

15KW HYBRID INVERTER PSHi15KW3#48VPV

USER MANUAL



WWW.POWERSOLID.VN

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1. Introduction

This hybrid PV inverter can provide power to connected loads by utilizing PV power, utility power and battery power.



Figure 1 Basic hybrid PV System Overview

Depending on different power situations, this hybrid inverter is designed to generate continuous power from PV solar modules (solar panels), battery, and the utility. When MPP input voltage of PV modules is within acceptable range (see specification for the details), this inverter is able to generate power to feed the grid (utility) and charge battery. This inverter is only compatible with PV module types of single crystalline and poly crystalline. Do not connect any PV array types other than these two types of PV modules to the inverter. Do not connect the positive or negative terminal of the solar panel to the ground. See Figure 1 for a simple diagram of a typical solar system with this hybrid inverter.

Note: By following the EEG standard, every inverter sold to German area is not allowed to charge battery from Utility. The relevant function is automatically disabled by the software.

2. Important Safety Warning

Before using the inverter, please read all instructions and cautionary markings on the unit and this manual. Store the manual where it can be accessed easily.

This manual is for qualified personnel. The tasks described in this manual may be performed by qualified personnel only.

General Precaution-

Conventions used:

WARNING! Warnings identify conditions or practices that could result in personal injury;

CAUTION! Caution identify conditions or practices that could result in damaged to the unit or other equipment connected.



WARNING! Before installing and using this inverter, read all instructions and cautionary markings on the inverter and all appropriate sections of this guide.



WARNING! Normally grounded conductors may be ungrounded and energized when a ground fault is indicated.



WARNING! This inverter is heavy. It should be lifted by at least two persons.



CAUTION! Authorized service personnel should reduce the risk of electrical shock by disconnecting AC, DC and battery power from the inverter before attempting any maintenance or cleaning or working on any circuits connected to the inverter. Turning off controls will not reduce this risk. Internal capacitors can remain charged for 5 minutes after disconnecting all sources of power.



CAUTION! Do not disassemble this inverter yourself. It contains no user-serviceable parts. Attempt to service this inverter yourself may cause a risk of electrical shock or fire and will void the warranty from the manufacturer.



CAUTION! To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that the wire is not undersized. Do not operate the Inverter with damaged or substandard wiring.



CAUTION! Under high temperature environment, the cover of this inverter could be hot enough to cause skin burns if accidentally touched. Ensure that this inverter is away from normal traffic areas.



CAUTION! Use only recommended accessories from installer. Otherwise, not-qualified tools may cause a risk of fire, electric shock, or injury to persons.



CAUTION! To reduce risk of fire hazard, do not cover or obstruct the cooling fan.



CAUTION! Do not operate the inverter if it has received a sharp blow, been dropped, or otherwise damaged in any way. If the inverter is damaged, please call for an RMA (Return Material Authorization).



CAUTION! AC breaker, DC switch and Battery circuit breaker are used as disconnect devices and these disconnect devices shall be easily accessible.

Before working on this circuit

Isolate inverter/Uninterruptible Power System (UPS)
 Then check for Hazardous Voltage between all

terminals including the protective earth.



Risk of Voltage Backfeed

Symbols used in Equipment Markings

	Refer to the operating instructions		
\wedge	Caution! Risk of danger		
A	Caution! Risk of electric shock		
\land	Caution! Risk of electric shock. Energy storage timed discharge for 5 minutes.		
	Caution! Hot surface		

3. Unpacking & Overview

3-1. Packing List

Before installation, please inspect the unit. Be sure that nothing inside the package is damaged. You should have received the following items inside of package:



Software CD

Manual USB cable

RS-232 cable



iai

3-2. Product Overview





- 1) LCD display panel
- 2) Operation buttons
- 3) AC Grid connectors
- 4) AC output connectors (Load connection)
- 5) PV connectors
- 6) DC Switch
- 7) Battery thermal sensor
- 8) EPO
- 9) Current sharing port

- 10) Relay control port
- 11) Dry contact
- 12) USB communication port
- 13) RS-232 communication port
- 14) Parallel communication port
- 15) Intelligent slot
- 16) Battery connectors
- 17) Connector for surge protective device (Reserve)

4. Installation

4-1. Selecting Mounting Location

Consider the following points before selecting where to install:

- Do not mount the inverter on flammable construction materials.
- Mount on a solid surface
- This inverter can make noises during operation which may be perceived as a nuisance in a living area.
- Install this inverter at eye level in order to allow the LCD display to be read at all times.
- For proper air circulation to dissipate heat, allow a clearance of approx. 20 cm to the side and approx. 50 cm above and below the unit.
- Dusty conditions on the unit may impair the performance of this inverter.
- The ambient temperature should be between 0°C and 40°C and relative humidity should be between 5% and 85% to ensure optimal operation.
- The recommended installation position is to be adhered to vertical.
- For proper operation of this inverter, please use appropriate cables for grid connection.
- The pollution degree of the inverter is PD2. Select an appropriate mounting location. Install the solar inverter in a protected area that is dry, free of excessive dust and has adequate air flow. Do NOT operate it where the temperature and humidity is beyond the specific limits. (Please check the specs for the limitations.)
- Installation position shall not prevent access to the disconnection means.
- This inverter is designed with IP20 for indoor applications only.
- Regularly clean the fan filter.

4-2. Mounting Unit

WARNING!! Remember that this inverter is heavy! Please be carefully when lifting out from the package.

Installation to the wall should be implemented with the proper screws. After that, the device should be bolted on securely.

The inverter only can be used in a CLOSED ELECTRICAL OPERATING AREA. Only service person can enter into this area.

WARNING!! FIRE HAZARD.

SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY.

 Drill six holes in the marked locations with supplied six screws. The reference tightening torque is 35 N.m.



 Fix the inverter in position by screwing the supplied two screws (M4*12) located on the top two sides of the inverter.



2. Raise the inverter and place it over the mounting plate.



4. Check if the inverter is firmly secured.



5. Grid (Utility) Connection

5-1. Preparation

NOTE: The overvoltage category of the AC input is III. It should be connected to the power distribution.

NOTE2: It's strongly recommended to install the external surge protection device at the grid input. The recommended parameters of the SPD is below:

Maximum Continuous Operating Voltage Uc (VAC)	275V~400V
Voltage protection Level Up (VAC) kV	≤1.0
Nominal Discharge Current In (8/20s) kA	20
Maximum Discharge Cuurent Imax (8/20s) kA	40
Response Time (ns)	<25

WARNING! It's very important for system safety and efficient operation to use appropriate cable for grid (utility) connection. To reduce risk of injury, please use the proper recommended cable size as below.

Suggested cable requirement for AC wire

Nominal Grid Voltage	230VAC per phase
Conductor cross-section (mm ²)	10-16
AWG no.	8-6

5-2. Connecting to the AC Utility

Overview of AC Connection Socket



Component	Description
А	Pressure dome
В	Clip
С	Sealing nut
D	Protective element
E	Socket element

Step 1: Check the grid voltage and frequency with an AC voltmeter. It should be the same to "VAC" value on the product label.

Step 2: Turn off the circuit breaker.

Step 3: Remove insulation sleeve 13 mm for five conductors.

Step 4: Thread the five cables through pressure dome (A), clip (B), sealing nut (C) and protective element (D) in sequence.



