



# **CSUNPOWER Photovoltaic Solutions**

Global / high-tech / your safe choice Off Grid

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CSUNPOWER is a joint venture company formed by a union of prominent Chinese photovoltaic manufacturing entrepreneurs. The company focuses on global clean energy development, solutions, investment and financing, energy management and electricity distribution business. CSUNPOWER utilizes the strength in PV manufacturing, supply chain, and technology to form a highly reputable international energy solutions provider.

CSUNPOWER has set up branches in United States, Japan, Philippines, Pakistan, Thailand, and the area of Middle East, forms a professional team to provide services to the local market, and realize the entrepreneurial strategy of "Globalized Partners, Local Professional Services". We devote ourselves to providing the best quality and efficient one-stop service for our global customers.

CSUNPOWER has a professional management team, adhering to the business philosophy of "efficient, professional, practical, and low-cost". We have many years of experience in the area of project development, design, engineering, research and development, project management, investment and financing, supply chain management, control, and project implementation & delivery, which we have received many compliments from our business partners.



1. Overview of the Power Plant System

Off grid solar system is a renewable energy system, which can transfer solar energy into electricity and save it to battery for storage. The energy generated from solar system will offset the energy customer used from power grid, so as to help reduce cost of monthly electricity bill, and enjoy life with clean energy.

Typical Case		CSUNPOWER OG2KS	CSUNPOWER OG3KS	CSUNPOWER OG6KS	CSUNPOWER OG10KS
System Peak Power DC (W)		2000	3000	6000	10000
Daily Energy Production (approx*)(kWh)		8.8	13.2	26.5	44.3
Number of 270W Poly Solar Panels(Optional)		8	12	24	40
Roof Area Required (mtrs sq.)		14	20	40	66
AC Output Max.		2000VA	3000VA	6000VA	9000VA
System Voltage DC (V)		48	48	48	48
Battery Bank (VAh)( Optional)		9600	9600	19200	28800
Only battery duration time(h)		3.8	2.5	2,5	2.5
		Main Compo	nents		
PV Module	CSUN 270060P	8	12	24	40
	48V 45A	1		1	1
Solar Regulator	48V 80A		1	1	2
т.,	48V 2000VA	1			
Inverter	48V 3000VA		1	2	3
MCU				1	1
Lead-acid battery (Li-ion optional)	12V 200Ah	4	4	8	12
Bracket	Set	1	1	1	1
PV Cable	m	60	70	110	160
Connector	Set	5	8	15	25
		AC Outp	ut		
AC nominal voltage	110Vac/220Vac				
AC grid frequency	50/60;±5% Hz				
Parallel	Single Phase or N+1 parallel redundancy framework design for future expansion				
THDI	<3%				
Efficiency (full load)			89%		

Notes:

1, Installation materials needed for the solar systems depend on where & how will the equipments be mounted. Some extended materials will be prepared by the customers if needed.

2, Final Packing plan may change with different structure requirement, Provides data for reference only.

3, The Average Daily Energy production is based on specific prod 4.1kWh/kWp/ day.

4, Battery discharging capacity will be different in different situation, such as discharging current, temperature and many others. Provides data for reference only.



### 2. Main equipment

#### 2.1 Photovoltaic Modules

Our standard modules are designed, developed and manufactured for both residential and commercial, rooftop and ground-

mounted, as well as on-grid and off-grid photovoltaic projects. Quality of our products is the reason of CSUN's life. We select the best raw materials and conduct regular testing to ensure that they can meet our rigorous quality standards. Every module has been tested before delivery to make sure the efficiency tolerance is in a narrow range. Each link is strictly controlled to ensure the benefit of our customers.

