PHX 1000-12: 0.01A/s ~ 24.00A/s	When Parallel Connection: (Maximum Output Current x 2)/s * This function can only be set for full-featured “F” type models.
6		Serial I/F2	0=Serial Data Communication Control (Remote Mode) 1=Use for Sequential ON/OFF (Local Mode)	0=Serial Data Communication Control (Remote Mode) * This function can only be set for full-featured “F” type models.
7		ON Delay Time	0.00s~99.99s	0.00s
8		OFF Delay Time	0.00s~99.99s	* This function can only be set for full-featured “F” type models.

Settings Items List (Continued)

[FUNCTION Settings Items]

Item No.		Settings Item		Parameters and their Ranges	Default Value
9	General Functions	Operation during Alarm		0=Stop switching	0=Stop switching
				1=Input Switch TRIP (Only for TRIP input and serious failures)	
				2=Input Switch TRIP (TRIP input, serious failures, OVP, and OCP)	
10		Output ON/OFF Toggle with External Contact		0=Invalid	0=Invalid
				1=When close Output is ON, When open Output is OFF	
				2=When close can be ON/OFF by panel control, When open Output is OFF	
11		Measurement Value Moving Average Processing		0=No	0=No
				1=Yes	
12		Linearity Compensation Function Operation Mode		0=Compensation Mode OFF	1=Operates when Output is turned ON/OFF or when settings are changed. Saves compensation value after converging
				1=Operates when Output is turned ON/OFF or when settings are changed. Saves compensation value after converging	
				2=Performs continuous compensation	
20	Calibration	Voltage Setting Offset		Not displayed	
21		Voltage Setting Full-Scale		Not displayed	
22		Current Setting Offset		Not displayed	
23		Current Setting Full-Scale		Not displayed	
24		Voltage Measurement Offset		Voltage measured value	
25		Voltage Measurement Full-Scale		Voltage measured value	
26		Current Measurement Offset		Voltage measured value	
27		Current Measurement Full-Scale		Voltage measured value	
28		External Analog Input	Voltage Setting Offset	Not displayed	
29			Voltage Setting Full-Scale	C: Coarse adjustment, F: Fine adjustment	C: Coarse adjustment
30			Current Setting Offset	Not displayed	
31			Current Setting Full-Scale	C: Coarse adjustment, F: Fine adjustment	C: Coarse adjustment
32		Voltage Monitor Output Offset		Not displayed	
33		Voltage Monitor Output Full-Scale		Not displayed	
34		Current Monitor Output Offset		Not displayed	
35		Current Monitor Output Full-Scale		Not displayed	
36		-		Not displayed	
37		Voltage offset when series slave		Not displayed	
38		Voltage full-scale when series slave		Not displayed	
39		User adjustment value initialization (CV, CC, Voltage/Current measurement)		0=Invalid	0=Invalid
				1=Valid	

Settings Items List (Continued)

[FUNCTION Settings Items]

Item No.		Settings Item	Parameters and their Ranges	Default Value
40	Insulation option	Constant Voltage (CV) Insulation of external analog control signals	0=Invalid 1=Valid	0=Invalid * The insulation function is only available for the 1000V models.
41		Constant Current (CC) Insulation of external analog control signals	0=Invalid 1=Valid	
50	Panel Operation	Methods for Determining PRESET Contents	0=Determines PRESET contents after PRESET mode is complete 1=Determines PRESET contents during PRESET mode	0=Determines PRESET contents after PRESET mode is complete
51		OUTPUT Status when POWER ON	0=OFF (TOGGLE) 1=MODE1 (HOT START) 2=MODE2 (HOT START) Startup with OUTPUT OFF when recovering from ALM occurrence or TRIP operation. OUTPUT ON when the OUTPUT key is pressed.	0=OFF (TOGGLE)
52		Voltmeter/Ammeter Display when OUTPUT is OFF	0=Displays Measurement Values 1=Displays Set Values	0=Displays Measurement Values
53		LOCK Mode Selection	0 = only LOCK key is valid 1 = only OUTPUT and LOCK keys are valid 2 = VOLTAGE/CURRENT dial, PRESET, FUNC., OVP, and OCP are invalid	0 = only LOCK key is valid
54		Panel Memory Key Load Procedure	0=Single-Action 1=Double-Action	1=Double-Action
60	Communication Functions	Device Address	1 to 50	1
61		Bitrate	0=2400bps 1=9600bps 2=19200bps 3=38400bps	1=9600bps
62		Parity	0=No 1=ODD 2=EVEN	0=No
63		Command Form	0 = SCPI Standard Conformance 1 = PHX Series Compatible	0 = SCPI Standard Conformance
70	External Control	CV Control EXT R/V, PANEL Settings	0=Front Panel 1=External Voltage(0~10V) 2=External Resistance(0~10kΩ A) 3=External Resistance(0~10kΩ B) 4=External Resistance(0~10kΩ C)	0=Front Panel
71		CC Control EXT R/V, PANEL Settings	0=Front Panel 1=External Voltage(0~10V) 2=External Resistance(0~10kΩ A) 3=External Resistance(0~10kΩ B) 4=External Resistance(0~10kΩ C)	0=Front Panel

