

## ***I*Power Series**

— **Pure Sine Wave Inverter**

# **User Manual**



### **Models:**

IP350-12/22/11/21  
IP500-12/22/11/21  
IP1000-12/22/11/21  
IP1500-12/22/11/21  
IP2000-22/42/21/41



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# 1. Important Safety Instructions

As an AC power supply equipment, the inverter's output voltage is with the same level as that of household power plug. Mind the AC output terminals, or you may get an electric shock and result in life danger!

## Attentions:

- Connect the DC input according to the requirement strictly. The power inverter has a relatively wide input range, but too high or too low input may cause problems even destroy the inverter.
- A reverse polarity connection will blow the fuses in the inverter and may damage the unit.
- Do not expose the inverter to humid, flammable, explosive or dust environment.
- Keep the inverter out of children touch.
- Inverter input is recommended to connect to battery, the min. capacity of battery(expressed in AH) should be calculated in the following way: 5times of the rated power of the inverter/battery voltage. If for testing purpose, user should select DC power supply current at least twice greater than that of the inverter rated input to keep inverter normal operation. Use DC power supply for testing may cause the damage of the inverter.
- When the inverter works continuously, its surface may become very hot, please make sure the air ventilation clearance around the inverter is more than 10cm. Keep away from the material or device which may suffer from high temperature when the inverter is working. Do not install the inverter in airproof location and keep enough space around the inverter.
- The protective grounding must be connected to the ground. The

cross section of wire should not be less than  $4\text{mm}^2$ .

- The wire connects between battery and inverter should be shorter than 3m, the current density should be less than  $3.5\text{A}/\text{mm}^2$  while the output of inverter is fully loaded. If the wire longer than 3m, the current density should be reduced.
- A fuse or breaker should be used between battery and inverter, the value of fuse or breaker should be twice of the inverter rated input current.
- Do not connect the battery charger or similar devices to the input terminal of the inverter.
- Do not put the inverter close to the flooded lead-acid battery because the sparkle in the terminals may ignite the hydrogen released by the battery.
- It's an off-grid inverter, do not connect the AC output terminals to the grid or electrical source, otherwise the inverter may be damaged.
- This inverter can only be used singly, parallel connection or in series will damage the inverters.
- Risk of electric shock, don't touch output port when the inverter is working. The output is forbidden to connect other power sources or grid, otherwise the inverter will be damaged. The inverter must be in off, when connecting load.
- Do not attempt to repair the fault inverter by yourself, otherwise it may lead to a serious accident. Please contact the manufacturer's engineer.

## 2. Introduction

IPower series is a kind of pure sine wave inverter which can convert. 12/24/48VDC to 220/230VAC(or 110/120VAC). Industrial design, compared with the civil design, has a wider operating temperature, easy installation and operation. The wide input voltage range is ideal for solar system application. The inverter can be applied in many fields, such as household emergency lighting system, vehicle mounted system and small field power supply etc.

### Features:

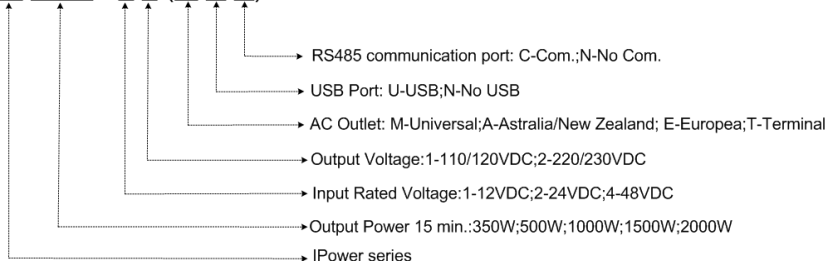
- Safe design with input and output electrical isolation
- Adoption of advanced SPWM technology, pure sine wave output
- Optional output voltage 220/230VAC(or 110/120VAC), choosing by DIP switch
- LED indicators for fault status and working status
- Lower No-load consumption
- Max. efficiency up to 95%(IP2000-22, IP2000-42)<sup>①</sup>
- Input protection: Over voltage protection, low voltage protection
- Output protection: Over load protection, short circuit protection
- Over temperature protection: Temperature-controlled Fan Ventilation; Inverter turns off automatically when overheating
- Operational USB output 5VDC/1A
- Operational RS485 communication port<sup>②</sup>

① The efficiency is tested at rated input voltage,220V output with resistive load, 25°C Ambient temperature,1500W and higher version

② 1000W and higher version support RS485 communication port optional.

