Pure Sine Wave Inverter

User Manual

IP350-12/22/11/21
IP500-12/22/11/21
IP1000-12/22/11/21
IP1500-12/22/11/21

EN

CONTENTS

1. Important Safety Instructions

As an AC power supply equipment, the inverter's output voltage is at the same level as that of the 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 IPower inverter has a relatively wide input range. Still, 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 a humid, flammable, explosive, or dust environment.
- Keep the inverter out of children's touch.
- Inverter input is recommended to connect to the battery. The minimum capacity of the 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, the user should select DC power supply current at least twice greater than that of the inverter rated input to keep normal inverter operation. Use a DC power supply for testing may cause damage to the inverter.
- When the inverter works continuously, its surface may become very hot; please ensure 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 an airproof location and keep enough space around the inverter.
- The protective grounding must be connected to the ground. The cross-section of the wire should not be less than $4mm^2$.
- The wire connection between the battery and inverter should be less than 3m, and the current density should be less than $3.5A/mm^2$. At this time, the inverter is running at full load. If the wire length is greater than 3m, the current density should be reduced.
- A fuse or breaker should be used between the battery and inverter. The value of the fuse or breaker should be twice the inverter's rated input current.
- Do not connect the battery charger or similar devices to the inverter's input terminal.
- Do not put the inverter close to the flooded lead-acid battery because the terminals' sparkle 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 in parallel connections. The series connection will damage the inverters.
- Risk of electric shock, don't touch the output port when the inverter is working. The output is forbidden to connect to other power sources or grid; otherwise, the inverter will be damaged. The inverter must be turned off when connecting the load.
- Do not attempt to repair the fault inverter by yourself; otherwise, it may lead to a serious accident. Please contact the manufacture's engineer.
- IPower series is only suitable for civil applications, not for industrial applications.

2. Introduction

IPower series is a kind of pure sine wave inverter that can convert 12/24/48VDC to 220/230VAC(or 110/120VAC). Compared with civil design, industrial design has a wide operating temperature, high reliability, and high efficiency. Simple appearance and lightweight make it easy to install and operate. The wide input voltage range is ideal for solar system applications. This inverter is especially suitable for civil applications, such as household emergency lighting systems, vehicle-mounted systems, small field power supply, etc.

Features:

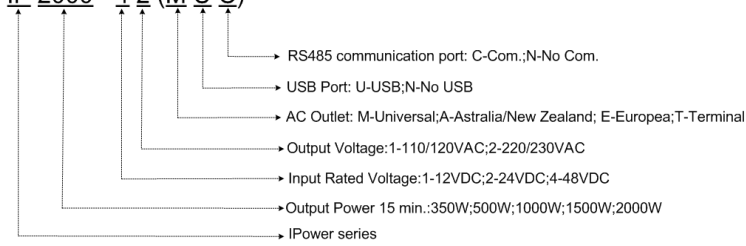
- Safe design with input and output electrical isolation
- Adoption of advanced SPWM technology, pure sine wave output
- Optional output voltage 220/230VAC(or 110/120VAC), choosing by DIP switch
- LED indicators for fault status and working status
- Lower No-load consumption
- Max. efficiency up to 95%(IP2000-22, IP2000-42)①
- Input protection: Over voltage protection, low voltage protection
- Output protection: Overload 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 port②

① The efficiency is tested at rated input voltage,220V output with resistive load, 25℃ 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)

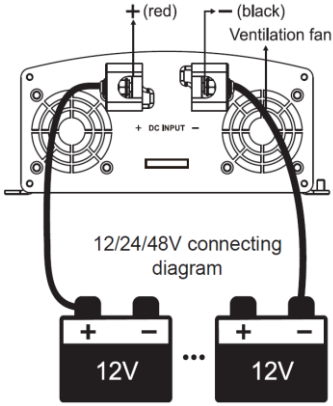


Model	Input Rated Voltage	Output Voltage	Output Power 15 min.
IP350-12	12VDC	220/230VAC	350W
IP350-22	24VDC	220/230VAC	350W
IP500-12	12VDC	220/230VAC	500W
IP500-22	24VDC	220/230VAC	500W
IP1000-12	12VDC	220/230VAC	1000W
IP1000-22	24VDC	220/230VAC	1000W
IP1500-12	12VDC	220/230VAC	1500W
IP1500-22	24VDC	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