Settings Items List (Continued)

[FUNCTION Settings Items]

Item No.		Settings Item			Parameters and their Ranges	Default Value
72	External Control	Internal Resistance Settings			PHX 30-200: 0 to 150mΩ PHX 30-400: 0 to 75mΩ PHX 60-100: 0 to 600mΩ PHX 60-200: 0 to 300mΩ PHX 500-12: 0 to 41.7Ω PHX 500-24: 0 to 20.8Ω PHX 1000-6: 0 to 167Ω PHX 1000-12: 0 to 83Ω	0Ω * This function can only be set for full-featured “F” type models.
73		Series Operation			0=Master 1=Slave	0=Master
74	External Control	LEVEL1 _ALM	CV_STS		0=Is not included in LEVEL1_ALM 1=Included in LEVEL1_ALM	0=Is not included in LEVEL1_ALM
75			CC_STS		0=Is not included in LEVEL1_ALM 1=Included in LEVEL1_ALM	0=Is not included in LEVEL1_ALM
80	Status Display	Status Display 1	4th digit	B15	Over voltage detected	Display only Current status information is displayed in hexadecimal. 4th digit from the left end: Displayed as 1st digit
				B14	Over current detected	
				B13	Status of Output ON/OFF Toggle with External Contact	
				B12	Alarm occurrence	
			3rd digit	B11	Status of Output ON/OFF	
				B10	Status of Master/Booster	
				B09	Input Power Monitoring (Booster)	
				B08	Input Power Monitoring (Master)	
			2nd digit	B07	-	
				B06	Over Heating Protection (OHP)	
				B05	Over Voltage Protection (OVP)	
				B04	Over Current Protection (OCP)	
			1st digit	B03	-	
				B02	-	
				B01	Status of Constant Current (CC)	
				B00	Status of Constant Voltage (CV)	
81		Status Display 2	4th digit	B15	-	Display only Current status information is displayed in hexadecimal. 4th digit from the left end: Displayed as 1st digit
				B14	-	
				B13	External TRIP Input Latch Information	
				B12	External TRIP Input Information	
			3rd digit	B11	-	
				B10	-	
				B09	-	
				B08	-	

Settings Items List (Continued)

[FUNCTION Settings Items]

Item No.		Settings Item			Parameters and their Ranges	Default Value
81	Status Display	Status Display 2	2nd digit	B07	-	
				B06	-	
				B05	Internal Power Part (B) Power Monitoring	
				B04	Internal Power Part (A) Power Monitoring	
			1st digit	B03	-	
				B02	-	
				B01	-	
				B00	Insulation Option Board Mounting Status	
82		HW FPGA Version			Ex: 1.00 (Cannot be changed)	Display only
90	Beep Sound	Beep sound when button is pressed down			0=OFF	1=ON
					1=ON	
91		Beep sound at alarm occurrence			0=OFF	1=ON
					1=ON	

Setting Output ON/OFF Toggle Mode

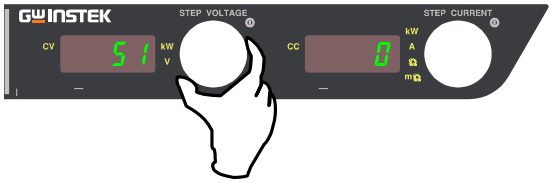
Output status at power supply is turned on (POWERON) can be changed.
If this is set to 1 or 2 and the power supply is turned on (POWERON), output will begin even if the OUTPUT key is not pressed.

Setting Procedures

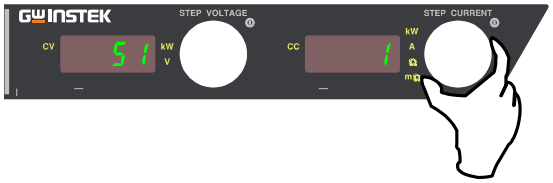
Press The Function "FUNC." key.

The FUNC. lamp will light.
The Setting Item Number will be displayed in the top Number Display and the parameter will be displayed in the bottom Number Display.

Select Item number 51 with the VOLTAGE dial.



Set Parameter to 0 or 1 with the CURRENT dial.

