DC Power Supply

SPS-1230A/1820A/3610A/2415A/606A

USER MANUAL

GW INSTEK PART NO.

ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

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

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Table of Contents

SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow when operating the SPS-A series and when keeping it in storage. Read the following before any operation to ensure your safety and to keep the best condition.

Safety Symbols

These safety symbols may appear in this manual.

 WARNING	Warning: Identifies conditions or practices that could result in injury or loss of life.
 CAUTION	Caution: Identifies conditions or practices that could result in damage to the SPS-A series or to other properties.
	DANGER High Voltage
	Attention Refer to the Manual
	Protective Conductor Terminal
	Earth (ground) Terminal

Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased.

Safety Guidelines

General Guidelines CAUTION	• Do not place any heavy object on the device. • Avoid severe impacts or rough handling that leads to damaging the device. • Do not discharge static electricity to the device. • Do not block or obstruct the cooling fan vent opening. • Do not perform measurement at circuits directly connected to Mains. • Do not disassemble the device unless you are qualified as service personnel.
Power Supply WARNING	• AC Input voltage: 115 V / 230 VAC ± 15 %, 50 or 60 Hz • Connect the protective grounding conductor of the AC power cord to an earth ground, to avoid electrical shock.
Fuse WARNING	• Fuse type: 97 V to 133 V: T10A / 250 V 195 V to 265 V: T6.3A / 250 V • Make sure the correct type of fuse is installed before power up. • To ensure fire protection, replace the fuse only with the specified type and rating. • Disconnect the power cord before fuse replacement. • Make sure the cause of fuse blowout is fixed before fuse replacement.

Cleaning the device	• Disconnect the power cord before cleaning. • Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid. • Do not use chemicals or cleaners containing harsh products such as benzene, toluene, xylene, and acetone.
Operation Environment	• Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (note below) • Relative Humidity: < 80 % • Altitude: < 2000 m • Temperature: 0 °C to 40 °C
	(Pollution Degree) EN 61010-1:2010 specifies the pollution degrees and their requirements as follows. The SPS-A series falls under degree 2. Pollution refers to "addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity". • Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence. • Pollution degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected. • Pollution degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected. In such conditions, equipment is normally protected against exposure to direct sunlight, precipitation, and full wind pressure, but neither temperature nor humidity is controlled.
Storage environment	• Location: Indoor • Relative Humidity: < 70 % • Temperature: −10° C to 70 °C

OVERVIEW

This chapter describes the SPS-A series in a nutshell, including its main features and front/rear panel introduction. After going through the overview, follow the Setup chapter (page 22) to properly power up and set operation environment.

SPS-A Series Overview

Series lineup

The SPS-A Series consists of 5 models: SPS-1230A,SPS-1820A,SPS-2415A,SPS-3610A and SPS-606A. Note that throughout the user manual, the term "SPS-A" refers to all the models in the SPS-A Series lineup, unless stated otherwise.

Model	Output Voltage	Output Current	Output Power
SPS-1230A	12 V	30 A	360 W
SPS-1820A	18 V	20 A	360 W
SPS-2415A	24 V	15 A	360 W
SPS-3610A	36 V	10 A	360 W
SPS-606A	60 V	6 A	360 W

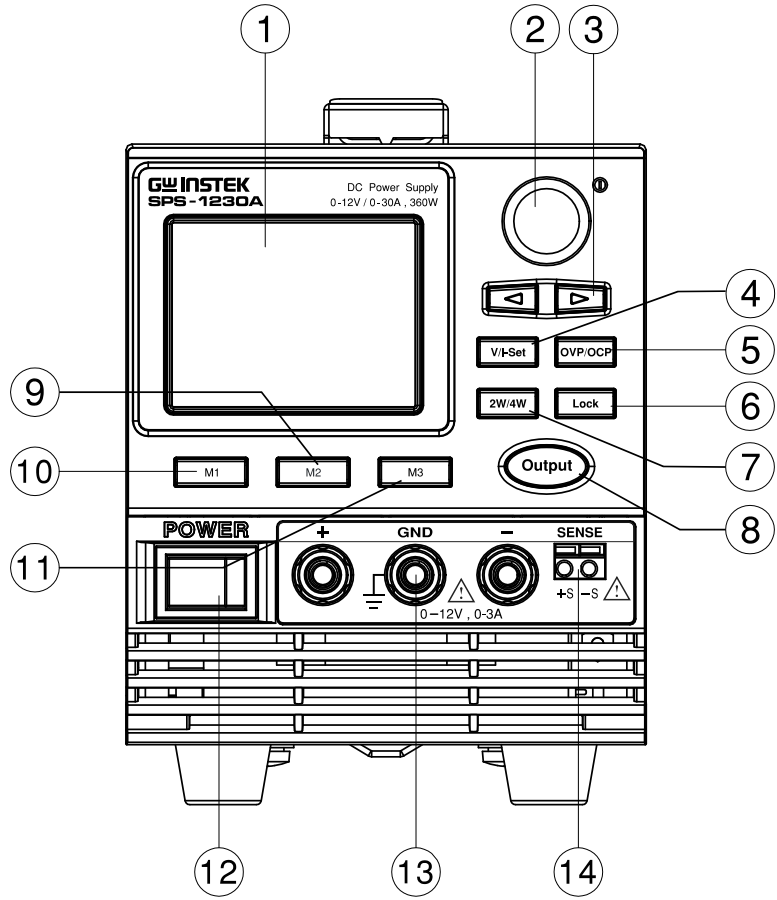
Main Features

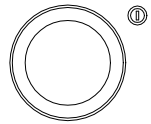
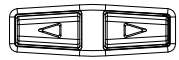
Performance	• 2.4-inch TFT-LCD Panel. • Low noise: Temperature controlled cooling fan • Remote sensing to compensate for voltage drop in load leads • Compact, lightweight, standard rack mount comformity 3U, 1/4 Rack
Operation	• Constant voltage/Constant current operation • Digital voltage and current settings • 3 groups of save/recall settings and 1 groups of power-on settings • Output On/Off control • Function for locking the setting
Protection	• OVP, OCP and OTP protection • Key misoperation protection (Lock) • Reverse polarity protection