#### Features

- ➢ 60 High-Efficiency Polycrystalline Solar Cells;
- Passing mechanical load test of 5400Pa according to IEC 61215(advanced test);
- > Tested to withstand hails with maximum diameter of 25mm with impact speed of 23m/s;

> The high-transparency low-iron tempered glass allows maximum light permeability while enhancing

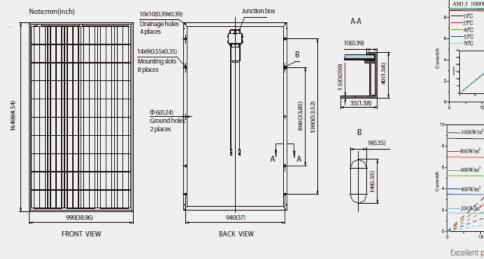
#### stiffness

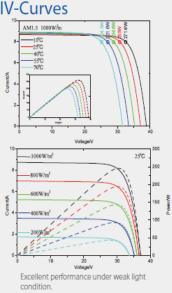
- and impact resistance;
- Integrated bypass diodes to protect the solar cell circuit from hot spots during partial shadowing;
- Our module technology avoids any problems of water freezing and warping;
- Black back sheet or black frame is also available.

Electrical characteristics at Standard Test Conditions(STC)		Temperature Characteristics		
Module type	CSUN 270-60P	Voltage Temperature Coefficient	0. 2 <b>92%/K</b>	
Pmpp[W]	270	Current Temperature Coefficient	+0.045%/K	
VocM	37.9	Power Temperature Coefficient	0408%/K	
Isc [A]	9.08	Mechanical Characteristics		
VmppM	30.7	Dimension With Weight Frame	1640x990x40mm(LxWxH)	
Impp[A]	8.8	Weight	19.1kg	
Module efficiency	16.63%	Cell	6xl0 pieces polycystic line solar cells series strings (156mmxl56mm)	
Junction Box	with 6bypass diode	Back Sheet	White roughened safety glass, 3.2mm	

Standard Test Conditions(STQ irradiance 1000W/ m' AM 15;cell temperature 25°C. Measuring uncertainty of power is within: 1:3%.

#### Dimensions





#### 2.2 MCU Central control unit

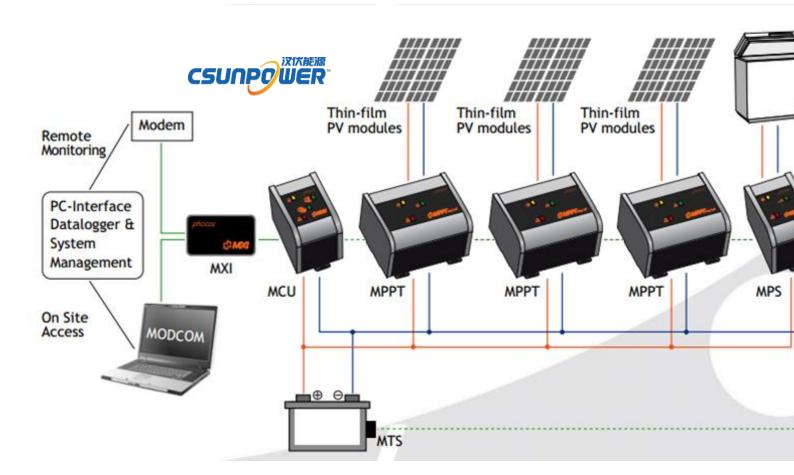
As the central control unit, MCU is a key component of Phocos' modular power management family. MCU offers a variety of functions such as priority load management based on user-adjustable voltage thresholds as well as control or alarm functions through an integrated relay control output. This intelligent control unit allows for the synchronization of up to sixteen Phocos power modules (MPPT/MPS) while providing complete system monitoring with integrated datalogging memory.

MCU's features open an endless spectrum of system design possibilities and combinations. Customizing your system electronics is as simple as choosing the appropriate Modular Power Management components for the application and assigning their responsibilities. This flexibility eliminates production lead times for customized electronics for standalone power supplies.