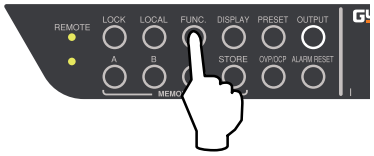


Parameter = 0:
Output is OFF (COLD START) after power is turned on, Pressing the OUTPUT key will toggle it ON/OFF.

Parameter = 1:
Output turns ON approximately 8 seconds after power is turned on. (HOT START)

Parameter = 2:
Output turns ON approximately 8 seconds after power is turned on.
(HOT START MODE 2)
However, the output status is OFF when recovered from ALM occurrence or TRIP operation. If the OUTPUT key is pressed, the output status becomes ON.

Press the FUNC. key again to finalize settings.



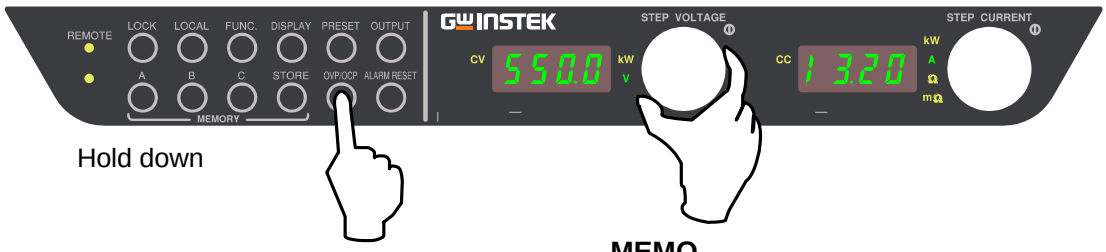
Over Voltage Protection (OVP)

In the event of an over voltage due to circuit failure of the power supply, improper use, load opens in constant current mode, etc. the output is turned OFF and switching is ceased to protect the load.
The OVP voltage can be set to any value from 0.30V to 33.00V(PHX 30-200/400), 0.60V to 66.00V(PHX 60-100/200), 5.0V to 550.0V(PHX 500-12/24) or 10V to 1100V (PHX 1000-6/12).

Setting/Canceling Over Voltage Protection

Setting Over Voltage Protection Level

① Set the output to OFF with the OUTPUT key.
② Press the OVP/OCP key to display the current OVP set value in the top Number Display (voltage).
③ Change the set value by turning the VOLTAGE dial while pressing down the OVP/OCP key.
(Turn the dial right to raise or left to lower the set value.)
④ Release the OVP/OCP key to confirm set values and to return to measurement display mode.



MEMO

- Press the VOLTAGE dial to display the current number position. The selected number will be brightened. Press to change position.
  If all 4 places are brightened, numbers will change from the lowest place.
- Press the OVP/OCP key to display the OVP set value in the Number Display (voltage) and the OCP set value in the Number Display (current).

Verifying Over Voltage Protection Operation

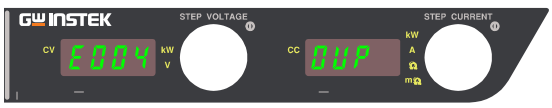
After settings are complete, please follow the procedures below to test verify operation.

① Disconnect the load from the power supply.
② Turn the POWER switch ON with the Output ON/OFF Toggle mode (FUNC.51) set to "0".
③ Set the Output Voltage settings lower than OVP level.
④ Turn OUTPUT to ON.
⑤ Gradually increase the Output Voltage with the VOLTAGE dial. Verify that the output turns OFF once the OVP set voltage has been reached and that the error code "E004" appears in the Number Display (voltage) and "OUP" appears in the Number Display (current).
⑥ Hold down the ALARM RESET key for more than 1 second to cancel the alarm. Return the CV set value to its original value.

Canceling Over Voltage Protection Operation

When Over Voltage Protection Circuit (OVP) is triggered, the OUTPUT is set to OFF and an error code and the alarm message will be displayed in the Number Display (voltage) and the Number Display (current).

The error code "E004" is displayed in the Number Display



(voltage) and "OUP" blinks in the Number Display (current).

MEMO

When the OVP is triggered, the Falling slew rate setting by the slew rate function becomes invalid and the voltage is decreased most rapidly under the condition of that time point.

Hold down the ALARM RESET key for more than 1 second to erase the displayed error code and OUP.

Caution

If the error code and OVP are not erased after holding down the ALARM RESET key, the power supply may be damaged. Turn power off immediately and contact your nearest GW Instek distributor or the GW Instek service center.

MEMO

- During serial data communication, recovery from alarm status is possible using commands.
- During parallel operation where the Master unit is the operating normal, if any Slave unit triggers an alarm, the error code “E006” will be displayed in the Master and functioning Slave units.