Appearance

Front Panel Overview

SPS-1230A/SPS-1820A/SPS-2415A/SPS-3610A/SPS-606A

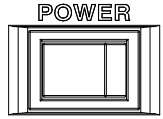


1.	Display area		The display area shows set values, output values and parameter settings.
2.	Knob Key		Used to configure or confirm voltage/current, etc. Holding the Knob key will clear any protection alarms.
3.	Left/Right Arrow Keys		Used to select a parameter number in the Function settings.
4.	Voltage/ Current Setting		Sets the constant voltage level or Sets the constant current level.
5.	OVP/OCP Setting		Sets the over current protection level or Sets the over voltage protection level.
6.	lock/unlock		Holding the key will Locks/Unlocks the front panel keys to prevent accidentally changing panel settings. Note: The output can still be turned off when the key lock in active.
7.	2-wire/4-wire setting		Used to 2-wire/4-wire setting.
8.	Output Button		Used to turn the output on or off.
9.	M2		Used to recall the M2 setup. (hold) Used to save the current setup to M2.
10.	M1		Used to recall the M1 setup. (hold) Used to save the current setup to M1.

11. M3

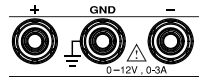
Used to recall the M3 setup. (hold) Used to save the current setup to M3.

12. Power Switch

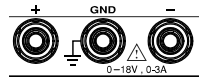


Turns on the mains power.

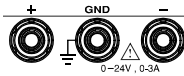
13. Front output terminals



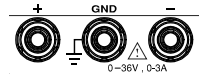
DC output front terminal of the SPS-1230A
SPS-1230A the max. output is 12 V / 3 A



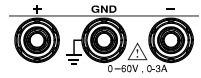
DC output front terminal of the SPS-1820A
SPS-1820A the max. output is 18 V / 3 A



DC output front terminal of the SPS-2415A
SPS-2415A the max. output is 24 V / 3 A

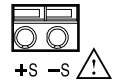


DC output front terminal of the SPS-3610A
SPS-3610A the max. output is 36 V / 3 A



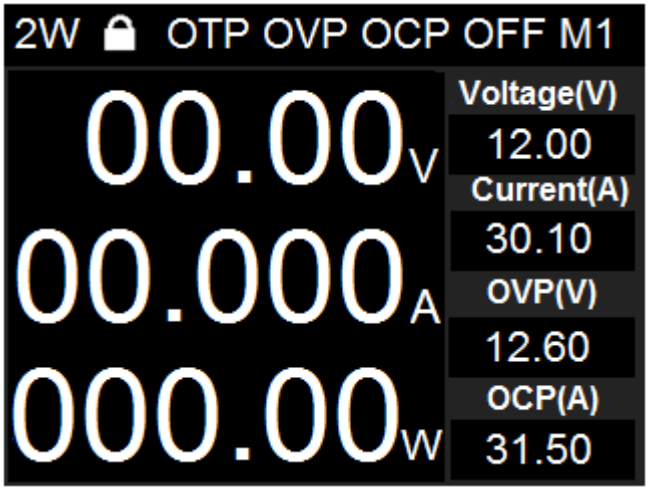
DC output front terminal of the SPS-606A
SPS-606A the max. output is 60 V / 3 A

14. Sensing Terminal



Terminal to connect the sensing cables, which compensate voltage drop occurred in load leads.

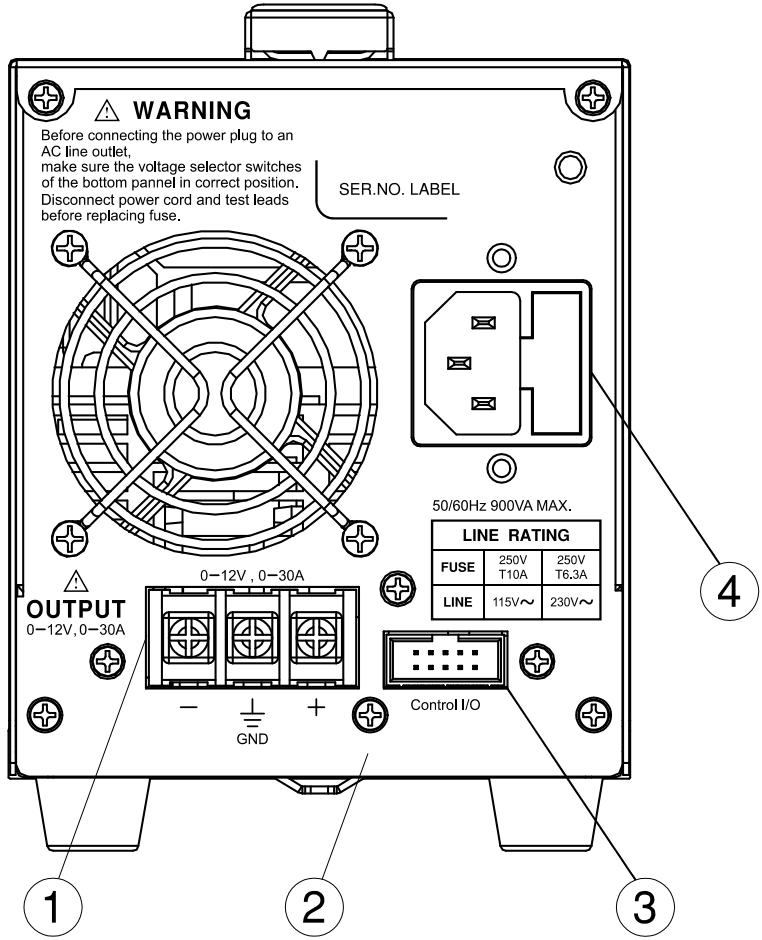
Display Area

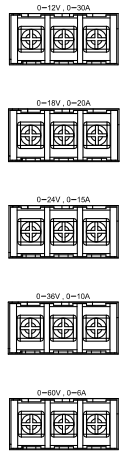
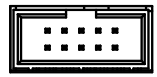
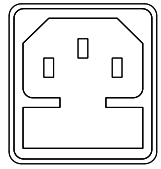


2W	2-wire indicator.	4W	4-wire indicator.
🔒	When the lock mode is activated, the icon will be shown.	OTP	Over temperature protection functions is tripped.
OVP	Over voltage protection functions is tripped.	OCP	Over current protection functions is tripped.
OFF	Indicates if the output is OFF.	CC	Indicates that the output is in CC mode.
CV	Indicates that the output is in CV mode.	M1	Indicates that the memory value are being saved.