### 3. Designations of models

IP 2000 - 4 2 (M U C)

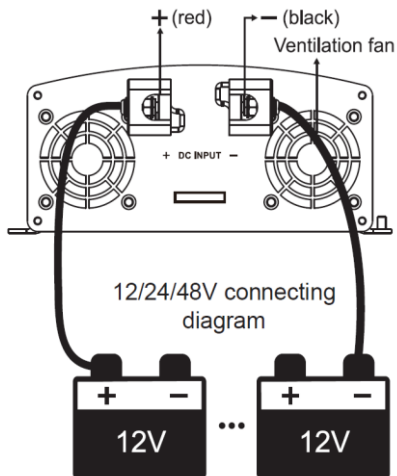


Model	Input Rated Voltage	Output Voltage	Output Power 15 min.
IP350-12	12VDC	220/230VAC	350W
IP350-22	24VDC	220/230VAC	350W
IP500-12	12VDC	220/230VAC	500W
IP500-22	24VDC	220/230VAC	500W
IP1000-12	12VDC	220/230VAC	1000W
IP1000-22	24VDC	220/230VAC	1000W
IP1500-12	12VDC	220/230VAC	1500W
IP1500-22	24VDC	220/230VAC	1500W
IP2000-22	24VDC	220/230VAC	2000W
IP2000-42	48VDC	220/230VAC	2000W
IP350-11	12VDC	110/120VAC	350W
IP350-21	24VDC	110/120VAC	350W
IP500-11	12VDC	110/120VAC	500W
IP500-21	24VDC	110/120VAC	500W
IP1000-11	12VDC	110/120VAC	1000W
IP1000-21	24VDC	110/120VAC	1000W
IP1500-11	12VDC	110/120VAC	1500W
IP1500-21	24VDC	110/120VAC	1500W
IP2000-21	24VDC	110/120VAC	2000W
IP2000-41	48VDC	110/120VAC	2000W

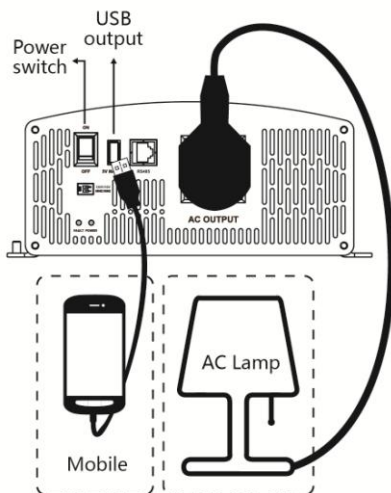
- + 220/230VAC output outlet: Universal, Australia/New Zealand, European, Terminal(IP1000 and above models)
- + 110/120VAC output outlet: Universal, Terminal(IP1000 and above models)
- + All the IPower models have option for USB output.
- + All the IPower models have option for RS485 communication except IP350 and IP500

## 4. Wiring

(1) 12/24/48V system DC input



(2) 220/230V AC(or 110/120V) output





## Operation Steps:

**Step 1:** Turn the power switch of the inverter to OFF

**Step 2:** Disconnect the input breaker or the fuse between inverter and battery, connect the battery terminals ('+' with red line and '-' with black line). Do not connect the poles by contraries.

**Step 3:** Use the cable no less than  $4\text{mm}^2$  to connect the grounding terminal of the inverter to the ground.

**Step 4:** Connect the plug of AC load to the inverter AC outlet

**Step 5:** Switch on the input breaker or the fuse between inverter and battery; turn on the power switch to start the inverter. If the green indicator is on solid, turn on the loads one by one. Check the operation state of the inverter and loads.

**Step 6:** If there are different types of loads, it is suggested that turn on the loads with higher startup current first, such as television, then after the loads works stably, turn on the loads with lower startup current, such as incandescent lamp.