Step 5: Thread five cables through socket element (E) according to polarities indicated on it and tighten the screws to fix wires after connection.



The reference tightening torque is 1.5-2.5 N.m.

Step 6: Push protective dome (D) on to socket element (E) until both are locked tightly. Then, twist protective element (D) and pressure dome (A) so that all cables are firmly connected.



Step 7: Plug the AC connection socket into AC grid terminal of the inverter.



CAUTION: To prevent risk of electric shock, ensure the ground wire is properly earthed before operating this hybrid inverter no matter the grid is connected or not.

6. PV Module (DC) Connection

NOTE1: It's strongly recommended to install the external surge protection device (SPD) at the solar input. The recommended parameters of the SPD is below:

Maximum Continuous Operating Voltage Uc (VDC)	600V~1000V
Voltage protection Level Up (VDC) kV	≤2.0
Nominal Discharge Current In (8/20s) kA	20
Maximum Discharge Cuurent Imax (8/20s) kA	40
Response Time (ns)	<25

NOTE2: The overvoltage category of the PV input is II. Please follow below steps to implement PV module connection:

WARNING: Because this inverter is non-isolated, only three types of PV modules are acceptable: single crystalline and poly crystalline with class A-rated and CIGS modules. To avoid any malfunction, do not connect any PV modules with possibility of leakage current to the inverter. For example, grounded PV modules will cause leakage current to the inverter. When using CIGS modules, please be sure NOT grounding. **CAUTION:** It's requested to have PV junction box with surge protection. Otherwise, it will cause inverter damage when lightning occurs on PV modules.

Step 1: Check the input voltage of PV array modules. The acceptable input voltage of the inverter is 350VDC - 900VDC. Please make sure that the maximum current load of MPPT1 input connector is less than 37.2A; MPPT 2 input connector is 18.6A



CAUTION: Exceeding the maximum input voltage can destroy the unit!! Check the system before wire connection.

Step 2: Disconnect the circuit breaker and switch off the DC switch.

Step 3: Assemble provided PV connectors with PV modules by the following below steps.

Components for PV connectors and Tools:

Female connector housing	
Female terminal	
Male connector housing	
Male terminal	
Crimping tool and spanner	

Cable preparation and connector assembly process:

Strip one cable 8 mm on both end sides and be careful NOT to nick conductors.

Insert striped cable into female terminal and crimp female terminal as shown below charts.



Insert assembled cable into female connector housing as shown below charts.







Cable

₹ 8mm

L 30mm

Insert striped cable into male terminal and crimp male terminal as shown below charts.



Insert assembled cable into male connector housing as shown below charts.



∢→ 8mm



Then, use spanner to screw pressure dome tightly to female connector and male connector as shown below.



Step 4: Check correct polarity of connection cable from PV modules and PV input connectors. Then, connect positive pole (+) of connection cable to positive pole (+) of PV input connector. Connect negative pole (-) of connection cable to negative pole (-) of PV input connector.



WARNING! It's very important for system safety and efficient operation to use appropriate cable for PV module connection. To reduce risk of injury, please use the proper recommended cable size as below.

Conductor cross-section (mm ²)	AWG no.
6	10

CAUTION: Never directly touch terminals of the inverter. It will cause lethal electric

CAUTION: Do NOT touch the inverter to avoid electric shock. When PV modules are exposed to sunlight, it may generate DC voltage to the inverter.

Recommended Panel Configuration

Solar Panel	SOLAR INPUT 1	SOLAR INPUT 2	O'ty of	Total
Spec. (reference)	(Min in series: 11pcs; Max. in series: 18pcs)		panels	Input Power
- Vmp: 36.7Vdc	11pcs in series	х	11pcs	2750W
- Imp: 6.818A - Voc: 44Vdc	х	11pcs in series	11pcs	2750W
- Isc: 7.636A	11pcs in series	11pcs in series	22pcs	5500W
- 00113. 72	11pcs in series, 2 parallel	х	22pcs	5500W
	х	11pcs in series, 2 parallel	22pcs	5500W
	18pcs in series	18pcs in series	36pcs	9000W
	14pcs in series, 2 parallel	14pcs in series	42pcs	10500W
	18pcs in series, 2 parallel	18pcs in series	54pcs	13500W
	15pcs in series, 2 parallel	15pcs in series, 2 parallel	60pcs	15000W
	15pcs in series, 4 parallel	15pcs in series, 2 parallel	90pcs	22500W

7. Battery Connection

CAUTION: Before connecting to batteries, please install **separately** a DC circuit breaker between inverter and batteries.

NOTE1: Please only use sealed lead acid battery, vented and Gel battery. Please check maximum charging voltage and current when first using this inverter. If using Lithium iron or Nicd battery, please consult with installer for the details.

NOTE2: Please use 60VDC/300A circuit breaker.

NOTE3: The overvoltage category of the battery input is II.

Please follow below steps to implement battery connection:

Step 1: Check the nominal voltage of batteries. The nominal input voltage for inverter is 48VDC.

Step 2: Use two battery cables. Remove insulation sleeve 12 mm and insert conductor into cable ring terminal. Refer to right chart.

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Step 3: Remove battery cover and follow battery polarity guide

printed near the battery terminal! Place the external battery cable ring terminal over the battery terminal.

RED cable to the positive terminal (+); BLACK cable to the negative terminal (-).



WARNING! Wrong connections will damage the unit permanently.

Step 4: Make sure the wires are securely connected. The reference tightening torque is $5.5 \sim 7.0$ N.m.

WARNING! It's very important for system safety and efficient operation to use appropriate cable for battery connection. To reduce risk of injury, please use the proper recommended cable size as below.

Nominal Battery Voltage	48V
Conductor cross-section (mm ²)	182
AWG no.	2*1/0

8. Load (AC Output) Connection

8-1. Preparation

CAUTION: To prevent further supply to the load via the inverter during any mode of operation, an additional disconnection device should be placed on in the building wiring installation.

WARNING! It's very important for system safety and efficient operation to use appropriate cable for AC connection. To reduce risk of injury, please use the proper recommended cable size as below.

Nominal Grid Voltage	208/220/230/240 VAC per phase
Conductor cross-section (mm ²)	5.5-10
AWG no.	10-8

8-2. Connecting to the AC output

Overview of Load Connection Socket



Component	Description
А	Pressure dome
В	Clip
С	Sealing nut
D	Protective element
E	Socket element

Step 1: Remove insulation sleeve 8.5 mm for five conductors.

Step 2: Thread the five cables through pressure dome (A), clip (B), sealing nut (C) and protective element (D) in sequence.

Step 3: Thread five cables through socket element (E) according to polarities indicated on it and tighten the screws to fix wires after connection.





Step 4: Push protective dome (D) on to socket element (E) until both are locked tightly. Then, twist protective element (D) and pressure dome (A) so that all cables are firmly connected.



Step 5: Plug the socket into the terminal.



CAUTION: It's only allowed to connect load to "AC Output Connector". Do NOT connect the utility to "AC Output Connector".

CAUTION: Be sure to connect L terminal of load to L terminal of "AC Output Connector" and N terminal of load to N terminal of "AC Output Connector". The G terminal of "AC Output Connector" is connected to grounding of the load. Do NOT mis-connect.