Rear Panel Overview

SPS-1230A/SPS-1820A/SPS-2415A/SPS-3610A/SPS-606A



1.	Output terminals		SPS-1230A the max. output is 12 V / 30 A SPS-1820A the max. output is 18 V / 20 A SPS-2415A the max. output is 24 V / 15 A SPS-3610A the max. output is 36 V / 10 A SPS-606A the max. output is 60 V / 6 A
2.	AC Select Switch		The AC selector is located at the bottom side of the unit. Switch Voltage to 115 V or 230 V.
3.	Control I/O		The Connector is used for parallel/series control.
4.	Power Cord / Fuse Socket		The power cord socket accepts the AC mains. For power up details, see page 22. The fuse holder contains the AC mains fuse. For fuse replacement details, see page 37.

Theory of Operation

The theory of operation chapter describes the basic principles of operation, protection modes and important considerations that must be taken into account before use.

Operating Description

Background

The SPS-A power supplies are regulated DC power supplies with a stable voltage and current output. These operate within a switch automatically between constant voltage and constant current according to changes in the load.

Note

Suitable supply cord set for use with the equipment:

Mains plug: shall be national approval

Mains connector: C13 type

Cable:

1. Length of power supply cord: less than 3 m
2. Cross-section of conductors: at least 0.75 mm^2
3. Cord type: shall meet the requirements of IEC 60227 or IEC 60245 (e.g.: H05VV-F, H05RN-F)

Caution

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

CC and CV Mode

CC and CV mode Description

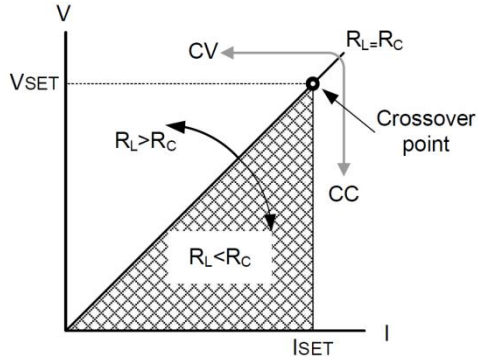
When the power supply is operating in constant current mode (CC) a constant current will be supplied to the load. When in constant current mode the voltage output can vary, whilst the current remains constant. When the load resistance increases to the point where the set current limit (ISET) can no longer be sustained the power supply switches to CV mode. The point where the power supply switches modes is the crossover point.

When the power supply is operating in CV mode, a constant voltage will be supplied to the load, whilst the current will vary as the load varies. At the point that the load resistance is too low to maintain a constant voltage, the power supply will switch to CC mode and maintain the set current limit.

The conditions that determine whether the power supply operates in CC or CV (VSET), the load resistance (RL) and the critical resistance (RC). The critical resistance is determined by VSET/ISET. The power supply will operate in CV mode when the load resistance is greater than the critical resistance. This means that the voltage output will be equal to the VSET voltage but the current will be less than ISET. If the load resistance is reduced to the point that the current output reaches the ISET level, the power supply switches to CC mode.

Conversely the power supply will operate in CC mode when the load resistance is less than the critical resistance. In CC mode the current output is equal to ISET and the voltage output is less than VSET.

Diagram



Alarms

The SPS-A has many protective features. If one of these items is triggered, the alarm information is displayed on the screen and the corresponding alarm icon (OCP, OVP, etc.) appears in the status bar. At the same time, the output is automatically turned off according to the alarm type and control Settings (see page 29). How to clear alarms or how to set protected mode, see page 31.

OVP — Over voltage protection (OVP) prevents a high voltage from damaging the load. This alarm can be set by the user.

OCP — Over current protection prevents high current from damaging the load. This alarm can be set by the user.

OTP — Over temperature protection is a hardware protection function.

Considerations

The following situations should be taken into consideration when using the power supply.

Inrush current

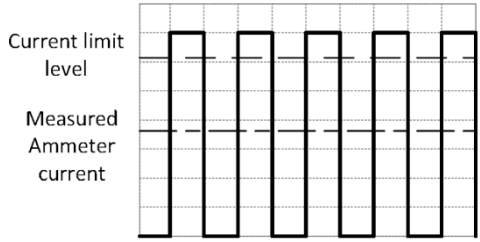
When the power supply switch is first turned on, an inrush current is generated. Ensure there is enough power available for the power supply when first turned on, especially if a number of units are turned on at the same time.

⚠ Caution

Cycling the power on and off quickly can cause the inrush current limiting circuit to fail as well as reduce the working life of the input fuse and power switch.

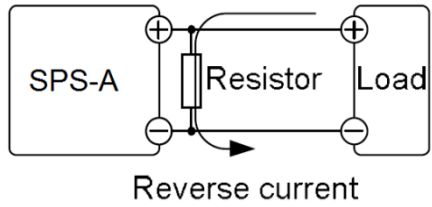
Pulsed or Peaked loads

When the load has current peaks or is pulsed, it is possible for the maximum current to exceed the mean current value. The SPS-A power supply ammeter only indicates mean current values, which means for pulsed current loads, the actual current can exceed the indicated value. For pulsed loads, the current limit must be increased, or a power supply with a greater capacity must be chosen. As shown below, a pulsed load may exceed the current limit and the indicated current on the power supply ammeter.