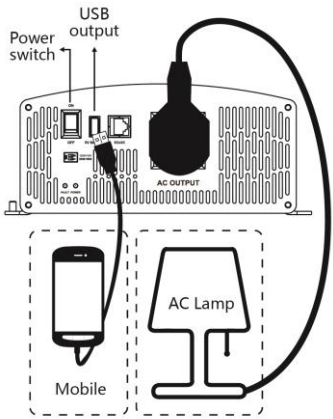
- **220/230VAC output outlet: Universal, Australia/New Zealand, European, Terminal(IP1000 and above models).**
- **110/120VAC output outlet: Universal, Terminal(IP1000 and above models).**
- **All the IPower models have an option for USB output.**
- **All the IPower models have an option for RS485 communication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

4. Wiring

(1)12/24/48Vsystem 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 the inverter and battery, connect the battery terminals ('+' with the red line and '-' with the black line). Do not connect the poles by contraries.

Step 3: Use the cable no less than 4mm^2 to connect the inverter's grounding terminal 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 the 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.

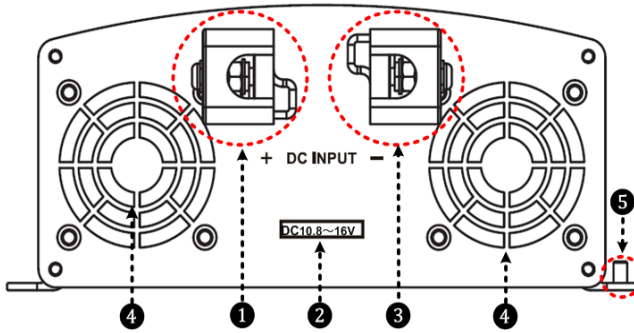
Step 6: If there are different types of loads, the loads with higher startup current should be turned on firstly, such as television. After the loads work stably, turn on the loads with a lower startup current, such as an incandescent lamp.

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

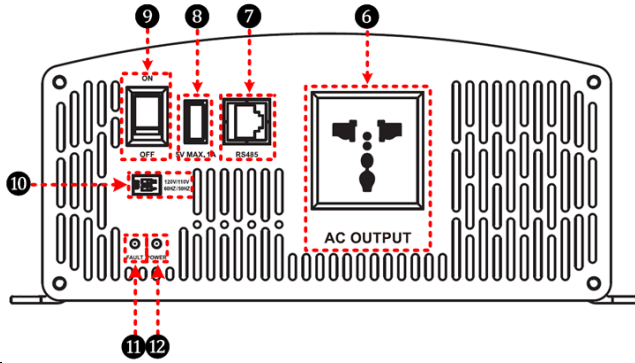
Note: When using a USB port for charging, it is suggested to charge the power bank first and then use the power bank to charge mobile phones.

5. Functions

■ **DC Input Panel**



■ **AC Output Panel**



❶	DC Input Terminal Positive	❼	RS485 communication port(4)
❷	DC input voltage range (1)	❽	USB output port (5VDC/1A)
❸	DC Input Terminal Negative	❾	AC output switch
❹	Ventilation Fan (2)	❿	Mode switch(5)
❺	Grounding Terminal	⓫	Fault indicator(red) (6)
❻	AC Outlet (3)	⓬	Working indicator(green) (6)