9. Communication

The inverter is equipped with several communication ports and it is also equipped with a slot for alternative communication interfaces in order to communicate with a PC with corresponding software. This intelligent slot is suitable to install with SNMP card and Modbus card. Follow below procedure to connect communication wiring and install the software.



Please install monitoring software in your computer. Detailed information is listed in the next chapter. After software is installed, you may initial the monitoring software and extract data through communication port.

10. Dry Contact Signal

There is one dry contact available on the bottom panel. It could be used to remote control for external generator.

10-1. Electric Parameter

Parameter	Symbol	Max.	Unit
Relay DC voltage	Vdc	30	V
Relay DC current	Idc	1	А

Note: The application of the dry contact should not exceed the electric parameter shown as above. Otherwise, the internal relay will be damaged.

10-2. Function Description

Unit Status	Condition	Dry contact	port: NC C NO
		NO&C	NC&C
Power Off	Unit is off and no output is powered.	Open	Close
	Battery voltage is lower than setting battery cut-off discharging voltage when grid is available.	Close	Open
Dowor On	Battery voltage is lower than setting battery cut-off discharging voltage when grid is unavailable.	Close	Open
rower On	 Battery voltage is higher than below 2 setting values: 1. Battery re-discharging voltage when grid is available. 2. Battery re-discharging voltage when grid unavailable. 	Open	Close

You can set the related parameters in software. Refer to below chart:

Parameters setting					
Min. grid-corinected voltage:	184 📮 V	Apply	The waiting time before grid-connection:	6D 📮 Sec.	Apply
Max. grid-cori nected voltage:	284.5 🌻 V	Apply	Max. grid-connected sverage voltage:	253 📮 V	Apply
Min. grid-connected frequency:	47.48 📮 Hz	Apply	Max, feed-in grid power:	10,000 🚔 VV	Apply
Mak, grid-connected frequency:	51.5 🗧 Hz	Apply			
Min. PV input voltag	ie: 300 🌲	V Apply	Floating charging voltage:	54 🍣 V	Apply
Max, PV input voltag	e: 900 🚔	V Apply	Battery cut-off discharging voltage when Grid is available:	48 🐳 V	Apply
Min. MPP voltag	ie: 350	V Apply	Battery re-discharging voltage when Drid is available:	54 🐳 V	Apply
Max. MPP voltag	je: 850 📮	V Apply	Battery cut-off discharging voltage when Grid is unavailable:	42 🐳 V	Apply
Max. charging curre	nt 60-	A Apply	Battery re-discharging voltage when Grid is unavailable.	48 🍯 V	Apply
Max. AC charging curre	nt: 60	A Apply	Battery temperature compensation.	Vm 📑 0	Apply
Bulk charging voltage(C.V. voltag	e): 56 🍧	V Apply	Feeding grid power calibration.	0 🎒 VV	Apply
Start LCD screen-saver aft	er. None 💌	Sec. Apply	Max, battery discharge current in hybrid mode	10 🗧 A	Apply
Mute Buzzer ala	ırm: 🔿 Enabl	e 💿 Disable 🦲	Generator as AC source: 0 1	Enable 💿 Disable	Арруу
Mute the buzzer in the Standby mo	ode: 🔘 Enabl	e 💿 Disable <u>A</u> r	Activate LI-Fe battery while commissioning: 🔘 🕚	res 💿 No	Apply
Mute alarm in battery mo	ode: 🔘 Enabl	e 💿 Disable <u>A</u> p	Wide AC input range: 🔿 🛙	Enable 💿 Disable	Apply
When float charging current is less tha	n X (A) and coni	inued T (Min),then (charger off, when battery voltage is less than $Y\left(M\right)$ then charger of	n again.	
X: 0 📮 A	T: 60 🏺		1 53 📮 V Apply		
🥌 Any schedule chan	ge will affect the	power generated a	and shall be conservatively made.		
System time: 2014-10-27					
14:03:21	Арріу				
					Close

11. Relay Control Port

This port is available to provide a power source (230V/8A) to trigger external relay. This function is only valid for **Grid-tie with backup II** mode.

11-1. Interface Configuration

There are four pins on this port. However, only Pin 1 and Pin 4 are worktable. Please use supplied cables to connect Pin 1 and Pin 4 shown as below charts.





11-2. Function Description

12- Unit	Condition	Output voltage from
status	Condition	relay control port
Power Off	Unit is off and no output is powered.	0V
Power On	When the unit is working at inverter mode and grid is not available. Condition 1: A	230V



12-2. Application

Below chart is recommended circuit wiring.



12. Application with Energy Meter

With Modbus card II and energy meter, hybrid inverter can be easily integrated into the existing household system. For details please refer to Modbus card II manual.

Note: this application is only valid for Grid-Tie with Backup II mode.

Equipped with Modbus card II, hybrid inverter is connected to energy meter with RS485 communication port. It's to arrange self-consumption via Modbus card to control power generation and battery charging of the inverter.



13. Commissioning

Step 1: Check the following requirements before commissioning:

- Ensure the inverter is firmly secured
- Check if the open circuit DC voltage of PV module meets requirement (Refer to Section 6)
- Check if the open circuit utility voltage of the utility is at approximately same to the nominal expected value from local utility company.
- Check if connection of AC cable to grid (utility) is correct if the utility is required.
- Full connection to PV modules.
- AC circuit breaker (only applied when the utility is required), batter circuit breaker, and DC circuit breaker are installed correctly.

Step 2: Switch on the battery circuit breaker and then switch on PV DC breaker. After that, if there is utility connection, please switch on the AC circuit breaker. At this moment, the inverter is turned on already. However, there is no output generation for loads. Then:

- If LCD lights up to display the current inverter status, commissioning has been successfully. After pressing "ON" button for 1 second when the utility is detected, this inverter will start to supply power to the loads. If no utility exists, simply press "ON" button for 3 seconds. Then, this inverter will start to supply power to the loads.
- If a warning/fault indicator appears in LCD, an error has occurred to this inverter. Please inform your installer.

Step 3: Please insert CD into your computer and install monitoring software in your PC. Follow below steps to install software.

- 1. Follow the on-screen instructions to install the software.
- 2. When your computer restarts, the monitoring software will appear as shortcut icon located in the system tray, near the clock.

NOTE: If using 23odbus card as communication interface, please install bundled software. Check local dealer for the details.

14. Initial Setup

Before inverter operation, it's required to set up "Operation Mode" via software. Please strictly follow below steps to set up. For more details, please check software manual. **Step 1:** After turning on the inverter and installing the software, please click "Open Monitor" to enter main screen of this software.

Step 2: Log in into software first by entering default password "administrator".

Step 3: Select Device Control>>MyPower Management. It is to set up inverter operation mode and personalized interface. Refer to diagram below.



MyPower Management		
_orate with backup] [083719] [0837	🖞 Standard VCE0126 🗖 Nominal culput voltage 230 🗖 Nomi	nal bulplat trequence: 50 🗖 🔺
Beting		
One The with Backley di		
	PV and Orid PV power is not sufficient, PV and grid will charge bullery together	🛃 Maan ta sharge ballay 🗃 Maan AC ta sharge ballay
	PV-Ond Ballow 🗖 Priority 1 at PV -> 2nd: Grid -> 3rd; Ballow	Addeer to file-of-initial three Orid
	OndeBattery 💭 Phonty: 1st: Ond -> 2nd Battery	Allow balance to destinance of the first sector of the sector by Allow balance to the sector by the first sector by Allow balance to the sector by the first sector by
H Witten battery-rollage - Allow AC-charging duration AC-cusput DepOff Timer	01- V. the AC statis charge 0000E - 0000E 000E 000E 000E 000E 000E 000E 00E 00E 00E 00E 00E 00E 0E 0E <td></td>	
		193301 (1955)

Mode

There are three operation modes: Grid-tie with backup, Grid-Tie and Off-Grid.