Reverse Current: Regenerative load

When the power supply is connected to a regenerative load such as a transformer or inverter, reverse current will feed back to the power supply. The SPS-A power supply cannot absorb reverse current. For loads that create reverse current, connect a resistor in parallel to the power supply to bypass the reverse current. This description only applies when the bleed resistance is off.



Reverse current

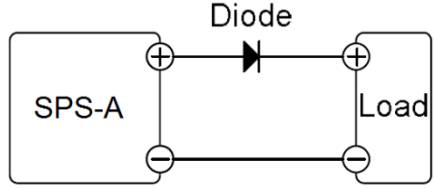
Note

The current output will decrease by the amount of current absorbed by the resistor.

Ensure the resistor used can withstand the power capacity of the power supply/load.

Reverse Current: Accumulative energy.

When the power supply is connected to a load such as a battery, reverse current may flow back to the power supply if the bleed resistance is on. To prevent damage to the power supply under this condition, use a reverse-current-protection diode in series between the power supply and load. If the bleed resistor is turned off or set to auto, there is no need to add a diode.



Caution

Ensure the reverse withstand voltage of the diode is able to withstand 2 times the rated output voltage of the power supply and the forward current capacity can withstand 3 times to 10 times the rated output current of the power supply.

Ensure the diode is able to withstand the heat generated in the following scenarios.

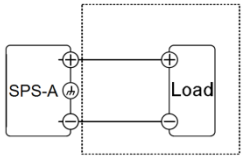
When the diode is used to limit reverse voltage, remote sensing cannot be used.

Grounding

The output terminals of the SPS-A power supplies are isolated with respect to the protective grounding terminal. The insulation capacity of the load, the load cables and other connected devices must be taken into consideration when connected to the protective ground or when floating.

Floating

As the output terminals are floating, the load and all load cables must have an insulation capacity that is greater than the isolation voltage of the power supply.



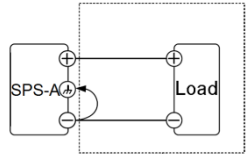
(·····) Insulation capacity ≥ isolation voltage of power supply

Warning

If the insulation capacity of the load and load cables are not greater than the isolation voltage of the power supply, electric shock may occur.

Grounded output terminal

If the positive or negative terminal is connected to the protective ground terminal, the insulation capacity needed for the load and load cables is greatly reduced. The insulation capacity only needs to be greater than the maximum output voltage of the power supply with respect to ground.

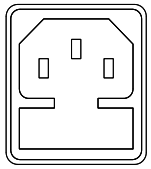


(·····) Insulation capacity ≥ voltage of power supply with respect to ground

SETUP

This chapter describes how to properly power up and configure the SPS-A series before operation.

Power Up

Select AC voltage	Before powering up the power supply, select the AC input voltage from the rear panel.	
Connect AC power cord	Connect the AC power cord to the rear panel socket.	
Power On	Press the power switch to turn on the power. The machine starts to initialize, and after TFT, it will display the voltage, current, set value, and status.	
Power Off	Press the power switch again to turn off the power.	

Wire Gauge Considerations

Background

Before connecting the output terminals to a load, the wire gauge of the cables should be considered.
It is essential that the current capacity of the load cables is adequate. The rating of the cables must equal or exceed the maximum current rated output of the instrument.

Recommended wire gauge

Wire Gauge	Nominal Cross Section	Maximum Current
28	0.1	3
26	0.15	4
24	0.25	5
22	0.35	7
20	0.55	9
18	1	12
16	1.5	18
14	2.5	24
12	4	34

The maximum temperature rise can only be 60 degrees above the ambient temperature. The ambient temperature must be less than 30 degrees.

Using the Output Terminal Cover

Steps

Screw the bottom cover onto the rear panel using the two M3 screws.

Removal

Reverse the procedure to remove the terminal covers.

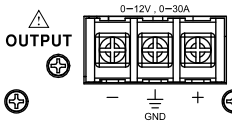
Output Terminals

Connection with the rear panel output terminal

Background: Before connecting the output terminals to the load, first consider whether voltage sense will be used, the gauge of the cable wiring and the withstand voltage of the cables and load.

Warning: Dangerous voltages. Ensure that the power to the instrument is disabled before handling the power supply output terminals. Failing to do so may lead to electric shock.

Output Connector Pinout



-	Negative output terminal
GND	Ground
+	Positive output terminal

Wiring the Connector Plug:
Unscrew the appropriate terminal anticlockwise to release the receptacle.
Insert a wire that has had at least ~6.5mm stripped from the insulation.
Tighten the receptacle by screwing clockwise.

Steps:
1. Turn the power switch off.

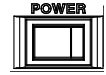
2.Remove the rear panel output terminal cover.
3.Choose a suitable wire gauge for the load cables.

Warning: For safety, Never output power through both the front and rear output terminals

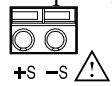
Connection with the front panel output terminal

Background: Before connecting the output terminals to the load, first consider whether voltage sense will be used, the gauge of the cable wiring and the withstand voltage of the cables and load.

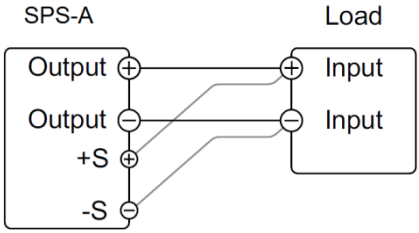
Warning: Dangerous voltages. Ensure that the power to the instrument is disabled before handling the power supply output terminals. Failing to do so may lead to electric shock.