(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。

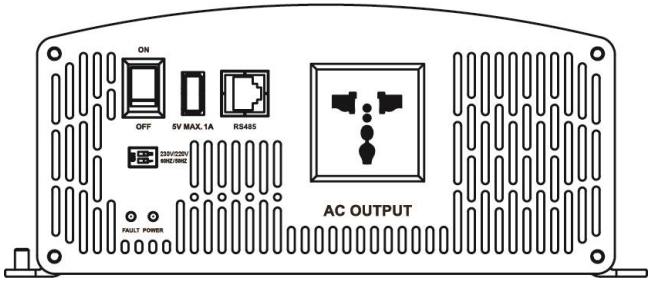
(2) Fan Ventilation

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

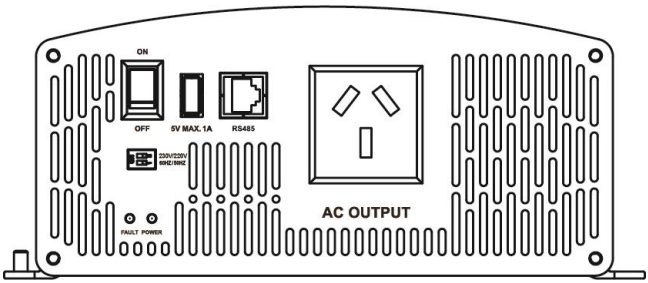
When the heat sink temperature is lower than 40℃ and the internal temperature is lower than 40℃, the fan will turn off automatically.

(3) AC Outlet (optional)

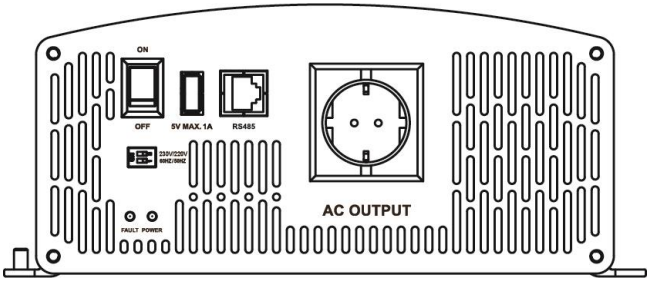
Universal



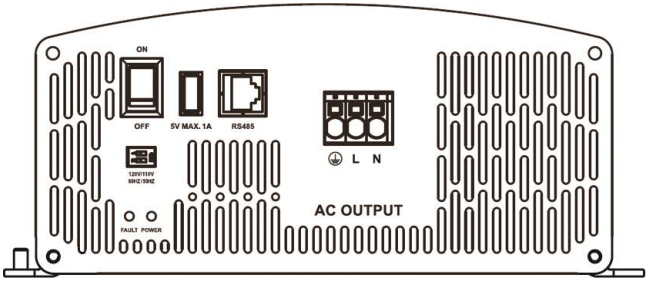
Australia/New Zealand



European

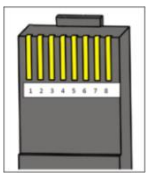


Terminal(IP1000 and above models）



(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

- When switch No.1 is on the ON side, the output frequency is 60Hz. Otherwise, it is 50Hz.
- When switch No.2 is on the ON side, the output voltage is 230VAC（120VAC）.

Otherwise, it is 220VAC(110VAC).

NOTE: Both the output frequency and the output voltage change availability after restarting 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 overvoltage
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