(Information concerning the alarm will be displayed on the Slave unit that triggered the alarm)

Remove cause which triggered the OVP

(Change CV set values, OVP set values, load status)

Press the OUTPUT key to start output.

Over Current Protection (OCP)

In the event of an over current due to a short circuit in the load, the output is turned OFF and switching is ceased to protect the load.
The OCP current can be set from 1% to 110% of the rated current.

Setting/Canceling Over Current Protection

Setting Over Current Protection Level

①. Set the output to OFF with the OUTPUT key.
②. Press the OVP/OCP key to display the current OCP set value in the Number Display (current).
③. Change the set value by turning the CURRENT dial while pressing down the OVP/OCP key.
④. Release the OVP/OCP key to confirm set values and to return to measurement display mode.

MEMO

- Press the CURRENT dial to display the current number position. The selected number will be brightened. Press to change position.
  If all 4 places are brightened, numbers will change from the lowest place.
- Press the OVP/OCP key to display the OVP set value in the Number Display (voltage) and the OCP set value in the Number Display (current).
- If the number of parallel devices (total power) is changed, the OCP set value is set again to the maximum value.

Verifying Over Current Protection Operation

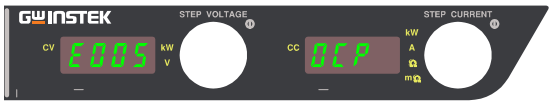
After settings are complete, please follow the procedures below to test verify operation.

①. Disconnect the load from the power supply and short between the +/- output terminals using cross section area wires that can flow rated current.
②. Turn the POWER switch ON with the Output ON/OFF Toggle mode (FUNC.51) set to "0".
③. Set the Output Current settings lower than OCP level.
④. Turn OUTPUT to ON.
⑤. Gradually increase the Output Current with the CURRENT dial. Verify that the output turns OFF once the OCP set current has been reached and that the error code "E005" appears in the Number Display (voltage) and the Number Display (current) becomes the "OCP" display.
⑥. Hold the OVP and OCP keys simultaneously for more than 1 second to cancel the alarm. Return the CC set value to its original value.

Canceling Over Current Protection Operation

When Over Current Protection Circuit (OCP) is triggered, the OUTPUT is set to OFF and an error code and the alarm message will be displayed in the Number Display (voltage) and the Number Display (current).

The error code "E005" is displayed in the top Number Display and "OCP" blinks in the ammeter/power meter.



MEMO

When the OCP is triggered, the Falling slew rate setting, based on the slew rate function, is set invalid and the output current is decreased most rapidly under the condition of that time point.

Hold down the ALARM RESET key for more than 1 second to erase the displayed error code and OCP.

CAUTION

If the error code and OCP does not erase after holding down the OVP and OCP keys, the power supply may be damaged. Turn power off immediately and contact your nearest GW Instek distributor or the GW Instek service center.

MEMO

- During serial data communication, recovery from alarm status is possible using commands.
- During parallel operation where the Master unit is the operating normal, if any Slave unit triggers an alarm, the error code “E006” will be displayed in the Master and functioning Slave units.

(Information concerning the alarm will be displayed on the Slave unit that triggered the alarm)

Remove cause which triggered the OCP.

(Change CC set values, OCP set values, load status)

Press the OUTPUT key to start output.

Setting Operation during Alarm

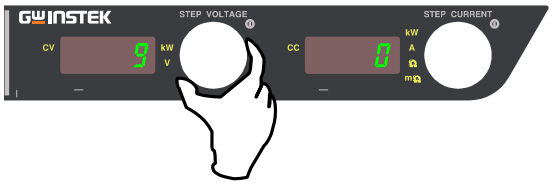
Setting can be done about whether input shutoff is done or switching stop (forced output OFF) is done for this machine at various types of alarm occurrence.

Setting Procedures

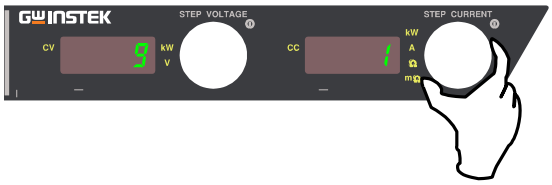
Press The Function "FUNC." key.

The FUNC. lamp will light.
The Setting Item Number will display on the top Number Display and the parameter will be displayed in the bottom Number Display.

Select Item number 9 with the VOLTAGE dial.



Set Parameter to 0 or 1 with the CURRENT dial.



Parameter = 0 [Default value]:
When any alarm occurs, switching is stopped (forced output OFF).

Parameter = 1:
At occurrence of TRIP input and serious failures (failures of this machine), the input switch is turned off and input shutoff is done.