Steps	1. Turn the power switch off.  2.Connect the test lead includes in the accessory parts to front panel output terminal. 3.Fix the load cables firmly to eliminate loose connections from the front output terminals and load cables.
⚠Warning	For safety, Never output power through both the front and rear output terminals

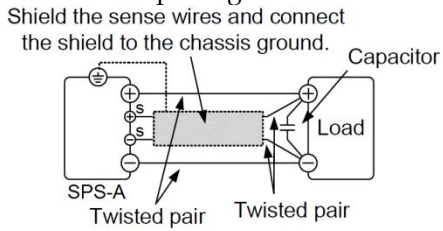
Remote Sense

Background	Remote sense is used to compensate for the voltage drop seen across load cables due to the resistance inherent in the load cables. The remote sense terminals are connected to the load terminals to determine the voltage drop across the load cables. Remote sense can compensate up to 0.5 volt for SPS-A. Load cables should be chosen with a voltage drop less than the compensation voltage.
⚠Warning	Ensure the output is off before handling the remote sense connector. Use sense cables with a voltage rating exceeding the isolation voltage of the power supply. Never connect sensing cables when the output is on. Electric shock or damage to the power supply could result.
Output terminal Connector Overview	When using the remote sensing, make sure the wires that are used follow the following guidelines: Wire gauge: AWG 20 to AWG 14 Strip length: 6.5 mm // 0.26 inch  +S: + Sense terminal -S: - Sense terminal
⚠Note	Be sure to remove the Sense joining cables so the units are not using local sensing.
Single Load	1. Connect the +S terminal to the positive

potential of the load. Connect the -S terminal to the negative potential of the load.



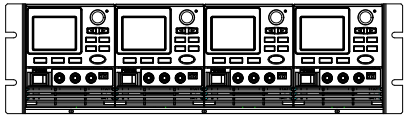
2. Operate the instrument as normal. See the Basic Operation chapter for details.

Wire Shielding and Load line impedance	To help to minimize the oscillation due to the inductance and capacitance of the load cables, use an electrolytic capacitor in parallel with the load terminals. To minimize the effect of load line impedance use twisted wire pairing. 

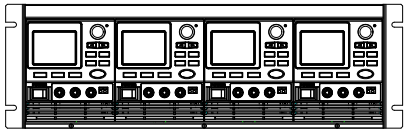
Using the Rack Mount Kit

Background	The SPS-A series has an optional Rack Mount Kit (GW Instek part number: GRA-441-J [JIS], GRA-441-E [EIA]) that can be used to hold up to 4 SPS-A units into rack.

GRA-441-E [EIA] Rack mount diagram



GRA-441-J [JIS] Rack mount diagram



Operation

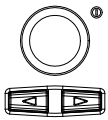
Setting the Output Voltage Level

Background — The voltage setting sets the voltage level of the power supply.

Steps

1. Press the V/I-Set key. The Voltage Set parameter will be editable.

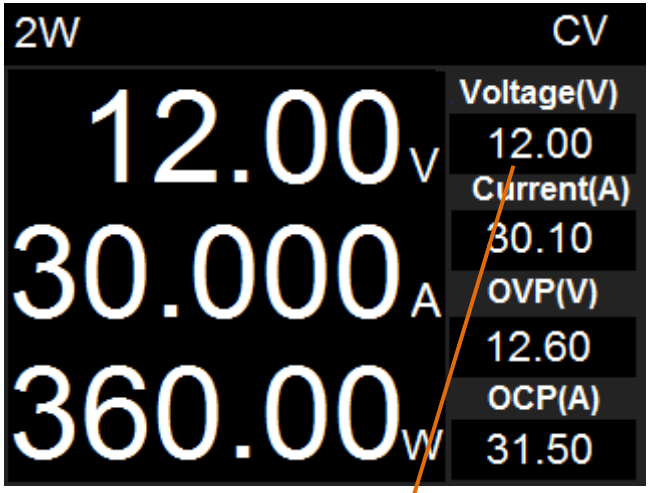
2. Set the voltage with the scroll wheel/arrow keys.



Range 0 volts to full range

3. Click knob key to confirm the voltage setting.

Note — The voltage level can be set when the output is on.



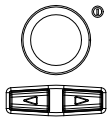
Setting the Output Current Level

Background The current setting sets the current level of the power supply.

Steps

1. Press the V/I-Set key. The Current Set parameter will be editable.

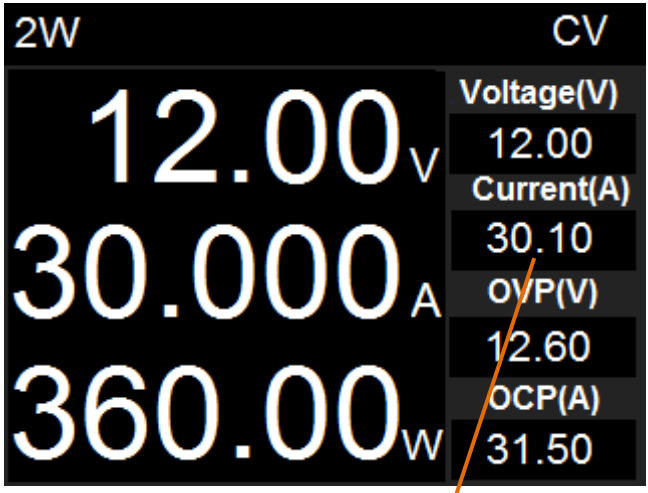
2. Set the current with the scroll wheel/arrow keys.



Range 0 amps to full range

3. Click knob key to confirm the current setting.

Note The current level can be set when the output is on.



Setting the OVP Level

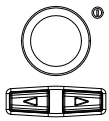
Background

The over voltage protection (OVP) protects the unit from overvoltage. When the voltage level crosses the OVP threshold, the output is automatically turned off.