<table>
<tr><th rowspan="2">Protection and recover</th><th colspan="4">Condition</th><th rowspan="2">Phenomenon</th></tr>
<tr><th>Parameter</th><th>IPower-1*</th><th>IPower-2*</th><th>IPower-4*</th></tr>
<tr><td rowspan="2">Overvoltage protection and recover</td><td rowspan="2">Input Voltage Ui</td><td>Ui>16V</td><td>Ui>32V</td><td>Ui>64V</td><td>Output is OFF
Green indicator fast flashing
Buzzer sounds</td></tr>
<tr><td>Ui≤14.5V</td><td>Ui≤29V</td><td>Ui≤58V</td><td>Green indicator on solid
The output is on</td></tr>
<tr><td rowspan="2">Low voltage protection and recover</td><td rowspan="2">Input Voltage Ui</td><td>Ui<10.8V</td><td>Ui<21.6V</td><td>Ui<43.2V</td><td>Output is OFF
Green indicator slowly flashing
Buzzer sounds</td></tr>
<tr><td>Ui≥12.5V</td><td>Ui≥25V</td><td>Ui≥50V</td><td>Green indicator on solid
The output is on</td></tr>
<tr><td rowspan="2">Over tem. protection and recover</td><td rowspan="2">Tem. (T)</td><td colspan="3">Heat sink T＞80℃(IP1000 T＞75℃)
or Internal T＞60℃</td><td>Inverter turns OFF</td></tr>
<tr><td colspan="3">Heat sink T≤70℃(IP1000 T≤65℃)
and Internal T≤50℃</td><td>Inverter turns ON</td></tr>
<tr><td rowspan="3">Overload protection and recover</td><td rowspan="3">S: Output power
P_e: Rated power</td><td colspan="3">S=1.2P_e①</td><td>The output is OFF after 15min
Red indicator slowly flashing
Buzzer sounds</td></tr>
<tr><td colspan="3">S=1.5P_e①</td><td>The output is OFF after 30s②
Red indicator slowly flashing
Buzzer sounds</td></tr>
<tr><td colspan="3">S=1.8P_e①</td><td>The output is OFF after 10s</td></tr>
</table>

			Red indicator slowly flashing Buzzer sounds
		$S>2P_e$(Rated input voltage) ①	The output is OFF after 5s Red indicator slowly flashing Buzzer sounds
Load short circuit protection①			The output is OFF immediately Red indicator fast flashing Buzzer sounds

① When output overload protection or load short circuit protection is activated, the AC output would auto-recovery 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 the auto-recovery function, except IP350 and IP500.)

② IP350 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 overvoltage	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	• Reduce the number of AC loads. • Restart the inverter.
Red indicator fast flashing Buzzer sounds	Short circuit	• Check carefully loads connection, clear the fault. • Restart the inverter.
Green and red indicator on solid Buzzer sounds	Over-temperature	When the heat sink temperature exceeds 80℃, or the internal temperature exceeds 60℃, the inverter automatically turns off the output. When the heat sink temperature goes below 70℃, or the internal temperature goes below 50℃, the inverter resumes work.

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 the 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 are 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 the lightning arrester is in good condition. Replace a new one in time to avoid damaging the inverter/charger and even other equipment.

 **WARNING：Risk of electric shock!**

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

9. Disclaimer

The warranty does not apply under the following conditions:

- Damage caused by improper use or use in an inappropriate environment
- Battery voltage exceeds the input voltage limit of the 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	IP350-11	IP350-12	IP350-21	IP350-22
Rated Input Voltage	12VDC		24VDC	24VDC
Input Voltage Range	10.8～16VDC		21.6～32VDC	21.6～32VDC
Input surge voltage	＜32VDC		＜44VDC	＜44VDC
Output Voltage	110VAC(±5%) 120VAC(-10%~ +5%)	220VAC(±5%) 230VAC(-7%~+ 5%)	110VAC(±5%) 120VAC(-10%~ +5%)	220VAC(±5%) 230VAC(-7%~+ 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≤5%①	THD≤3%①	THD≤5%①	THD≤3%①
Max. Efficiency	90%	91%	91%	92%
No-load current	＜0.7A		＜0.5A	
USB Output Port②	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			

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

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

Item	IP500-11	IP500-12	IP500-21	IP500-22
Rated Input Voltage	12VDC		24VDC	
Input Voltage Range	10.8～16VDC		21.6～32VDC	
Input surge voltage	＜32VDC		＜44VDC	
Output Voltage	110VAC(±5%) 120VAC(-10%~ +5%)	220VAC(±5%) 230VAC(-10%~ +5%)	110VAC(±5%) 120VAC(-10%~ +5%)	220VAC(±5%) 230VAC(-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≤5%①	THD≤3%①	THD≤5%①	THD≤3%①
Max. Efficiency	91%	92%	91%	92%
No-load current	＜0.9A		＜0.5A	
USB Output Port②	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			