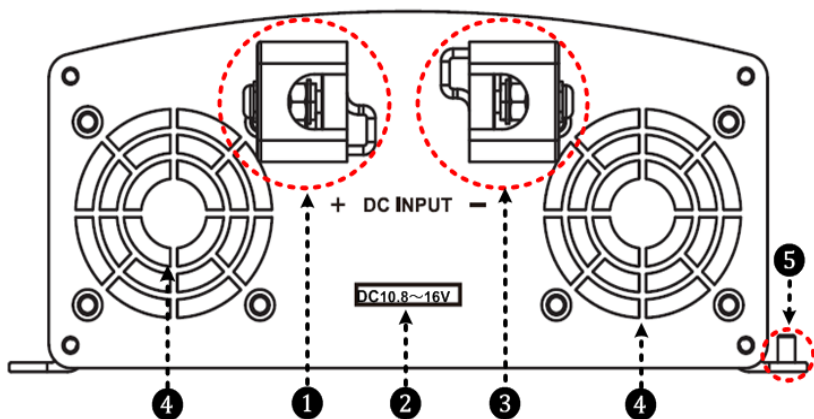
**Step 7:** If the Fault indicator is red and the buzzer alarms when turn on the devices, please switch off the loads and inverter immediately.



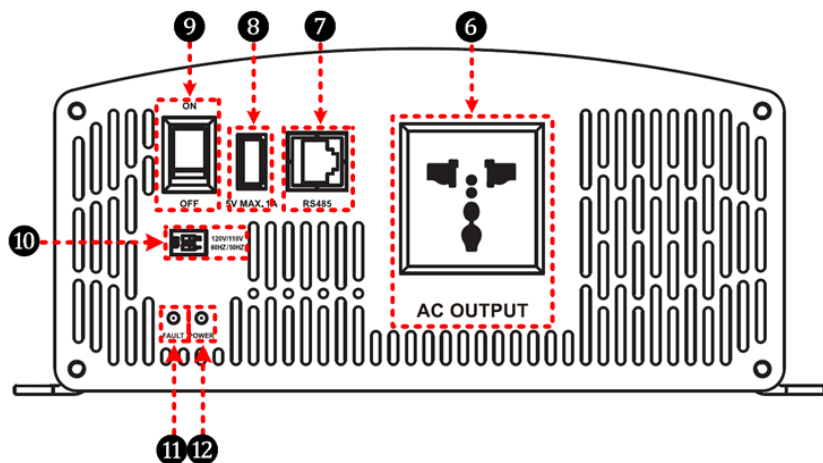
**Note:** When use USB port for charging, it is suggested to charge the power bank first, and then use the power bank to charge mobile phones.

## 5. Functions

### ■ DC Input Panel



### ■ AC Output Panel



①	DC Input Terminal Positive	⑦	RS485 communication port <sup>(4)</sup>
②	DC input voltage range <sup>(1)</sup>	⑧	USB output port (5VDC/1A)
③	DC Input Terminal Negative	⑨	AC output switch
④	Ventilation Fan <sup>(2)</sup>	⑩	Mode switch <sup>(5)</sup>
⑤	Grounding Terminal	⑪	Fault indicator(red) <sup>(6)</sup>
⑥	AC Outlet <sup>(3)</sup>	⑫	Working indicator(green) <sup>(6)</sup>

### (1) Input rated voltage

12V system input voltage range is 10.8~16V;

24V system input voltage range is 21.6~32V;

48V system input voltage range is 43.2~60V.

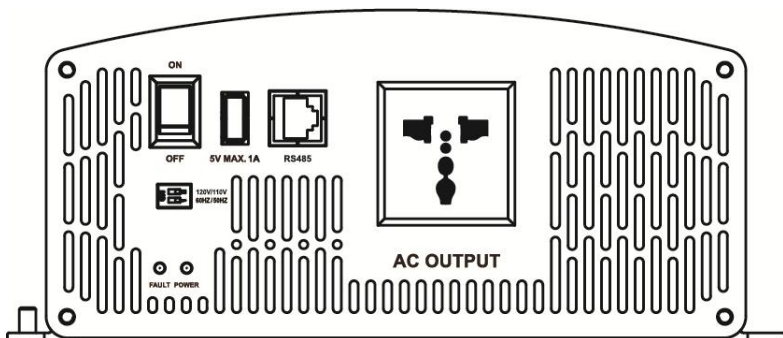
### (2) Fan Ventilation

When the heat sink temperature is higher than 50°C or internal temperature is higher than 50°C, the fan will turn on automatically.