Steps

1. Press the OVP/OCP key. The OVP Protect parameter will be editable.

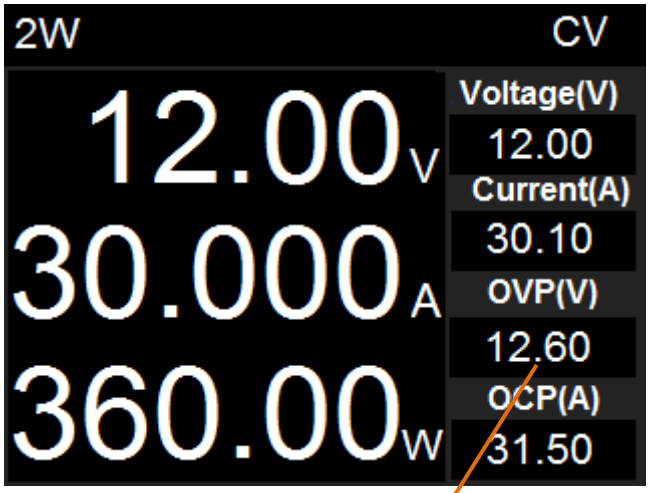
2. Set the OVP threshold level with the scroll wheel/arrow keys.



   Range 0 volts to 105 % full range
3. Click knob key to confirm the OVP setting.

Note

If the OVP threshold is set outside the OVP range, the screen is raised. The scope error message is displayed and the output is closed.
The OVP threshold level can be set when the output is on.



Setting the OCP Level

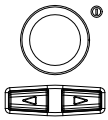
Background

The over current protection (OCP) protects the unit from overcurrent. When the current level crosses the OCP threshold level, the output is automatically turned off.

Steps

1. Press the OVP/OCP key. The OCP Protect parameter will be editable.

2. Set the OCP threshold level with the scroll wheel/arrow keys.

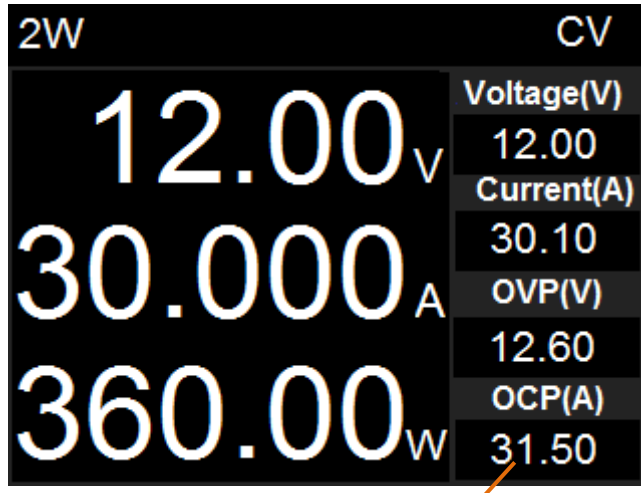


Range 0 amps to 105 % full range

3. Click knob key to confirm the OCP setting.

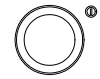
Note

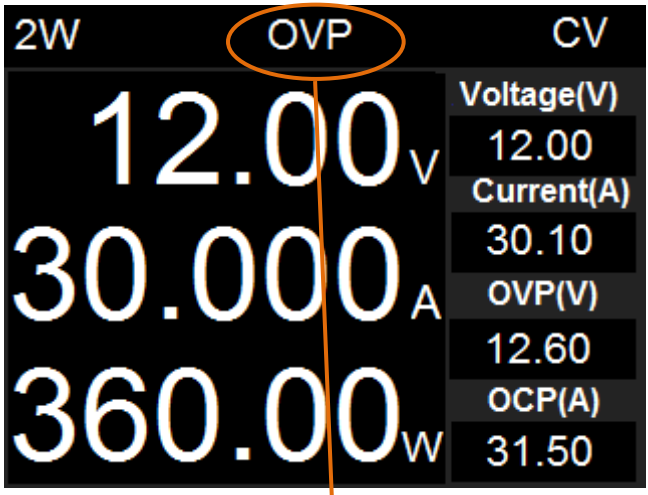
If the OVP threshold is set outside the OVP range, the screen is raised. The scope error message is displayed and the output is closed.
The OCP threshold level can be set when the output is on.



Alarm Clear

Background	The CLR_PROT (Clear Protection) function will clear any protection alarms.
Applicable Alarms	OVP, OCP, OTP
Steps	1. Press and hold the knob key to clear any alarms.





Sense Control

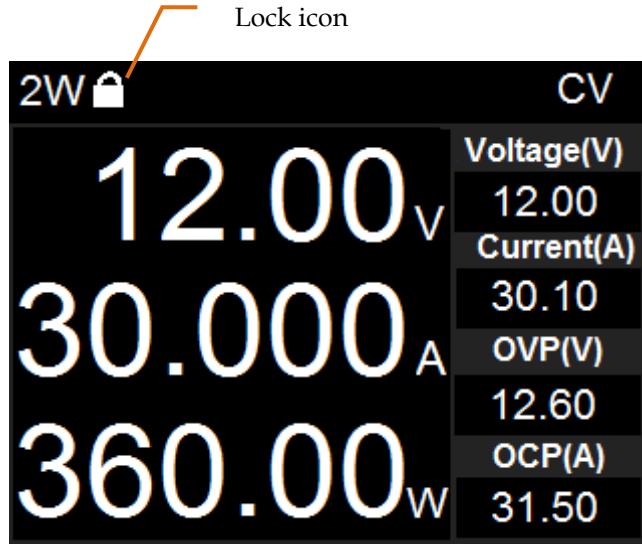
2 Wire	Press the 2W/4W key. The 2W will be displayed in the status bar to indicate that the 2 wire is Activate.	 
4 Wire	Press the 2W/4W key. The 4W will be displayed in the status bar to indicate that the 4 wire is Activate.	 

Panel Lock

The panel lock feature prevents settings from being changed accidentally. When activated, all keys and knobs except the Lock/Unlock key and the Output key will be disabled.

Activate the panel lock	Press the Lock key to active the panel lock.	

	The padlock icon at the top of the display will become "locked" when the panel keys are locked.	
Disable the panel lock	Press the Lock key to turn off the panel lock. the padlock icon will disappear.	