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

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

Item	**IP1000-11**	**IP1000-12**	**IP1000-21**	**IP1000-22**
Rated Input Voltage	12VDC		24VDC	
Input Voltage Range	10.8～16VDC		21.6～32VDC	
Input Surge Voltage	＜20VDC		＜44VDC	＜40VDC
Output Voltage	110VAC/120VAC(±3%)	220VAC/230VAC (±5%)	110VAC/120VAC(±3%)	220VAC/230VAC (±5%)
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≤5%①	THD≤3%①	THD≤5%①	THD≤3%①
Max. Efficiency	92.5%	94.5%	92.5%	94.5%
No-load Current	＜0.8A		＜0.5A	
USB Output Port②	5VDC/Max.1A			
RS485 Com. Port②	5VDC/200mA			

Binding Post	Φ6mm	
Overall Dimension	298.3×231.5×98.5mm	284.7×231.5×98.5mm
Mounting Dimension	183×220mm	163×219.5mm
Mounting Hole Size	Φ5.5mm	
Net Weight	3.9kg	3.6kg

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

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

Item	IP1500-11	IP1500-12	IP1500-21	IP1500-22
Rated Input Voltage	12VDC		24VDC	
Input Voltage Range	10.8～16VDC		21.6～32VDC	
Input Surge Voltage	＜20VDC		＜40VDC	
Output Voltage	110VAC(±3%) 120VAC(-7%~+3%)	220VAC(±5%) 230VAC(-7%~+5%)	110VAC(±3%) 120VAC(-7%~+3%)	220VAC(±5%) 230VAC(-7%~+5%)
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≤5%①	THD≤3%①	THD≤5%①	THD≤3%①
Max. Efficiency	93%		94%	
No-load Current	＜1.0A		＜0.6A	
USB Output Port②	5VDC/Max.1A			
RS485 Com. Port②	5VDC/200mA			
Binding Post	Φ6mm			
Overall Dimension	326.12×231.5×98.5mm		284.7×231.5×98.5mm	
Mounting Dimension	208×220mm		163×219.5mm	
Mounting Hole Size	Φ5.5mm			
Net Weight	4.6kg		3.9kg	

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

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

Item	IP2000-21	IP2000-22	IP2000-41	IP2000-42
Rated Input Voltage	24VDC		48VDC	

Input Voltage Range	21.6～32VDC		43.2～60VDC	
Input Surge Voltage	＜40VDC		＜80VDC	
Output Voltage	110VAC(±5%) 120VAC(-10%~+5%)	220VAC(±5%) 230VAC(-10%~+5%)	110VAC(±5%) 120VAC(-10%~+5%)	220VAC(±5%) 230VAC(-10%~+5%)
Output Frequency	50/60±0.1Hz			
Output Continuous Power	1600W			
Output Power 15 min.	2000W			
surge Power	3200W			
Power factor	0.2-1(VA lower than output continuous power)			
Output Wave	Pure sine wave			
Distortion THD	THD≤5%①	THD≤3%①	THD≤5%①	THD≤3%①
Max. Efficiency	94%	95%	94%	95%
No-load Current	＜0.6A		＜0.4A	
USB Output Port②	5VDC/Max.1A			
RS485 Com. Port②	5VDC/200mA			
Binding Post	Φ6mm			
Overall Dimension	326.12×231.5×98.5mm			
Mounting Dimension	208×219.5mm			
Mounting Hole Size	Φ5.5mm			
Net Weight	4.6kg			

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

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

Environmental Parameters

Working Temperature	-20℃~ +45℃
Storage Temperature	-35℃~ +70℃
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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