Parameter = 2:
At occurrence of TRIP input, serious failures (failures of this machine), over voltage (OVP), or over current (OCP), the input switch is turned off and input shutoff is done.

Press the FUNC. key again to finalize settings.

Error Codes

Place / Items	No. Display (Voltage)	No. Display (Current)	Content	Verify/Recovery
WDT	E001	-	CPU may have performed an illegal operation	Turn POWER switch OFF and restart
OHP	E003	OHP	Over heating protection is triggered.	● Turn power OFF. Leave device to cool down. Turn power ON ● Check environmental temperatures ● Verify Fan Motor rotates when power is turned on.
OVP	E004	OUP	Over voltage protection was triggered	Check OVP values. See page 48 about how to cancel.
OCP	E005	OCP	Over current protection was triggered	Check OCP values See page 50 about how to cancel.
BST	E006	-	Slave unit malfunctioned.	Check slave unit display.
P_ERR	E007	-	May have had a short interruption or voltage dip at the main power.	May be damaged. Contact the GW Instek Service Center.
BST_NRDY	E008	-	Slave unit's input voltage is abnormal.	Check whether slave unit's power switch is ON
Phase interruption detection alarm			Phase interruption of input power is detected.	Please check the wiring connection to the input connector.
Device Detection Error	E009	-	Cannot detect number of parallel devices	Restart power supply
No. of Parallel Connected Devices Over	E010	-	More than 11 parallel devices are connected	Verify No. of parallel devices. Restart power supply
Device No. Disagreement	E011	-	Difference in the current No. of connected parallel devices and the previous No. of parallel devices remembered by the power supply	If the present number of parallel devices is satisfactory, hold the FUNC. key for more than 2 seconds and confirm the detected number of devices.
TRIP	E012	Shdn	TRIP function was triggered	Cancel by pressing OVP+OCP keys simultaneously or by the remote control command ALM REG CLEAR.
Models of different voltages mixed	E013	-	Models of different voltages are connected.	Verify connection with models of different voltage and restart the power supply.
Communication Error	E100	-	Data was not received	Re-verify sent message. Recovered if normal message is received.
E2P Error	E110	-	Failure to initialize during startup	Cancel by pressing OVP+OCP keys simultaneously or by the remote control command ALM REG CLEAR.

SPECIFICATIONS

Output Specifications

Specification/Models	PHX 30-200 S(F)D	PHX 30-400 S(F)D	PHX 60-100 S(F)D	PHX 60-200 S(F)D	PHX 500-12 S(F)D	PHX 500-24 S(F)D	PHX 1000-6 S(F)D	PHX 1000-12 S(F)D
Rated Output Voltage	30V	30V	60V	60V	500V	500V	1000V	1000V
Rated Output Current	200A	400A	100A	200A	12A	24A	6A	12A
Rated Output Power	6000W	12000W	6000W	12000W	6000W	12000W	6000W	12000W

Input Characteristics

Specification/Models	PHX 30-200 S(F)D	PHX 30-400 S(F)D	PHX 60-100 S(F)D	PHX 60-200 S(F)D	PHX 500-12 S(F)D	PHX 500-24 S(F)D	PHX 1000-6 S(F)D	PHX 1000-12 S(F)D
Power Source	342/440 VAC models, 3 phases							
Input frequency range	45Hz to 65Hz							
Phases	3-phase, 3-wire plus ground. Neutral not used.							
Input Current*1	16A	32A	16A	32A	16A	32A	16A	32A
Input Power Factor *2	Above 0.6							
Power Efficiency *3	90% or more							
Inrush Current (Peak Value)	65A	130A	65A	130A	65A	130A	65A	130A

Note: *1: With rated output power and rated output current
*2: With 400V AC input, rated output power, and rated output current
*3: With 400V AC input, rated output voltage, and rated output power