Turning the Output On

Turn Output On	Press the *Output* key. The Output key will turn green and CC or CV will be displayed in the status bar to indicate that the output is on.	  
Turn Output Off	Press the *Output* key. The Output key light will go out and OFF will be displayed in the status bar to indicate that the output is off.	 

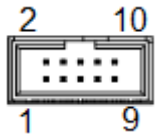
Save/Recall Setup

Background	The SPS-A has 3 dedicated keys (M1, M2, M3)to save/recall the set current and set voltage settings.
Save setup	After setting the voltage and current conditions, hold the desired memory key until the status bar indicator lights up M1/M2/M3, and the conditions are stored.
Recall setup	1.Press the desired memory key to recall the desired setup (M1, M2, M3). 2.When the setup is recalled the setup will be loaded and the memory number will be shown on the display.

Control IO Connector Overview

Overview: The Control IO Connector is a 10pin connector that can be used with the plug for wiring connection. The connector is used for digital remote control. The pins used determine what remote control mode is used.

Pin Assignment



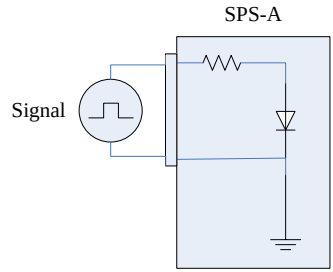
Pin name	Pin number	Description
Out ON/OFF Control	1	It is turned on when set to a high CMOS signal, and turned off when set to a low CMOS level signal.
Alarm Status	2	On when a protection function (OVP, OCP, OTP) has been activated or when an output shutdown signal is being applied (open-collector photocoupler output).
Status COM	5,7,8,9,10	This is the common line for the status signal pins 1 to 2.
N.C.	3,4,6	Not connected.

External Control of Output

Background

The output can be turned on or off externally using a switch. The analog control connector can be set to turn the output on from a high or low signal.
When set to High = On, the output is turned on when the pins 2 is high(CMOS).
When Low = Off, the output is turned off when the pins 2 is low(CMOS).

Connection

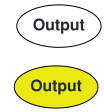


Pin1→ Switch input signal

Pin5,7,8,9,10→ COM

Output

The Output key indicator light is off, indicating that the output is turned off.
The Output key indicator light is on, indicating that the output is on.



Status Monitoring

Background

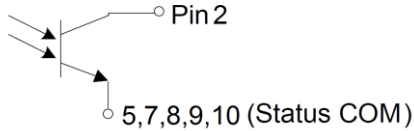
The IO connector can also be used to alarm status of the instrument. The pins are isolated from the power supply internal circuitry by photo couplers. Status Com (Pin 5,7,8,9,10) is a photo coupler emitter output, whilst pins 2 is photo coupler collector outputs.
A maximum of 30V and 8mA can be applied to each pin.

Pinout

Name and Pin	Description

	Alarm Status	2	On when a protection function (OVP, OCP or OTP) has been activated or when an output shutdown signal is being applied (open-collector photocoupler output).
	Status COM	5,7, 8,9, 10	This is the common line for the status signal pins 1 to 2.

Schematic

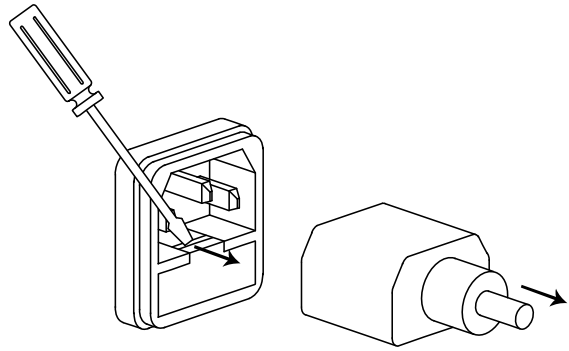


APPENDIX

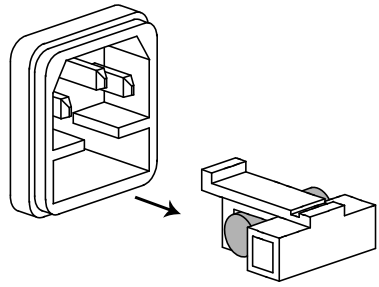
Fuse Replacement

Steps

1. Take off the power cord and remove the fuse socket using a minus driver.



2. Replace the fuse in the holder.



Rating

- 97 V to 133 V:T10 A / 250 V
- 195 V to 265 V:T6.3 A / 250 V

Specifications

The specifications apply when the SPS-A are powered on for at least 30 minutes under +20 °C – +30 °C.

Output Ratings	Independent	0 to 12 V, 0 to 30 A (SPS-1230A) 0 to 18 V, 0 to 20 A (SPS-1820A) 0 to 24 V, 0 to 15 A (SPS-2415A) 0 to 36 V, 0 to 10 A (SPS-3610A) 0 to 60 V, 0 to 6 A (SPS-606A)
Voltage Regulation	Line Regulation*1	≤ 5 mV
	Load Regulation*2	≤ 5 mV
	Ripple & Noise*3	≤ 5 mVrms
	Setting range	0 V to 12.5 V (SPS-1230A) 0 V to 18.5 V (SPS-1820A) 0 V to 24.5 V (SPS-2415A) 0 V to 36.5 V (SPS-3610A) 0 V to 60.5 V (SPS-606A)
	Setting/Read back Accuracy	± (0.1 % of reading + 30 mV) (≦ 36V) ± (0.1 % of reading + 60 mV) (> 36V)
	Setting/Read back Resolution	Setting 10 mV(≦36V) 20 mV(>36V) Read back 10 mV
	Maximum remote sensing compensation voltage	0.5 V
	Rise time*4	< 150 ms
	Fall time*5	< 150 ms (>10% rating load)
	Recovery Time*6	≤ 500 µs (50 % to 100% load change,)