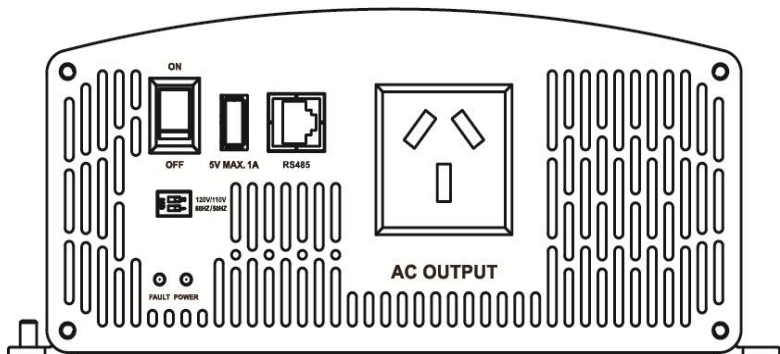
When the heat sink temperature is lower than 40°C and internal temperature is lower than 40°C, the fan will turn off automatically.

### (3) AC Outlet (optional)

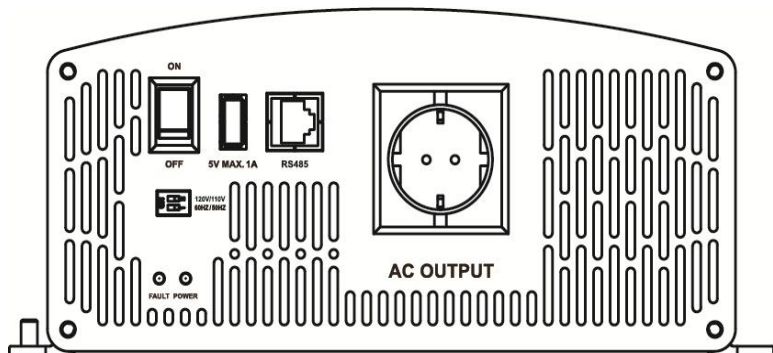
**Universal**



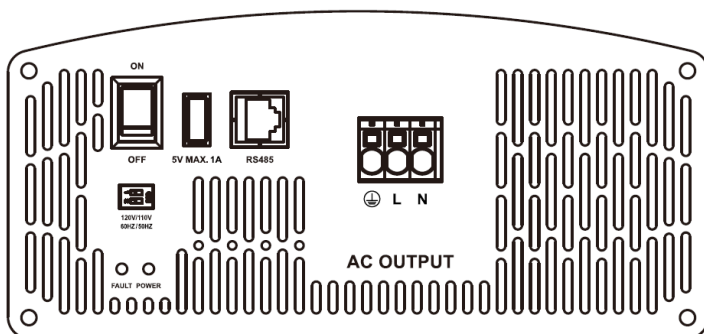
## Australia/New Zealand



## European

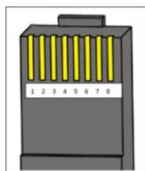


## Terminal(IP1000 and above models)



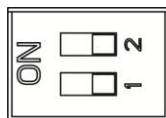
#### (4) RS485 communication port(IP1000 and above models optional)

The RJ45 interface pin definition is shown below:



Pins	Define
1/2	5VDC
3/4	RS485-B
5/6	RS485-A
7/8	GND

#### (5) Mode Switch



**230V/220V**  
**60HZ/50HZ**

- When the switch No.1 is on the ON side, output frequency is 60Hz, otherwise is 50Hz.
- When the switch No.2 is on the ON side, the output voltage is 230VAC, otherwise is 220VAC.



**NOTE: Both the output frequency and the output voltage change availability after restart the inverter.**



**WARNING: DO NOT turn ON/OFF the mode switch when the inverter is working.**

#### (6) LED indicator and Buzzer

Working indicator	Fault indicator	Buzzer	Status
Green On Solid	Red OFF	No Sounding	Output is normal
Green Slowly Flashing(1/4Hz)	Red OFF	Sounding	Input under voltage
Green Fast Flashing(1Hz)	Red OFF	Sounding	Input over voltage
Green On Solid	Red On Solid	Sounding	Over temperature
Green OFF	Red Fast Flashing(1Hz)	Sounding	Load short circuit
Green On Solid	Red Slowly Flashing(1/4Hz)	Sounding	Overload
Green OFF	Red OFF	Sounding	Output voltage abnormal