- Synchronizes up to 16 power modules (MPS/MPPT) (up to 8 MPM chargers, up to 8 MPM load switches, up to 4 MCS shunt interfaces)
- Excess energy management
- Up to five years data logging memory
- Relay control output
- Intelligent load management
- PC interface
- Advanced diversion control
- DIN rail mounting

Туре	MCU	
Nominal voltage	12/24/48 V	
Self consumption	< 20 mA	
Ambient temperature	–25 to +50 °C	
Dimensions (W xH x D)	90 x 150 x 112 mm	
Weight	380 g	
Type of protection	IP22	



#### 2.3 MPS Regulator

MPS is innovative new multi-functional power switching module for stand-alone power supplies. It can be configured to operate as a charge controller, load controller or diversion controller by simple toggling of DIP switch settings. A single MPS unit can control up to 80 A of current at 12, 24 or 48 V and switching can be set for pulse-width modulation or two-point series switching. When configured as a diversion controller, MPS can also control a diversion load for wind and micro-hydro turbine systems.

MPS offers integrated, adjustable low voltage disconnect as a load controller and sophisticated overcharge protection as a solar charge controller. The new flexible power electronics allow for positive or negative grounding.

The power switch is a fundamental unit within innovative Modular Power Management family. Multiple MPS units can be operated together with the help of MCU modular control unit. This allows multiple strings of solar inputs to be used to charge the same battery bank at an aggregate charge current of up to 640 A.

MPS is a cost-effective, simple, yet versatile power switch that is a valuable solution for stand-alone solar, wind, micro-hydro or hybrid power supplies.

Product Features:

- 12/24/48 V automatic recognition of voltage
- Low voltage disconnect (adjustable)
- Overcharge protection
- **4** Pulse-width modulation
- Two-point series switching
- Diversion control
- Excess energy management
- Flexible grounding
- DIN rail mounting

Туре	MPS 80 / 45		
Nominal voltage	12/24/48 V (auto recognition)		
Load current max.	80 A / A45		
	30 V in 12 V system		
Max. panel voltage	50 V in 24 V system		
	95 V in 48 V system		
Self consumption	< 10 mA		
Ambient temperature	-40 to +50 °C		
Dimensions (W xH x D)	108 x 150 x 112 mm		
Weight	1,100 g		
Type of protection	IP22		







system

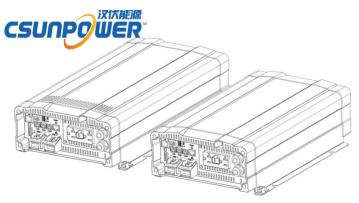
#### 2.4 Pure Sine Wave Inverter

SD-series is complete with N+1 parallel-able and stand–alone power inverter with AC transfer switch and is suitable for RV, Marine and Emergency appliances. Either mode is front panel programmable. In the first option, Off-line Mode, AC output power will be supplied through the AC Bypass Mode in its normal operation. Upon AC input failure, output power will be diverted through the DC to AC Inverter Mode. Once AC mains are restored, the unit will revert from the Inverter Mode to the Bypass Mode.

In the second option, On-line Mode, AC output power will be provided directly by the inverter from the DC source. Should the DC source or inverter fail, the system will transfer its output power through the Bypass Mode. Once the DC power source is restored, the system will revert to the Inverter Mode.

This power inverter series is a member of the most advanced line of mobile AC power systems available.

- N+1 parallel redundancy framework design for future expansion.
- Pure sine wave output (THD < 3%) to operate higherend electronic
- \rm Equipment.
- Unit of the selectable 4 Output frequency: 50 / 60Hz switch selectable
- Built in 16A or 30A rating transfer switch.
- Speed up transfer time (less 4ms. STS module) and synchronized operation with
- the AC source at all times that allows the transfer to be interruption-free for sensitive
- Equipment.
- Built in advance microprocessor to allow easy interface with user.
- Low power "Power Saving Mode " to conserve energy
- Capable of driving highly reactive & capacitive loads at start-up.
- Hardwire AC connection model option.
- Load-controlled cooling fan.
- Smart remote controller.
- LED indicators with tri-color display showing all operation statuses.
- High efficiency 85 ~ 92%.
- Protections:





Input over voltage and input low voltage protection.