- Grid-tie with backup: PV power can feed-in back to grid, provide power to the load and charge battery. There are four options available in this mode: Grid-tie with backup I, II, III and IV. In this mode, users can configure <u>PV power supply priority</u>, charging source priority and load supply source priority. However, when Grid-tie with backup IV option is selected in PV energy supply priority, the inverter is only operated between two working logics based on defined peak time and off-peak time of electricity. Only peak time and off-peak time of electricity usage.
- Grid-Tie: PV power only can feed-in back to grid.
- Off-Grid: PV power only provides power to the load and charge battery. No feed-in back to grid is allowed.

SECTION A:

Standard: It will list local grid standard. It's requested to have factory password to make any modifications. Please check local dealer only when this standard change is requested.

CAUTION: Wrong setting could cause the unit damage or not working.

ode		
Grid-De with backup) Orid-Te	🜒 Standard: VDE0126 🔽 Nominal output voltage: 230 📼	Nominal output frequency. 50
etting		
PV energy supply priority setting		
Grid-Tie with Backup ()		
Priority: 1st. Battery -= 2nd. Load -= 3rd. (
Configuration details	Lisan 🔊	
Charging source	PV and Grid Plasse enter factory password PV charging first, ICP Password	 Allow to charge battery Allow All bo charge battery
Load supply source (PV is available)	Pri-Ond-Battery Login Clear Priority 1st. PV -> 2n	Allow to feed in to the Ond Allow to deed in to the Ond Allow to the original statements of the charge when PV is analytical Allow to the of original statements of the analytical statements
Load supply source (PV is unavailable):	Ond-Bathery 🛛 🖡 Priority 1st Osid > 2nd Bathery	Recent adams to Seed in to the Onlywhen PV is available Recent balany to Need in to the Onlywhen PV is unavailable
🥅 When battery voltage «	45 V, the AC starts charging	
Allow AC-charging duration	00:00 🚆 - 04:00 🚆 00:00 - 00:00 Means AC charger operates all tr	
AC Output ON/Off Timer	00.05 / 00.00 00.00 means AC Oulput Imer function dis	sable
		Tassal 1998

Nominal Output Voltage: 230V.

Nominal Output Frequency: 50HZ.

SECTION B:

This section contents may be different based on different selected types of operations.

Allow AC charging duration: It's a period time to allow AC (grid) to charge battery. When the duration is set up as 0:00-00:00, it means no time limitation for AC to charge battery.

AC output ON/Off Timer: Set up on/off time for AC output of inverter. If setting it as 00:00/00:00, this function is disabled.

Allow to charge battery: This option is automatically determined by setting in "Charging source". It's not allowed to modify here. When "NONE" is selected in charging source section, this option becomes unchecked as grey text. Allow AC to charge battery: This option is automatically determined by setting in "Charging source". It's not allowed to modify here. When "Grid and PV" or "Grid or PV" is selected in charging source section, this option is default selected. Under Grid-tie mode, this option is invalid. Allow to feed-in to the Grid: This option is only valid under Grid-tie and Grid-tie with backup modes. Users can decide if this inverter can feed-in to the grid.

Allow battery to discharge when PV is available: This option is automatically determined by setting in "Load supply source (PV is available)". When "Battery" is higher priority than "Grid" in Load supply source (PV is available), this option is default selected. Under Grid-tie, this option is invalid.

Allow battery to discharge when PV is unavailable: This option is automatically determined by setting in "Load supply source (PV is unavailable)". When "Battery" is higher priority than "Grid" in Load supply source (PV is unavailable), this option is default selected. Under Grid-tie mode, this option is invalid.

Allow battery to feed-in to the Grid when PV is available: This option is only valid in Grid-tie with backup II or Grid-tie with backup III modes.

Allow battery to feed-in to the Grid when PV is unavailable: This option is only valid in all options of Grid-tie with backup mode.

Grid-tie with backup

• Grid-tie with backup (I) :

ode Orio-be with backup 000000000000000000000000000000000000	Standard VOE0128 Normal subpid voltage 230 🔽 Norm	inal output trequency 50 🔽
etting		
PV energy supply priority setting		
Grid-Tie with Backup ()		
Priority 1st Battery -> 2nd Load -> 3rd (
Configuration details		
	PV and Grid PV charging first. If PV power is not sufficient, PV and grid will charge ballery together	 Allow to charge softery Allow All to charge fullery
Load supply source (PV is available):	PV-Grid-Stattery Priority: 1st PV -+ 2nd, Grid 3rd, Battery	Allow to feed as to the Orid
	Ond-Battery	Allow battery to discharge when Princ ordenatable Allow battery to feed in to the God when PV is unavailable Allow battery to feed in to the God when PV is unavailable
Mhen battery voltage +	AD V. the AC starts charging	
Allow AC-charging duration :	00 00 💭 - 04 00 💭 00 00 - 00 00 Mesns AC charger operates all-time	
	00:00 0 / 00:00 00:00 / 00:00 means AC Output trees function disable	
		7402471 (762)

PV energy supply priority setting: 1st Battery, 2nd Load and 3rd Grid.

PV power will charge battery first, then provide power to the load. If there is any remaining power left, it will feed-in to the grid.

Battery charging source:

1. PV and Grid (Default)

It's allowed to charge battery from PV power first. If it's not sufficient, grid will charge battery.

2. PV only

It is only allow PV power to charge battery.

3. None

It is not allowed to charge battery no matter it's from PV power or grid.

Load supply source:

When PV power is available: 1st PV, 2nd Grid, 3rd Battery

If battery is not fully charged, PV power will charge battery first. And remaining PV power will provide power to the load. If it's not sufficient, grid will provide power to the load. If grid is not available at the same time, battery power will back up.

When PV power is not available:

1. 1st Grid, 2nd Battery (Default)

Grid will provide power to the load at first. If grid is not available, battery power will provide power backup.

2. 1st Battery, 2nd Grid

Battery power will provide power to the load at first. If battery power is running out, grid will back up the load.

NOTE: This option will become ineffective during AC charging time and the priority will automatically become 1st Grid and 2nd Battery order. Otherwise, it will cause battery damage.

👩 standard VDE0126 🕅 Normenal output voltage 230 🕅 No	minal output frequency 50 🔜
PV and Grid	🛃 Allow to Marge Nation
\ensuremath{PV} charging first. If \ensuremath{PV} power is not sufficient, \ensuremath{PV} and grid will charge balanty together	🜌 Allow NC to charge bottery .
PV-Battery Grid	Allow to feed-as to the Grid
Priority 1st PV-+ 2nd Battery-+ 3rd Grid	Allow tuffing to the harge where PV to available.
Battery-Orid	 Allow ballies to food in the flag both system (P/16) available
Priority 1st Battery-+ 2nd Grid	Allow battery to feed in to the Ond when PV is unavailab
This option is ineffective during of AC charging	
10 V, the AC starts charging	
00:00 - 04:00 00:00 - 00:00 Means AC charper operates all time	
	Standard VOE0128 Norrował oudput votagu 220 N No Norrował oudput votagu 220 N

Grid-tie with backup (II) :

PV energy supply priority setting: 1st Load, 2nd Battery and 3rd Grid.