## 6. Protection

Protection and recover	Condition				Phenomenon
	Parameter	IPower-1*	IPower-2*	IPower-4*	
Over voltage protection and recover	Input Voltage $U_i$	$U_i > 16V$	$U_i > 32V$	$U_i > 64V$	Output is OFF Green indicator fast flashing Buzzer sounds
		$U_i \leq 14.5V$	$U_i \leq 29V$	$U_i \leq 58V$	Green indicator on solid The output is on
Low voltage protection and recover	Input Voltage $U_i$	$U_i < 10.8V$	$U_i < 21.6V$	$U_i < 43.2V$	Output is OFF Green indicator slowly flashing Buzzer sounds
		$U_i \geq 12.5V$	$U_i \geq 25V$	$U_i \geq 50V$	Green indicator on solid The output is on
Over tem. protection and recover	Tem.(T)	Heat sink $T > 80^\circ C$ (IP1000 $T > 75^\circ C$ ) or Internal $T > 60^\circ C$			Inverter turns OFF
		Heat sink $T \leq 70^\circ C$ (IP1000 $T \leq 65^\circ C$ ) and Internal $T \leq 50^\circ C$			Inverter turns ON

Overload protection and recover	Output power S Rated power $P_e$	$S=1.2P_e$ <sup>①</sup>	Output is OFF after 15min Red indicator slowly flashing Buzzer sounds
		$S=1.5P_e$ <sup>①</sup>	Output is OFF after 30s <sup>②</sup> Red indicator slowly flashing Buzzer sounds
		$S=1.8P_e$ <sup>①</sup>	Output is OFF after 10s Red indicator slowly flashing Buzzer sounds
		$S>2P_e$ (Rated input voltage) <sup>①</sup>	Output is OFF after 5s Red indicator slowly flashing Buzzer sounds
Load short circuit protection <sup>①</sup>			Output is OFF immediately Red indicator fast flashing Buzzer sounds

**①When output overload protection or load short circuit protection is activated, the AC output would auto-recover for three times (the first time delays for 5s, the second time delays for 10s and the third time delays for 15s). After then the AC output would not auto-recover, and it can only be recovered after restarting the inverter. (When  $S=1.2P_e$ , the models don't have auto-recover function, except IP350 and IP500)**

**②IP350 and IP500 stop output after 1minute.**

## 7. Troubleshooting

Faults	Possible reasons	Troubleshooting
Green indicator slowly flashing Buzzer sounds	DC input under voltage	Measure the DC input voltage, if the voltage is lower than 10.8/21.6/43.2V. Adjust the input voltage to restore normally.
Green indicator fast flashing Buzzer sounds	DC input over voltage	Measure the DC input voltage, if the voltage is higher than 16/32/64V. Adjust the input voltage to restore normally.
Red indicator slowly flashing Buzzer sounds	Overload	<ul style="list-style-type: none"> <li>• Reduce the number of the AC load.</li> <li>• Restart the inverter.</li> </ul>
Red indicator fast flashing Buzzer sounds	Short circuit	<ul style="list-style-type: none"> <li>• Check carefully loads connection, clear the fault.</li> <li>• Restart the inverter.</li> </ul>
Green and red indicator on solid Buzzer sounds	Over temperature	When the heat sink temperature exceeds 80°C or the internal temperature exceeds 60°C, the inverter will automatically stop output; When the heat sink temperature below 70°C and the internal temperature below 50°C, the inverter will resume to output.



## 8. Maintenance

The following inspections and maintenance tasks are recommended at least two times per year for best performance.

- Make sure no block on air-flow around the inverter. Clear up any dirt and fragments on radiator.
- Check all the naked wires to make sure insulation is not damaged for serious solarization. Frictional wear, dryness, insects or rats etc. Repair or replace some wires if necessary.
- Check and confirm that indicator and display is consistent with required. Pay attention to any troubleshooting or error indication .Take corrective action if necessary.
- Confirm that all the terminals have no corrosion, insulation damaged, high temperature or burnt/discolored sign, tighten terminal screws to the suggested torque.
- Check for dirt, nesting insects and corrosion. If so, clear up in time.
- Check and confirm that lightning arrester is in good condition. Replace a new one in time to avoid damaging of the inverter/charger and even other equipments.