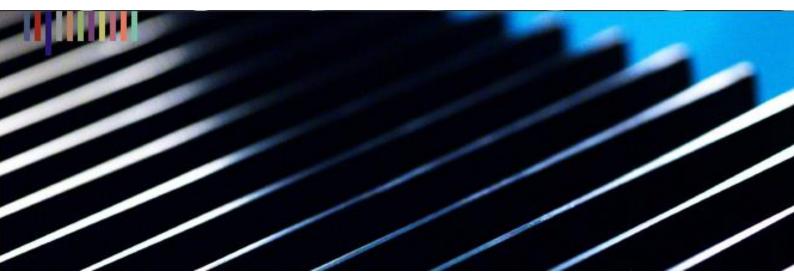
Low battery alarm

Over temperature protection.

Over load protection

- Short-circuit protection
- Reverse polarity protection.
- AC circuit breaker (16-30Amp)

Specification	Model No.			
Item	SP 3000	SP 2000		
Rating Power	3000W	2000W		
Over Rating Power (1Min.)	3450W	2300W		
Surge Power(1Sec.)	6000W	3000W		
Input Voltage	24/48VDC			
Output Voltage	100/110/115/120V± 5% 200 / 220 / 230 / 240V ± 3%			
Frequency (Switch Selectable)	50 / 60Hz ± 0.1%			
Output Waveform	Pure Sine Wave (THD < 3%)			
Efficiency (full load)	0.89			
No Load Current Draw	<1A@24VDC< 0.5A@48VDC			
Stand-By Current Draw	0.25A			
Input Voltage Regulation	21-33VDC/42-66 VDC			
Input Level Indicator Failure Indicator	Red / Orange / Green LED (standard) LCM Display (option)			
Protections	Overload, Short-Circuit, Reverse Polarity (Fuse), Over Temperature			
Protections	Over/Under Input Voltage, AC Input Circuit Breaker			
Remote Control Unit	CR16 A/ CR8 Optional			
Communication Port	CAN-BUS(RJ45), RS232 (RJ11 type connector)			
EMC	EN61000-3-2, EN61000-3-3			
Operating Temperature Range	-20℃ to 40℃			
Storage Temperature Range	-30℃ to 70℃			
Cooling	Load or temperature controlled cooling fan			



#### 2.5 CSUNPOWER Mounting Structure

One of the most important features of mounting system is the duration under different weather conditions. Structure must be solid and reliable, able to withstand atmospheric erosion, wind loads and other external effects, safe and reliable installation, with minimal installation achieve the maximum effect of the use, almost maintenance-free surface, and reliable maintenance, these are to do a program selection the important factor to consider. System-based solution makes the installation of that devices become commercially possible, in order to achieve the best result.

- Designed for crystalline module installation.
- · Anti-leakage design.
- · Water chute on the aluminum rail.
- · EPDM sealing rubber between modules, etc.
- · Easy Installation.
- · Aesthetical appeal.





Adoptable to all kinds of crystalline modules and certain thin film modules.

• Direct foundation bolt, concrete base or bear load are the possible solution for ground installation.

System installation inclination is adjustable according to requirement.

- Easy installation, only three kinds of tools could finish the installation.



· Easy & quick installation.

 Only 4~5 kinds of components and no more than three kinds of tools in whole system fixation.

All system components are made with high quality aluminum & stainless steel.







#### 2.6 Battery Bank

#### 2.6.1 Lead-acid

Based on strong scientific and technical strength. Four types of energy storage batteries have been developed in accordance with the application characteristics of solar energy, wind energy, hydropower energy storage and wind & solar hybrid project, and the four types of batteries meet the requirement of BSEN61427-2002 standard via testing and verification. Moreover, they have unique characteristics: Longer designed life (tubular plate battery: 20 years, flat plate battery: 15 years);

The daily or seasonal deep cycle and shallow cycle are excellent;

- Superior low current discharge performance
- Better high temperature performance
- Stronger constant power discharge capability
- Better charge acceptability
- Wider temperature range
- Better safety performance and reliability
- High Performance/price ratio and low yearly operating cost
- Eco-friendly, energy-saving
- Model selection characteristic:
  - Economical, procurement and maintenance cost are low;
  - Situation that cell battery voltage is 12V, capacity is below 200Ah;
  - Strong current in short time is relatively more excellent;
  - the floor area of installation is smaller;
  - Cycle performance is excellent;
  - Refer to the previous page for other characteristics;

Electrolyte: primary material adopts Germany gas silicon dioxide, and special technology is adopted; the material will be the thin colossal state when it's injected initially, and the material will be gel state in finished battery, accordingly, leakage and lamination are avoided.