PV power will provide power to the load first. Then, it will charge battery. If there is any remaining power left, it will feed-in to the grid.

Battery charging source:

1. PV and Grid

It's allowed to charge battery from PV power first. If it's not sufficient, grid will charge battery.

2. PV only

It is only allow PV power to charge battery.

3. None

It is not allowed to charge battery no matter it's PV power or grid.

Load supply source:

When PV power is available:

1. 1st PV, 2nd Battery, 3rd Grid

PV power will provide power to the load first. If it's not sufficient, battery power will provide power to the load. When battery power is running out or not available, grid will back up the load.

2. 1st PV, 2nd Grid, 3rd Battery

PV power will provide power to the load first. If it's not sufficient, grid will provide power to the load. If grid is not available at the same time, battery power will back up.

When PV power is not available:

1. 1st Grid, 2nd Battery: Grid will provide power to the load at first. If grid is not available, battery power will provide power backup.

2. 1st Battery, 2nd Grid: Battery power will provide power to the load at first. If battery power is running out, grid will back up the load

NOTE: This option will become ineffective during AC charging time and the priority will automatically become 1st Grid and 2nd Battery order. Otherwise, it will cause battery damage.

Power Management		
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Orid-te with backup Orid-Te Ori-Ori	🛃 Standurd VOE0128 🗺 Norminal output votage 230 🔜 No	sminal output frequency 50 💌
Grid-Tie with Backup (II)	•	
Priority 1st Load -+ 2nd Grid -+ 3rd Bat		
Configuration details		
	PV and Urid	🛃 Allow to Allerge Hattery
	\ensuremath{PV} charging first, if \ensuremath{PV} power is not sufficient, \ensuremath{PV} and grid will charge ballety together	🛃 Allow HC to charge ballery
	PV Battery Grid	Allow to feed-in to the Crid
	Priority 1st FV -+ 2nd Badlery -+ 3nd Grid	 Artise subary to inscribing when the planatox Artise subary to inscribing when PV is unavailable
	Battery Grid	Allow ballery to food in to the Grid when PV is available
	Priority 1st Battery -> 2nd Gnd	🥅 Allow battery to feed in to the Ond when PV is unavailabl
**************************************	The option is interestive during of ALL shanging	
When battery voltage +	V, the AC starts charging	
	00:00 - 04:08 00:00 - 00:00 Means AG charger operates all time	
	00 00 1 00 00 00 00 00 00 means AC Output timer function disab	
		June Con

PV energy supply priority setting: 1st Load, 2nd Grid and 3rd Battery

PV power will provide power to the load first. If there is more PV power available, it will feed-in to the grid. If feed-in power reaches max. feed-in power setting, the remaining power will charge battery.

NOTE: The max. feed-in grid power setting is available in parameter setting. Please refer to software manual.

Battery charging source:

1. PV and Grid: It's allowed to charge battery from PV power first. If it's not sufficient, grid will charge battery.

- 2. PV only: It is only allow PV power to charge battery.
- 3. None: It is not allowed to charge battery no matter it's PV power or grid. Load supply source:

When PV power is available:

1. 1st PV, 2nd Battery, 3rd Grid

PV power will provide power to the load first. If it's not sufficient, battery power will provide power to the load. When battery power is running out or not available, grid will back up the load.

2. 1st PV, 2nd Grid, 3rd Battery

PV power will provide power to the load first. If it's not sufficient, grid will provide power to the load. If grid is not available at the same time, battery power will back up.

When PV power is not available:

1. 1st Grid, 2nd Battery: Grid will provide power to the load at first. If grid is not available, battery power will provide power backup.

2. 1st Battery, 2nd Grid: Battery power will provide power to the load at first. If

battery power is running out, grid will back up the load.

NOTE: This option will become ineffective during AC charging time and the priority will automatically become 1st Grid and 2nd Battery order. Otherwise, it will cause battery damage.

• Grid-tie with backup (IV): Users are only allowed to set up peak time and offpeak electricity demand.

Moge Cold-be write backweg Cold-Draw Hit backweg Pri divelagie supply priority celling Cold-Draw Hit backweg/V) Pri arak tereur - Priority 1 et Load - 2 Prid. Ballery Of Paak Inter- Priority 1 et Load - 2 Prid. Ballery Of Paak Inter- Priority 1 et Ballery - 2 Prid. Ballery	Standard VDB0126 🌄 No Yo- Ing Desa- ad > Ing Desa-	ninal ordend voltage – 338 🗖 – I	Hominal output frequency - 50 - 🎫
Cond-Server Eastrage): (Selected) Setting PV energy cupply protonly cathing (Ord-Tie with Backupply) Para time - Phone, 141, Load - 2 md, Baller of Parak time - Phone, 141, Ballery - 2 nd, Load	Standard VDE0126 🗖 No Y-+ 3nt Gels+ ad -> 3nt Gels+	ninai sukput votage 🛛 238 🗖 I	Herminal extend Requeries: 50 🔤 🌄
Setting PV sheings supply polonity setting <u>Ond-The with Batsuptyy</u> Peak time + Privothy 1st Load -> Ind Batery Off Peak time, +Privothy 1st Battery -> 2nd Loa	y-= Trit Grad+ ad -> Brit Grad+		
PV energy supply priority setting One-Tie with Diskup(V) Reak time - Priority 1 st Load -+ 2nd, Battery Off-Peak time - Priority 1 st Battery 2nd Loa	y-> Jng Geds ad-> Jng Geds		
Grid-Tie with Backup(V) Pleak time « Priority 1st Load -» 2nd Battery Cff-Peak time « Priority 1st Battery -» 2nd Loa	y-+ 3ra: Ged+ ad -> 3rd: Ged+		
Peak time < Priority 1st Load -> Ind Battery Of-Peak time: <priority -="" 1st="" battery=""> 2nd Loa</priority>	y++ 3rd, Grid+ ad +> 3rd, Grid+		
Configuration details			
Charging source Pea			Allow to Clarge Suffery
Pea	ak time «PV power charge battery»		🛃 Allow AC to (Marge bation
0# f	Peak time <pv and="" battery="" charge="" grid=""></pv>		Allow to feed in to the Grid
Load supply source (PV is available) Peo	ol/Off Peak Grid Electricity Demand	Nor Courte	and the factor is described with the second se
OF I	Peak time =Priority: 1st PV-= 2nd. Grid -=	Jrd. Balleryn	Adout battom to feed ando the Circl when Philip available
			. Alizer ballers to feed to fe the Orid when Pit're unavailable
	Peak time «Priority: 1st. Battery -> 2nd. Ond		
061			
Minen ballery voltage <	V, the AC starts charging		
	00.00 - 04.00 - 00.00 - 00		
	00 00 🗮 / 👘 00 00 🗮 00 00 / 00 00		
			Anotel Class

Working logic under peak time:

PV energy supply priority: 1st Load, 2nd Battery and 3rd Grid

PV power will provide power to the load first. If PV power is sufficient, it will charge battery next. If there is remaining PV power left, it will feed-in to the grid. Feed-in to the grid is default disabled.