### **WARNING: Risk of electric shock!**

Risk of electric shock! Before above operations, make sure that all the power is turned off, and the electricity in the capacitances is completely discharged, then follow the corresponding inspections and operations.

## 9. Disclaimer

The warranty does not apply under the following conditions:

- Damage caused by improper use or use in inappropriate environment
- Battery voltage exceeds the input voltage limit of inverter
- Damage caused by working environment temperature exceeds the rated range
- Unauthorized dismantling or attempted repair
- Damage occurred during transportation or handling
- Damage caused by force majeure

## 10. Technical Specification

Item	IP350-12	IP350-22	IP350-11	IP350-21
Rated Input Voltage	12VDC	24VDC	12VDC	24VDC
Input Voltage Range	10.8~16VDC	21.6~32VDC	10.8~16VDC	21.6~32VDC
Input surge voltage	<32VDC	<44VDC	<32VDC	<44VDC
Output Voltage	220VAC(±5%) 230VAC(-7%~+5%)		110VAC(±5%) 120VAC(-10%~+5%)	
Output Frequency	50/60±0.1Hz			
Output Continuous Power	280W			
Output Power 15 min.	350W			
Surge power	750W			
Power factor	0.2-1(VA lower than output continuous power)			
Output Wave	Pure sine wave			
Distortion THD	THD≤3% <sup>①</sup>		THD≤5% <sup>①</sup>	
Max. Efficiency	91%	92%	90%	91%
No-load current	<0.7A	<0.5A	<0.7A	<0.5A
USB Output Port <sup>②</sup>	5VDC/Max.1A			
Binding post	φ6mm			
Overall dimension	214×105.5×57.7mm			
Mounting dimension	185.5×76.7mm			
Mounting hole size	φ4.2mm			
Net weight	1.0kg			

①Test condition: Rated Input Voltage, Output Continuous Power, Resistive load.

②Conventional products don't have this port; the port is optional.

Item	IP500-12	IP500-22	IP500-11	IP500-21
Rated Input Voltage	12VDC	24VDC	12VDC	24VDC
Input Voltage Range	10.8~16VDC	21.6~32VDC	10.8~16VDC	21.6~32VDC
Input surge voltage	<32VDC	<44VDC	<32VDC	<44VDC
Output Voltage	220VAC(±5%) 230VAC(-10%~+5%)		110VAC(±5%) 120VAC(-10%~+5%)	
Output Frequency	50/60±0.1Hz			
Output Continuous Power	400W			
Output Power 15 min.	500W			
Surge power	1000W			
Power factor	0.2-1(VA lower than output continuous power)			
Output Wave	Pure sine wave			
Distortion THD	THD≤3% <sup>①</sup>		THD≤5% <sup>①</sup>	
Max. Efficiency	92%		91%	
No-load current	<0.9A	<0.5A	<0.9A	<0.5A
USB Output Port <sup>②</sup>	5VDC/Max.1A			
Binding post	φ6mm			
Overall dimension	232.2×132×74.5mm			
Mounting dimension	205×102mm			
Mounting hole size	φ5.2mm			
Net weight	1.7kg			

①Test condition: Rated Input Voltage, Output Continuous Power, Resistive load.

②Conventional products don't have this port; the port is optional.

Item	IP1000-12	IP1000-22	IP1000-11	IP1000-21
Rated Input Voltage	12VDC	24VDC	12VDC	24VDC
Input Voltage Range	10.8~16VDC	21.6~32VDC	10.8~16VDC	21.6~32VDC
Input Surge Voltage	<20VDC	<40VDC	<20VDC	<44VDC
Output Voltage	220VAC/230VAC (±5%)		110VAC/120VAC(±3%)	
Output Frequency	50/60±0.1Hz			
Output Continuous Power	800W			
Output Power 15 min.	1000W			
Surge power	1600W			
Power factor	0.2-1(VA lower than output continuous power)			
Output Wave	Pure sine wave			
Distortion THD	THD≤3% <sup>①</sup>		THD≤5% <sup>①</sup>	
Max. Efficiency	94.5%		92.5%	
No-load Current	<0.8A	<0.5A	<0.8A	<0.5A
USB Output Port <sup>②</sup>	5VDC/Max.1A			
RS485 Com. Port <sup>②</sup>	5VDC/200mA			
Binding Post	φ10mm			
Overall Dimension	298.3×231.5×98.5mm	284.7×231.5×98.5mm	298.3×231.5×98.5mm	284.7×231.5×98.5mm
Mounting Dimension	183×220mm	163×219.5mm	183×220mm	163×219.5mm
Mounting Hole Size	φ5.5mm			
Net Weight	3.9kg	3.6kg	3.9kg	3.6kg

①Test condition: Rated Input Voltage, Output Continuous Power, Resistive load.