	Temperature Coefficient	≤ 100ppm/°C
Current Regulation	Line Regulation*1	≤ 3 mA
	Load Regulation*7	≤ 10 mA
	Ripple & Noise	≤ 3 mArms (SPS-606A) ≤ 5 mArms (SPS-3610A) ≤ 10 mArms (SPS-1820A/2415A) ≤ 30 mArms (SPS-1230A)
	Setting range	0 A to 30.1 A (SPS-1230A) 0 A to 20.1 A (SPS-1820A) 0 A to 15.1 A (SPS-2415A) 0 A to 10.1 A (SPS-3610A) 0 A to 6.1 A (SPS-606A)
	Setting/Read back Accuracy	± (0.5 % of reading + 30 mA)
	Setting/Read back Resolution	Setting 10 mA Read back 1 mA (SPS-606A/SPS-3610A/SPS-2415A) 2 mA (SPS-1820A/SPS-1230A)
OVP	Range	5% ~105% of rate output voltage
	Resolution	0.1 V
	Accuracy	±（1% of setting + 0.5V)
OCP	Range	5%-105% of rate output current
	Resolution	0.1A
	Accuracy	±（1% of setting + 0.3A)
Insulation	Chassis and Terminal	20 MΩ or above (DC 500 V)
	Chassis and AC cord	30 MΩ or above (DC 500 V)

Operation Environment	Indoor use, Altitude: ≤ 2000 m Ambient temperature: 0 °C to 40 °C Relative humidity: ≤ 80 % Installation category: II Pollution degree: 2
Storage Environment	Ambient temperature: -10 °C to 70 °C Relative humidity: ≤ 70 %
Power Source	AC 115 V/230 V ± 15 %, 50 or 60 Hz
Power consumption	900 VA
Accessories	Power Cord x1,Packing List x1 Test lead: Non-European: GTL-105A x1 Test lead: European: GTL-203A x1, GTL-201A x1
Dimensions	107 mm x 124 mm x 363 mm, (W x H x D) mm
Weight	Approx. 3.6 kg

*1 At 97 ~ 133Vac or 195 ~ 265Vac, constant load.

*2 From No-load to Full-load, constant input voltage. Measured at the front output terminal.

*3 Measurement frequency bandwidth is 5Hz to 1MHz.

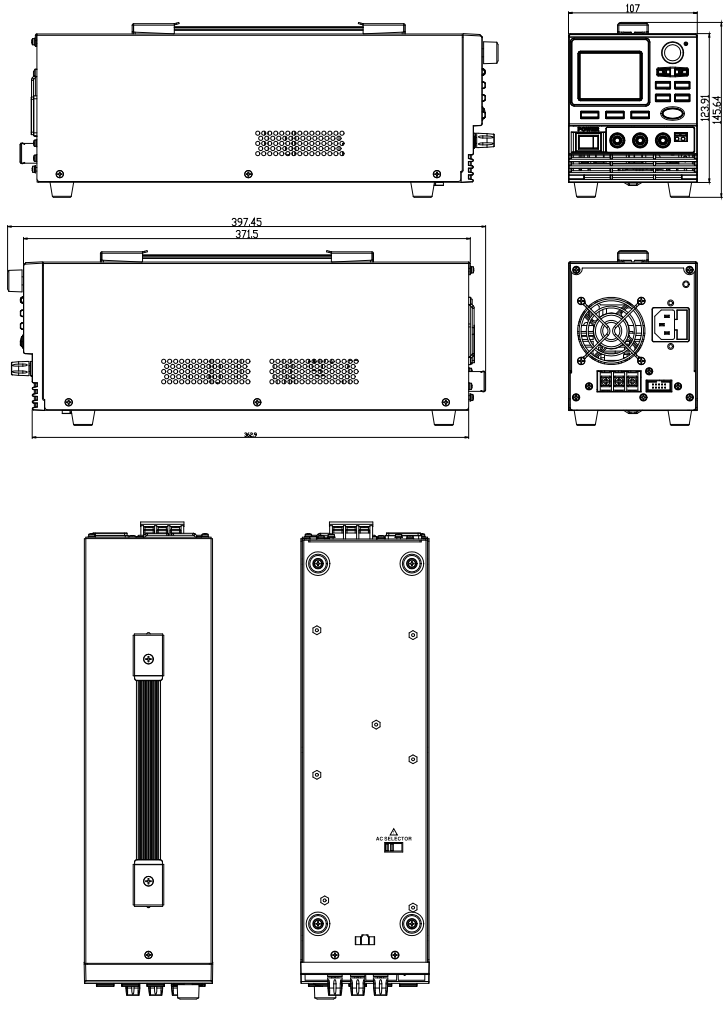
*4 From 10% to 90% of rated output voltage, with rated resistive load.

*5 From 90% to 10% of rated output voltage, with rated resistive load.

*6 Time for output voltage to recover within 0.1% + 10mV of its rated output for a load change from 50 to 100% of its rated output current.

*7 For load voltage change, equal to the unit voltage rating, constant input voltage.

SPS-A Series Dimensions



Declaration of Conformity

We
GOOD WILL INSTRUMENT CO., LTD.
declare that the CE marking mentioned product
satisfies all the technical relations application to the product within the scope of council:
Directive: EMC; LVD; WEEE; RoHS
The product is in conformity with the following standards or other normative documents:

◎ **EMC**

EN 61326-1:	Electrical equipment for measurement, control and laboratory use — EMC requirements
Conducted & Radiated Emission EN 55011 / EN 55032	Electrical Fast Transients EN 61000-4-4
Current Harmonics EN 61000-3-2 / EN 61000-3-12	Surge Immunity EN 61000-4-5
Voltage Fluctuations EN 61000-3-3 / EN 61000-3-11	Conducted Susceptibility EN 61000-4-6
Electrostatic Discharge EN 61000-4-2	Power Frequency Magnetic Field EN 61000-4-8
Radiated Immunity EN 61000-4-3	Voltage Dip/ Interruption EN 61000-4-11 / EN 61000-4-34

◎**Safety**

EN 61010-1:	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

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