Plate: both positive plate and negative plate adopt pasted plate, the distance is shorter, the strong current discharging capability is strong; the grid is composed of multi-component alloy whose hydrogen evolution potential is higher, the corrosion resistance is fine and service life is long; the utilization rate of active substance is high and charge receptivity is strong.

Battery case lid: made of ABS material, corrosion is prevented, strength is high and appearance is beautiful. The case lid is sealed by hot-melting, reliability is high and potential leakage risk can be prevented.

Separator: adopt special micro-pore PVC-SiO2 separator from Europe AMER-SIL Company, the porosity of separator is big and resistance is low. It has bigger electrolyte storage space.

Terminal sealing: the built-in copper core lead-base terminal post has stronger current carrying capacity and corrosion resistance. The unique double sealing structure of terminal post can effectively avoid leakage, to guarantee reliability of terminal post sealing.

Safety valve: adopt Germany technology, with constant opening and closing valve, high reliability, the accumulator case expansion, damage and electrolyte dry up can be avoided.





## 2.6.2 Li-ion Battery

Lithium battery is characterized by high specific energy, Discharge voltage stability, Wide operating temperature range, Low self discharge

rate,Long storage life,No memory effect and no pollution,Diversified products structure,Provide one-stop solutions for various applications,and have long life cycle,high density energy and high cost performance,High rate discharge superior performance,Low self discharge,no memory,Safe and eco-friendly.



# Specification: 48V 100Ah lithium ion battery pack

Nominal Voltage	48V		
Nominal Capacity	100Ah		
Charge cut-off voltage	58.4V		
Discharge cut-off voltage	40V		
Max charge current	1C		
Charge method	CV/CC		
Maximum continuous discharge current	2C		
Maximum impulse discharge current	3C		
Cycle life(0.2C/80%DOD)	≥1800 times		
Size	595*440*180mm or customized		
Weight of china manufacturers	58 kgs		
Charge temperature	0°C~45°C		
Discharge temperature	-20°C~60°C		



#### 2.7 PV Cables and Connectorss

We have designed 4mm2 solar cables to minimize losses in efficiency and ensure optimal operation even at high temperatures.

All cables from PV modules to inverter have been designed to minimize losses and ensure optimal operation even at high temperatures. These cables are extremely robust and resist high mechanical load and abrasion. High temperature resistance and excellent weather proofing characteristics provide a long service life.



- Multiple plugging and unplugging cycles.
- Highly robustness, UV-Resistance.
- > Connector adopts insertion of reed with inner-knob type.
- Auto-lock equipment for male and female points enables connection easier and reliable.
- > Popular appearance suit most of field installation.
- Simple on-site operation.
- Fit for PV cables with different insulation diameters.
- High current carrying capacity

PV Cable Technical data			MC4 Connectors Technical data		
Nominal Voltage	UO/U-600/1000AC.1800DC		Insulation material	PPO	
Test Voltage	6500V5min 50HZ		Color	Black	
Conductor DC Resistance	at 20°C≤0.795Ω/Km		Contact material	Copper tin plated	
Temp. rating	-40°C ~ +125°C		Rate voltage	DC 1500V(TUV)600V(UL)	
Max.Conductor Temp	+120°C		Rated current	30A	
Ambient Temp	.(-40°C ~ +90°C): > 25years		Safety class	class 2	
Bending radius	≥ 8* cable OD		Waterproof grade	IP 68	
Fire performance	IEC60332-1 TUV 3PFG 1169/08: 2007		Temperature range	-40 ~+90 Celsius degree	
UV Resistant	≥ 720h		Flame retardant grade	UL94-V0	
Content of halogen acid gas	IEC670754-1 EN50267-2-1		Pin dimensions	Φ4mm	
Smoke density IEC61034 EN50268-2			Test voltage	6kv(TUV50HZ 1min)	
			Contact resistance	0.4 mΩ	



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