Constant Voltage Mode

Specification/Models		PHX 30-200 S(F)D	PHX 30-400 S(F)D	PHX 60-100 S(F)D	PHX 60-200 S(F)D	PHX 500-12 S(F)D	PHX 500-24 S(F)D	PHX 1000-6 S(F)D	PHX 1000-12 S(F)D
Range		0.00V~31.50V		0.00V~63.00V		0.0V~525.0V		0V~1050V	
Accuracy *11		0.1% of setting + 5mV		0.1% of setting + 10mV		0.1% of setting + 0.1V		0.1% of setting + 0.2V	
Resolution		10mV		10mV		0.1V		1V	
Load Regulation *4		0.01% of setting + 0.005% of rated output voltage							
Line Regulation *5		0.01% of setting + 0.003% of rated output voltage							
Ripple (RMS value) *6		< 10 mV		< 10 mV		< 50 mV		< 100mV	
Noise(p-p value)(Typ) *7		< 100 mVp-p		< 100 mVp-p		< 300mVp-p		< 300mVp-p	
Temperature Coefficient (Typ.)		± 100ppm/°C							
Transient Response Time *8		1ms or less		1ms or less		1ms or less		2ms or less	
Output Response Time *9	Rising	200ms ± 20%(rated load) 200ms ± 20%(no load)				500ms ± 20% (rated load) 500ms ± 20% (no load)			
	Falling	200ms ± 30% (rated load) <1200ms (no load)				500ms ± 30% (rated load) <1200ms (no load)			
Remote Sense Compensation Voltage (Sinlge Wire)		5V							
Maximum Sink Current		1A ± 20%	2A ± 20%	1A ± 20%	2A ± 20%	250mA ± 20%	500mA ± 20%	125mA ± 20%	250mA ± 20%
Residual Voltage when OUTPUT is OFF (TYP)		± 10mV or less		± 10mV or less		± 25mV or less		± 50mV or less	

Constant Current Mode

Specification/Models	PHX 30-200 S(F)D	PHX 30-400 S(F)D	PHX 60-100 S(F)D	PHX 60-200 S(F)D	PHX 500-12 S(F)D	PHX 500-24 S(F)D	PHX 1000-6 S(F)D	PHX 1000-12 S(F)D
Range	0.0A~ 210.0A	0.0A~ 420.0A	0.0A~ 105.0A	0.0A~ 210.0A	0.00A~ 12.60A	0.00A~ 25.20A	0.000A~ 6.300A	0.00A~ 12.60A
Accuracy *12	0.5% of setting +0.1A	0.5% of setting +0.2A	0.5% of setting +0.05A	0.5% of setting +0.1A	0.5% of setting +5mA	0.5% of setting +10mA	0.5% of setting +3mA	0.5% of setting +6mA
Resolution	0.1A		0.1A		10mA		1mA	10mA
Load Regulation *10	0.05% of setting + 0.01% of rated output current				0.05% of setting + 0.03% of rated output current			
Line Regulation *5	0.05% of setting + 0.005% of rated output current							
Ripple (RMS Value) *6	< 200mA	< 400mA	< 100mA	< 200mA	< 10mA	< 20mA	< 5mA	< 10mA
Temperature Coefficient (Typ.)	± 200ppm/°C							

Note: *4: Measurement at sensing point for 0~100% change in rated load current (Static Load Change)
*5: For ± 10% change in input voltage (Static input Change)
*6: At measurement frequency band of 20Hz~1MHz (Resistance Loaded)
*7: Measured with oscilloscope at measurement frequency band of 20Hz~20MHz
*8: Recovery time within 0.1%+10mV of rated output voltage for 50% to 100% abrupt change in rated load current (Dynamic Load Change)
*9: Time in which set voltage error is reached within 1% due to setting changes via panel operation or communication control or external analog control.
*10: Current change value at the rated output current when load resistance is changed until resistance value outputs 0~rated power (Static Load Change)
*11: At output open-circuit and environmental temperature 23°C ± 5°C
*12: At output short-circuit and environmental temperature 23°C ± 5°C

Measures/Displays

Specification/Models		PHX 30-200 S(F)D	PHX 30-400 S(F)D	PHX 60-100 S(F)D	PHX 60-200 S(F)D	PHX 500-12 S(F)D	PHX 500-24 S(F)D	PHX 1000-6 S(F)D	PHX 1000-12 S(F)D
Voltmeter		4-Digit Digital Meter							
	Maximum Display	99.99 V		99.99 V		999.9 V		9999V	
	Measure Accuracy *13	0.1% of reading +20mV		0.1% of reading +20mV		0.1% of reading +0.2V		0.1% of reading +2V	
	Temperature Coefficient (Typical Value)	± 100ppm/°C							
Ammeter		4-Digit Digital Meter							
	Maximum Display *14	999.9A		999.9A		99.99A		9.999A	99.99A
	Measure Accuracy *13*14	0.5% of reading +400mA		0.5% of reading +200mA	0.5% of reading +400mA	0.5% of reading +20mA	0.5% of reading +40mA	0.5% of reading +2mA	0.5% of reading +20mA
	Temperature Coefficient (Typical Value)	± 200 ppm/°C							
Power Meter		4-Digit Digital Meter							
	Maximum Display *14	9.999kW	99.99kW	9.999kW	99.99kW	9.999kW	99.99kW	9.999kW	99.99kW
	Accuracy *14	Displays the multiplication value of the voltage measurement value and current measurement value.							
Measurement Mode		Moving average process can be selected for measurement							