Battery charging source: PV only

Only after PV power fully supports the load, the remaining PV power is allowed to charge battery during peak time.

Load supply source: 1st PV, 2nd Battery, 3rd Grid

PV power will provide power to the load first. If PV power is not sufficient, battery power will back up the load. If battery power is not available, grid will provide the load. When PV power is not available, battery power will supply the load first. If battery power is running out, grid will back up the load.

Working logic under off-peak time:

PV energy supply priority: 1st Battery, 2nd Load and 3rd Grid

PV power will charge battery first. If PV power is sufficient, it will provide power to the loads. The remaining PV power will feed to the grid.

NOTE: The max. feed-in grid power setting is available in parameter setting. Please refer to software manual.

Battery charging source: PV and grid charge battery

PV power will charge battery first during off-peak time. If it's not sufficient, grid will charge battery.

Load supply source: 1st PV, 2nd Grid, 3rd Battery

When battery is fully charged, remaining PV power will provide power to the load first. If PV power is not sufficient, grid will back up the load. If grid power is not available, battery power will provide power to the load.

Grid-Tie

Under this operation mode, PV power only feeds-in to the grid. No priority setting is available.

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ng PV enstry septivoredy setting Cell Gely Load septivoredy setting Load septivored (* is available) No. Load septivored (* is available) No. Load septivored (* is available) No. Load septivored (* is available) No. Load setting (* is available) Load Setting (* is avai	ninestitacije (nastie) store	Blandard VDE0176	🗖 Nominal output voltage: 2311 🗖 Nor	minal output thoquency 50 🗖
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Auger				Apply CI

Off-Grid

•

Off-Grid (I): Default setting for off-grid mode.

McPower Management		
Node The server sector	g] Standard <mark>Sciences -</mark> Normal output voltage 230 💌 Norm	nal output frequency . 60 🗖
Off-Grid () Priority: 1 6t, Load -> 2nd: Battery Orid relay is connected in inverter mode		
Configuration details		
	PV or Ond PV will charge bullery first. If PV power is fouls, grid will charge bullery	 Altere is charge autory Altere AC to charge bendry
Load supply source (PV is available):	PV Battery Ond 💭 💭	 More to feed in to the dom Aney helder to doe barge when SV is realizable
	Balamy-Gnd 💭 Prionity 1at Baltery -> Ziva Gnd This uption is instlective during of AC charging	Norw party a constraint many of a many and an
Mhen battery voltage <	49 V, the AC starts charging	
	00.00 - 04.00 - 00.00 - 00.00 Means AC charger operates all time	
	00:00 1 00:00 00 00:00 00:00 00 means AC Output Smer function disable	

PV energy supply priority setting: 1st Load, 2nd Battery

PV power will provide power to the load first and then charge battery. Feed-in to the grid is not allowed under this mode. At the same time, the grid relay is connected in Inverter mode. Besides, it will avoid overload fault because grid can supply load when connected load is over 15KW.

Battery charging source:

- 1. PV or Grid: If there is remaining PV power after supporting the loads, it will charge battery first. Only until PV power is not available, grid will charge battery. (Default)
- 2. PV only: It is only allow PV power to charge battery.
- 3. None: It is not allowed to charge battery no matter it's PV power or grid.

Load supply source:

When PV power is available:

1. 1st PV, 2nd Battery, 3rd Grid (Default)

PV power will provide power to the load first. If it's not sufficient, battery power will provide power to the load. When battery power is running out or not available, grid will back up the load.

2. 1st PV, 2nd Grid, 3rd Battery

PV power will provide power to the load first. If it's not sufficient, grid will provide power to the load. If grid is not available at the same time, battery power will back up.

When PV power is not available:

1. 1st Grid, 2nd Battery

Grid will provide power to the load at first. If grid is not available, battery power will provide power backup.

2. 1st Battery, 2nd Grid (Default)

Battery power will provide power to the load at first. If battery power is running out, grid will back up the load.

NOTE: This option will become ineffective during AC charging time and the priority will automatically become 1st Grid and 2nd Battery order. Otherwise, it will cause battery damage.

•	Off-Grid	(II)
		· ·

MPower Management		
ode Grane with receip) Gristing (cs.or	a) Standard 🚾 Nominal output vottage: 230 🔽 Nomi	natoutput Requency. Si 🔽
PV energy supply priority setting		
Off-Orid (0)	-	
Priority: 1st: Battery -+ 2nd. Load Grid relay is connected in inverter mode		
Charging source.	PV or Onld 🗖	Million to charge battery
	PV will charge battery first. If PV power is loss, grid will charge battery	🔀 Allow AC to churge outlany
Load supply source (PV is available).	PV-Ond-Battery	Allow to feed, in to the Onli
	Priority 1 at PV - + 2nd: Orid -+ 3rd: Battery	Allow batters to discharge when PV is an advantable
Load supply source $\partial^{\rm e} V$ is unavailable):	Orid-Dadlery	Allow ballers to feed-in to the Orid when PV is evaluable
	Priority 1st Crid -> 2nd Battery	Allow battery to fixed in to the Ond when Strict unavail
🥅 Witten battery voltage <		
Allow AC-charging duration	00:00 - 04:00 00:00 - 00:00 Means AC charger operates al-Sme	
AC Output ON/Off Timer:	00:00 / 00:00 00:00 00:00:00 means AC Output timer function disable	
		Acceved Tech

PV energy supply priority setting: 1st Battery, 2nd Load

PV power will charge battery first. After battery is fully charged, if there is remaining PV power left, it will provide power to the load. Feed-in to the grid is not allowed under this mode. At the same time, the grid relay is connected in Inverter mode. Besides, it will avoid overload fault because grid can supply load when connected load is over 15KW.

Battery charging source:

1. PV or Grid: If there is remaining PV power after supporting the loads, it will charge battery first. Only until PV power is not available, grid will charge battery.

- 2. PV only: It is only allow PV power to charge battery.
- 3. None: It is not allowed to charge battery no matter it's PV power or grid.

NOTE: It's allowed to set up AC charging duration.

Load supply source:

When PV power is available: 1st PV, 2nd Grid, 3rd Battery

PV power will provide power to the load first. If it's not sufficient, grid will provide power to the load. If grid is not available at the same time, battery power will back up.

When PV power is not available:

1. 1st Grid, 2nd Battery: Grid will provide power to the load at first. If grid is not available, battery power will provide power backup.

2. 1st Battery, 2nd Grid: Battery power will provide power to the load at first. If battery power is running out, grid will back up the load.

NOTE: This option will become ineffective during AC charging time and the priority will automatically become 1st Grid and 2nd Battery order. Otherwise, it will cause battery damage.