②Conventional products don't have this port; the port is optional.

Item	IP1500-12	IP1500-22	IP1500-11	IP1500-21
Rated Input Voltage	12VDC	24VDC	12VDC	24VDC
Input Voltage Range	10.8~16VDC	21.6~32VDC	10.8~16VDC	21.6~32VDC
Input Surge Voltage	<20VDC	<40VDC	<20VDC	<40VDC
Output Voltage	220VAC(±5%) 230VAC(-7%~+5%)		110VAC(±3%) 120VAC(-7%~+3%)	
Output Frequency	50/60±0.1Hz			
Output Continuous Power	1200W			
Output Power 15 min.	1500W			
Surge power	2400W			
Power factor	0.2-1(VA lower than output continuous power)			
Output Wave	Pure sine wave			
Distortion THD	THD≤3% <sup>①</sup>		THD≤5% <sup>①</sup>	
Max. Efficiency	93%	94%	93%	94%
No-load Current	<1.0A	<0.6A	<1.0A	<0.6A
USB Output Port <sup>②</sup>	5VDC/Max.1A			
RS485 Com. Port <sup>②</sup>	5VDC/200mA			
Binding Post	φ10mm			
Overall Dimension	326.12×231.5×98.5mm	284.7×231.5×98.5mm	326.12×231.5×98.5mm	284.7×231.5×98.5mm
Mounting Dimension	208×220mm	163×219.5mm	208×220mm	163×219.5mm
Mounting Hole Size	φ5.5mm			
Net Weight	4.6kg	3.9kg	4.6kg	3.9kg

①Test condition: Rated Input Voltage, Output Continuous Power, Resistive load.

②Conventional products don't have this port; the port is optional.

	<b>IP2000-22</b>	<b>IP2000-42</b>	<b>IP2000-21</b>	<b>IP2000-41</b>
Rated Input Voltage	24VDC	48VDC	24VDC	48VDC
Input Voltage Range	21.6~32VDC	43.2~60VDC	21.6~32VDC	43.2~60VDC
Input Surge Voltage	<40VDC	<80VDC	<40VDC	<80VDC
Output Voltage	220VAC(±5%) 230VAC(-10%~+5%)		110VAC(±5%) 120VAC(-10%~+5%)	
Output Frequency	50/60±0.1Hz			
Output Continuous Power	1600W			
Output Power 15 min. surge Power	2000W 3200W			
Power factor	0.2-1(VA lower than output continuous power)			
Output Wave	Pure sine wave			
Distortion THD	THD≤3% <sup>①</sup>		THD≤5% <sup>①</sup>	
Max. Efficiency	95%		94%	
No-load Current	<0.6A	<0.4A	<0.6A	<0.4A
USB Output Port <sup>②</sup>	5VDC/Max.1A			
RS485 Com. Port <sup>②</sup>	5VDC/200mA			
Binding Post	φ10mm			
Overall Dimension	326.12×231.5×98.5mm			
Mounting Dimension	208×219.5mm			
Mounting Hole Size	φ5.5mm			
Net Weight	4.6kg			

①Test condition: Rated Input Voltage, Output Continuous Power, Resistive load.

②Conventional products don't have this port; the port is optional.

## Environmental Parameters

Working Temperature	-20°C~+45°C
Storage Temperature	-35°C~ +70°C
Humidity	< 95%(N.C.)
Enclosure	IP20
Altitude	< 5000 m (Derating to operate according to IEC62040 at a height exceeding 1000 m)

## Others

Dielectric Strength	Between DC input terminals and metal case: Test voltage AC500V, 1 minute Between AC output terminals and metal case: Test voltage AC1500V, 1 minute
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**Any changes without prior notice! Version number: V1.2**



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