*13: At environmental temperature 23°C ± 5°C
*14: At stand-alone operation

Protection Functions

Specification/Models		PHX 30-200 S(F)D	PHX 30-400 S(F)D	PHX 60-100 S(F)D	PHX 60-200 S(F)D	PHX 500-12 S(F)D	PHX 500-24 S(F)D	PHX 1000-6 S(F)D	PHX 1000-12 S(F)D
Over Voltage Protection Circuit (OVP)	Range	0.30V~33.00V		0.60V~66.00V		5.0V to 550.0V		10V to 1100V	
	Accuracy *10	0.2% of setting + 50mV		0.2% of setting + 50mV		0.2% of setting + 0.5V		0.2% of setting + 5V	
	Operation	Can select from operations below • Output OFF by switching stop • Input switch cut-off (Input switch cut-off turns the power supply's internal input power relays OFF.)							
Over Current Protection Circuit (OCP)	Range	2.0A~ 220.0A	4.0A~ 440.0A	1A~ 110.0A	2.0A~ 220.0A	0.12A~ 13.20A	0.24A~ 26.40A	0.060A~ 6.600A	0.12A~6. 13.20A
	Accuracy *11	0.6% of setting + 0.5A	0.6% of setting + 1A	0.6% of setting + 0.5A	0.6% of setting + 1A	0.6% of setting + 50mA	0.6% of setting + 100mA	0.6% of setting + 5mA	0.6% of setting + 50mA
	Operation	Can select from operations below • Output OFF by switching stop • Input switch cut-off (Input switch cut-off turns the power supply's internal input power relays OFF.)							
Over Temperature Protection Circuit		• Stops switching, shuts off output, and displays alarms if the temperature of the radiating section heat exceeds 90°C due to stopped fan motor, etc. • Welds temperature fuses, built in the Inrush Limiting Resistors, at 135°C.							
Excessive Input Current Protection		35A fuse	60A fuse	35A fuse	60A fuse	35A fuse	60A fuse	35A fuse	60A fuse

Other Functions

Specification/Models	PHX 30-200 S(F)D	PHX 30-400 S(F)D	PHX 60-100 S(F)D	PHX 60-200 S(F)D	PHX 500-12 S(F)D	PHX 500-24 S(F)D	PHX 1000-6 S(F)D	PHX 1000-12 S(F)D
Operational Mode Displays	All modes are displayed with LEDs							
	OUT ON ---------- Orange							
	CV (Constant Voltage) ---------- Green							
	CC (Constant Current) ---------- Green							
	PRESET (PRESET) ---------- Green							
	FUNC. (when setting functions) ---------- Green							
	REMOTE (During Remote Operation) ---------- Green							
	LOCK (in Key Lock state) ---------- Green							
Master-Slave Parallel Operation	Able to control a maximum of 10 parallel connected same-voltage model products with one master unit							
Master-Slave Series Operation	Able to control a maximum of 2 series connected same model products with one master unit						---	
Startup Mode								
CV Priority	*Only full-featured “F” type models:							
High Speed	10ms		10ms		100ms		100ms	
Medium Speed	100ms		100ms		300ms		300ms	
Low Speed	200ms		200ms		500ms		500ms	
CC Priority	*Only full-featured “F” type models:							
High Speed	10ms		10ms		10ms		10ms	
Medium Speed	100ms		100ms		100ms		100ms	
Low Speed	200ms		200ms		200ms		200ms	
CV Priority	*Standard version. “S” type models:							
Low Speed	200ms		200ms		500ms		500ms	
Variable Slew Rate	*Only full-featured “F” type models: Sets the rising and falling rate for each output voltage and output current individually.							
CV Slew Rate Range	0.01V/s~60.00V/s		0.1V/s~120V/s		1V/s~1000V/s		1V/s~2000V/s	
CC Slew Rate Range	0.1A/s~ 400.0A/s	0.1A/s~ 800.0A/s	0.1A/s~ 200.0A/s	0.1A/s~ 400.0A/s	0.01A/s~ 24.00A/s	0.01A/s~ 48.00A/s	0.01A/s~ 12.00A/s	0.01A/s~ 48.00A/s
Sequential ON/OFF	* Only full-featured “F” type models: Output ON/OFF of multiple units can be controlled from one sequential master unit simultaneously or with time lag (Setting range: 0.00s to 99.99s for ON/OFF respectively) Note: Special cable is needed for use.							
Memory	Saves and loads the set values of the voltage, current, and various functions in memories "A", "B", and "C".							
Key Lock	Locks key operation at the front panel.							
Variable Internal Resistance (⊿R)	* Only full-featured “F” type model							
	0~0.15Ω	0~0.075Ω	0~0.6Ω	0~0.3Ω	0~41.7Ω	0~20.8Ω	0~167Ω	0~83Ω