Power Management			
Grid-Tie with backup (Grid-Tie) On Gr	g) Standard: VIE0126 💌 Nor	ninal oldplit voltage: 220 💌	Nominal output frequency 50 🔽
eding			
Off-Ond (III)			
Phoney 1st Load -+ 2nd Ballery			
Grid relay is disconnected in inverter mo			
			🖌 Allow to charge ballary
			🛃 Allow Albo charge body rv
Load supply source (PV is available).	PV-Battery-Orid		Allow to tread in to the Grid
	Priority 1st PV-> 2nd Battery-> 3rd Orid		🗹 Alber ballen is die statige eiten 🖓 is ereiligde
			Annual Ballion to Marker to Marker by the Cost and the second
	Priority 1st Grid -+ 2nd Ballery		Refere Cattery to funds in to the Orid when PST is unavaily
When ballers willing a	V. The AC starts charmen		
Anter As-criatiging duration		oo maana waxaa gala gaarahoo aha	
AU Output ONPOR Timer.	100:00 - 00:00 - 00:00 - 00:00 - 00:00	u means AC output timer function d	Sacie
			Apply) C

PV energy supply priority setting: 1st Load, 2nd Battery

PV power will provide power to load first and then charge battery. Feed-in to the grid is not allowed under this mode. The grid relay is NOT connected in Inverter mode. If connected load is over 15KW and grid is available, this inverter will allow grid to provide power to the loads and PV power to charge battery. Otherwise, this inverter will activate fault protection.

Battery charging source:

1. PV or Grid: If there is remaining PV power after supporting the loads, it will charge battery first. Only until PV power is not available, grid will charge battery.

- 2. PV only: It is only allow PV power to charge battery.
- 3. None: It is not allowed to charge battery no matter it's PV power or grid. **NOTE:** It's allowed to set up AC charging duration.

Load supply source:

When PV power is available: 1st PV, 2nd Battery, 3rd Grid

PV power will provide power to the load first. If it's not sufficient, battery power will back up the load. Only after battery power is running, Grid will back up the load. When PV power is not available:

1. 1st Grid, 2nd Battery: Grid will provide power to the load at first. If grid is not available, battery power will provide power backup.

2. 1st Battery, 2nd Grid: Battery power will provide power to the load at first. If battery power is running out, grid will back up the load.

NOTE: This option will become ineffective during AC charging time and the priority will automatically become 1st Grid and 2nd Battery order. Otherwise, it will cause battery damage.

15. Operation

15-1. Interface

This display is operated by four buttons.



NOTICE: To accurately monitor and calculate the energy generation, please calibrate the timer of this unit via software every one month. For the detailed calibration, please check the user manual of bundled software.

15-2. LCD Information Define



Display	Function
	Indicates AC input voltage or frequency.
L2N 8.8.8 Vac L3N 8.8.8 Hz	Vac: voltage, Hz: frequency, L1N/L2N/L3N: Line phase
AC OUTPUT L1N 8.8.8 KWA L2N 8.8.8 Vac L3N 8.8.8 WHz	Indicates AC output power, voltage, frequency, or load percentage. KVA: apparent power, KW: active power, Vac: Voltage, %: Load percentage, Hz: frequency, L1N/L2N/L3N: AC output phase
PV INPUT P1 P2 8.8.8 Vot	Indicates PV input voltage or power. Volt: voltage, KW: power, P1: PV input 1, P2: PV input 2
	Indicates battery voltage or percentage. Volt: voltage, %: percentage

CHARGING DISCHARGE	Indicates charging current to battery or discharging current from battery.
\wedge	Indicates that the warning occurs.
ERROR	Indicates that the fault occurs.
<u>(</u> #.#)	Indicates fault code or warning code.
DATA RECORD FROM 88+88+88 DATE : YY - MM - DD TIME : HH : MM : SS	Indicates date and time, or the date and time users set for querying energy generation.
	Indicates solar panels. Icon flashing indicates PV input voltage or is out of range.
UTILITY	Indicates utility. Icon flashing indicates utility voltage or frequency is out of range.
	Indicates battery condition. And the lattice of the icon indicates battery capacity.
0 BATTERY	Icon flashing indicates battery is not allowed to discharge.
	Icon $oldsymbol{I}$ flashing indicates the battery voltage is too low.
	Indicates AC output for loads is enabled and inverter is providing power to the connected loads.
	Indicates AC output for loads is enabled but there is no power provided from inverter. At this time, no battery and the utility are available. Only PV power exists but is not able to provide power to the connected loads.
OVERLOAD	Indicates overload.
TOTAL	Indicates PV energy generated.
EC - DN	Indicates inverter is connecting with Energy meter.

15-3. Button Definition

Button	Operation	Function
		Enter query menu.
	Short press.	If it's in query menu, press this button
		to confirm selection or entry.
ENTER/ON	Press and hold the button	This inverter is able to provide power
ENTERVON	for approximately 1 second	to connected loads via AC output
	when the utility is detected	connector.
	or 3 seconds without the	
	utility.	
	Short press.	Return to previous menu.
ESC/OFF	Press and hold the button	
ESC/OIT	until the buzzer	Turn off power to the loads.
	continuously sounds.	
Up	Short press.	Select last selection or increase value.
Down	Short press.	If it's in query menu, press this button
		to jump to next selection or decrease
		value.
		Mute alarm in standby mode or battery
		mode.

NOTE: If backlight shuts off, you may activate it by pressing any button. When an error occurs, the buzzer will continuously sound. You may press any button to mute it.

15-4. Query Menu Operation

The display shows current contents that have been set. The displayed contents can be changed in query menu via button operation. Press 'Enter' button to enter query menu. There are seven query selections:

- Input voltage or frequency of AC input.
- Frequency, voltage, power or load percentage of AC output.
- Input voltage or power of PV input.
- Battery voltage or capability percentage.
- Date and time.
- Today or total energy generated.

Setting Display Procedure

Input voltage or frequency of AC input



Frequency, voltage, power or percentage of AC output



Input voltage or power of PV input.



Battery voltage or percentage.



Date and time.



Today or total energy generated.



15-5. Operation Mode & Display

Below is only contained LCD display for **grid-tie with backup mode (I)**. If you need to know other operation mode with LCD display, please check with installer.

Inverter mode with grid connected

This inverter is connected to grid and working with DC/INV operation.

LCD Display	Description
	PV power is sufficient to charge battery, provide power to loads, and then feed in to the grid.
$P1 \longrightarrow I \longrightarrow $	PV power is sufficient to charge the battery first. However, remaining PV power is not sufficient to back up the load. Therefore, remaining PV power and the utility are supplying power to the connected load.

$P_{1} \longrightarrow P_{2} \longrightarrow P_{2$	PV power is generated, but not sufficient enough to charge battery by itself. PV power and the utility are charging battery at the same time. And the utility is also supplying power to the connected load.
P^{1}	This inverter is disabled to generate power to the loads via AC output. PV power is sufficient to charge battery first. Remaining PV power will feed in back to grid.
$P1 \longrightarrow I \longrightarrow $	This inverter is disabled to generate power to the loads via AC output. PV power and utility are charging battery at the same time because of insufficient PV power.
	This inverter is disabled to generate power to the loads via AC output. PV power is feeding power back to the grid.



Bypass mode

The inverter is working without DC/INV operation and connecting to the loads.

LCD Display	Description
	Only utility is charging battery and providing power to connected loads.
	Only utility is available to provide power to connected loads.

Standby mode :

The inverter is working without DC/INV operation and load connected.

LCD Display	Description
$P1 \longrightarrow I \longrightarrow $	This inverter is disabled on AC output or even AC power output is enabled, but an error occurs on AC output. Only PV power is sufficient to charge battery.
	This inverter is disabled to generate power to the loads via AC output. PV power is not detected or available at this moment. Only utility is available to charge battery.
P1	If PV, battery or utility icons are flashing, it means they are not within acceptable working range. If they are not displayed, it means they are not detected.