External Control

Specification/Models			PHX 30-200 S(F)D	PHX 30-400 S(F)D	PHX 60-100 S(F)D	PHX 60-200 S(F)D	PHX 500-12 S(F)D	PHX 500-24 S(F)D	PHX 1000-6 S(F)D	PHX 1000-12 S(F)D
Output Voltage Control	External Resistance		0~10kΩ (B, C Curve), 0~∞Ω (A Curve)						---	
	External Voltage		0~10V DC						---	
	External Voltage (Insulation)		---						0~10V DC	
Output Current Control	External Resistance		0~10kΩ (B, C Curve), 0~∞Ω (A Curve)						---	
	External Voltage		0~10V DC						---	
	External Voltage (Insulation)		---						0~10V DC	
Output ON/OFF Control		Normal	Can be controlled at external contact or photocoupler						---	
		Insulation	---						External contact or photocoupler	
Input Cut-Off Control		Normal	Can be controlled at external contact or photocoupler						---	
		Insulation	---						External contact or photocoupler	
Voltage Monitoring Output		Normal	10V DC output (non-isolated) accuracy: 0.5% ± 10mV						---	
		Insulation	---						10V DC output (isolated) accuracy: 0.5% ± 10mV	
Current Monitoring Output		Normal	10V DC output (non-isolated) accuracy: 1.0% ± 10mV						---	
		Insulation	---						10V DC output (isolated) accuracy: 1.0% ± 10mV	
Status Output			CV (Constant Voltage), CC (Constant Current), P-ON (Input Voltage Normal) The 5 points: LEVEL1_ALM (OVP, OCP), and LEVEL2_ALM (Group Alarm) are outputted by a photocoupler insulated open collector.							

Insulation/ Withstanding Voltage

Specification/Models	PHX 30-200 S(F)D	PHX 30-400 S(F)D	PHX 60-100 S(F)D	PHX 60-200 S(F)D	PHX 500-12 S(F)D	PHX 500-24 S(F)D	PHX 1000-6 S(F)D	PHX 1000-12 S(F)D
Insulation	Between each input and output, input and chassis, output and chassis: 500 Vdc, 20MΩ or more.				1000 Vdc, 20MΩ or more.			
Withstanding Voltage	Between input and chassis: 1.5kV AC 1 minute							
	Between input and output: 3.0kV AC 1 minute							
	Between output chasis: 1.3kV DC 1 minute				2.4kV DC 1 minute			
Relative Ground Voltage	At peak voltage value, within ± 500V (Between output and ground)				At peak voltage value, within ± 1200V (Between output and ground)			

Environmental Conditions

Specification/Models	PHX 30-200 S(F)D	PHX 30-400 S(F)D	PHX 60-100 S(F)D	PHX 60-200 S(F)D	PHX 500-12 S(F)D	PHX 500-24 S(F)D	PHX 1000-6 S(F)D	PHX 1000-12 S(F)D
Operating Temperature	0 to 50°C							
Storage Temperature	-20°C to 70°C							
Operating Humidity	20 to 90% RH							
Storage Humidity	20 to 90% RH							
Other	Do not place in cold environments, and areas with condensation or corrosive gases							

General Specifications

Specification/Models	PHX 30-200 S(F)D	PHX 30-400 S(F)D	PHX 60-100 S(F)D	PHX 60-200 S(F)D	PHX 500-12 S(F)D	PHX 500-24 S(F)D	PHX 1000-6 S(F)D	PHX 1000-12 S(F)D
External Dimensions *15 W(mm) x H(mm) x D(mm)	430 x 129 x 562	430 x 221 x 562	430 x 129 x 550	430 x 221 x 550	430 x 129 x 550	430 x 221 x 550	430 x 129 x 550	430 x 221 x 550
Max. Dimensions(mm) *16	482.6 x 149 x 637	482.6 x 241 x 647	482.6 x 149 x 637	482.6 x 241 x 637	482.6 x 149 x 625	482.6 x 241 x 625	482.6 x 149 x 625	482.6 x 241 x 625
Weight	About 24.0kg	About 43.0kg	About 22.0kg	About 38.0kg	About 20.5kg	About 37.0kg	About 22.0kg	About 40.0kg
Cooling Method	Forced cooling by fan motor							
Output Terminal	Copper Bar (M12 Screw)				Copper Bar (M5 Screw)			
Input Terminal	3P Connector							

Note: *15: Does not include protruding sections
*16: Includes handle, dial, rubber legs, and output terminal cover