16. Charging Management

Charging Parameter	Default Value	Note
Charging current	60A	It can be adjusted via software from 10Amp to 200Amp.
Floating charging voltage (default)	54.0 Vdc	It can be adjusted via software from 50Vac to 60Vdc.
Max. absorption charging voltage (default)	56.0 Vdc	It can be adjusted via software from 50Vac to 60Vdc.
Battery overcharge protection	62.0 Vdc	
Charging process based on default setting. 3 stages: First – max. charging voltage increases to 56V; Second- charging voltage will maintain at 56V until charging current is down to 12 Amp; Third- go to floating charging at 54V.	U Bulk Voltage	Bulk Absorption Floating time

This inverter can connect to battery types of sealed lead acid battery, vented battery, gel battery and lithium battery. The detail installation and maintenance explanations of the external battery pack are provided in the manufacturer's external battery pack of manual.

If using sealed lead acid battery, please set up the max. charging current according to below formula:

The maximum charging current = Battery capacity (Ah) $\times 0.2$

For example, if you are using 300 Ah battery, then, maximum charging current is $300 \times 0.2=60$ (A). Please use at least 50Ah battery because the settable minimum value of charging current is 10A. If using AGM/Gel or other types of battery, please consult with installer for the details.

Below is setting screen from software:

Paran	neters setting	_	_	×
	Min. grid-connected voltage:	184 📮 V	Apply	The waiting time before grid-connection: 60 🚔 Sec. Apply
	Max. grid-connected voltage:	264.5 📮 V	Apply	Max. grid-connected everage voltage: 253 🚆 V 🛛 Apply
	Min. grid-connected frequency:	47.48 🗧 Hz	Apply	Max, feed-in grid power: 10,000 🚆 VY 🛛 🗛 piv
	Mak, grid-connected frequency:	51.5 📮 Hz	Apply	
	Min. PV input voltag	ie: 300 🚔	V Apply	Floating charging voltage: 54 💭 V Apply
	Max PV input voltag	e: 900	V Apply	Battery cut: off discharging voitage when Grid is available: 48 🚔 V 🛛 🗛 ply
	Min. MPP voltag	ie: 350	V Apply	Battery re-discharging voltage when Orid is available: 54 🚆 V 🗛 🗛 🖓
	Max. MPP voltag	je: 850	V Apply	Battary cut-off discharging voltage when Grid is unavailable: 42 🚆 V 🗛 ply
	Max. charging curre	nt 80	A Apply	Battery re-discharging voltage when Grid is unavailable 48 🚔 V Apply
	Max AC charging curren	nt 80	A Apply	Battery temperature compensation: 0 🚍 mV [Apply
	Bulk charging voltage(C.V. voltage	e): 58 🚔	V Apply	Feeding grid power calibration: 0 📮 VV 🛛 Apply
	Start LCD screen-saver aft	er: None 📼	Sec. Apply	Max, battery discharge current in hybrid mode 10 🚆 A Apply
	Mute Buzzer als	ırm: 🔿 Enable	• Disable	ApaM Generatorae AC source: O Exable O Disable ApaM
	Mute the buzzer in the Standby mo	ode: 🔘 Enable	💿 Disable	Appay Activate Li-Fe battery while commissioning: O Yes O No Appay
	Mute alarm in battery mo	ode: 🔘 Enable	💿 Disable 🛛	Apply Vilde AC input range: O Enable O Disable Apply
	en float charging current is less tha	in X (A) and contin	nued T (Min), the	en charger off, when battery voltage is less than Y (V),then charger on again.
	X: 0 📮 A	T: 60 🏺		Y. 63 V Apply
	🥌 Any schedule chan	ge will affect the p	power generate	ed and shall be conservatively made.
	System time: 2014-10-27			
	14:03:21	Apply		

17. Maintenance & Cleaning

Check the following points to ensure proper operation of whole solar system at regular intervals.

- Ensure all connectors of this inverter are cleaned all the time.
- Before cleaning the solar panels, be sure to turn off PV DC breakers.
- Clean the solar panels, during the cool time of the day, whenever it is visibly dirty.
- Periodically inspect the system to make sure that all wires and supports are securely fastened in place.

WARNING: There are no user-replaceable parts inside of the inverter. Do not attempt to service the unit yourself.

Battery Maintenance

- Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions.
- When replacing batteries, replace with the same type and number of batteries or battery packs.
- The following precautions should be observed when working on batteries:
 - a) Remove watches, rings, or other metal objects.
 - b) Use tools with insulated handles.
 - c) Wear rubber gloves and boots.
 - d) Do not lay tools or metal parts on top of batteries.

e) Disconnect charging source prior to connecting or disconnecting battery terminals.

f) Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).

<u>CAUTION</u>: A battery can present a risk of electrical shock and high short-circuit current.

<u>CAUTION</u>: Do not dispose of batteries in a fire. The batteries may explode. <u>**CAUTION**</u>: Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

18. Trouble Shooting

When there is no information displayed in the LCD, please check if PV module/battery/grid connection is correctly connected.

NOTE: The warning and fault information can be recorded by remote monitoring software.

18-1. Warning List

There are 17 situations defined as warnings. When a warning situation occurs, 🛆 icon will flash and will display warning code. If there are several codes, it will display

will flash and will display warning code. If there are several codes, it will display in sequences. Please contact your installer when you couldn't handle with the warning situations.

Code	Warning Event	Icon	Description
		(flashing)	
01	Line voltage high loss	\wedge	Grid voltage is too high.
02	Line voltage low loss	\wedge	Grid voltage is too low.
03	Line frequency high loss	\wedge	Grid frequency is too high.
04	Line frequency low loss	\wedge	Grid frequency is too low.
05	Line voltage loss for long time	\land	Grid voltage is higher than 253V.
07	Island detect	\wedge	Island operation is detected.
08	Line waveform loss	\wedge	The waveform of grid is not suitable for inverter.
09	Line phase loss	\wedge	The phase of grid is not in right sequence.
10	EPO detected	\wedge	EPO is open.
11	Overload	\wedge	Load exceeds rating value.
12	Over temperature	\leq	The temperature is too high inside.
13	Batter voltage low	\wedge	Battery discharges to low alarm point.
14	Battery under-voltage when grid is loss	\land	Battery discharges to shutdown point.
15	Battery open	\wedge	Battery is unconnected or too low.
16	Battery under-voltage when grid is OK	\wedge	Battery stops discharging when the grid is OK.

18-2. Fault Reference Codes

When a fault occurs, the icon **ERROR** will flash as a reminder. See below for fault codes for reference.

	Situation	<u>n</u>	
Fault Code	Fault Event	Possible cause	Solution
01	Bus voltage over	Surge	 Restart the inverter. If the error message still remains, please contact your installer.
02	BUS voltage under	PV or battery disconnect suddenly	 Restart the inverter If the error message still remains, please contact your installer.
03	BUS soft start time out	Internal components failed.	Please contact your installer.
04	INV soft start time out	Internal components failed.	Please contact your installer.
05	INV over current	Surge	 Restart the inverter. If the error message still remains, please contact your installer.
06	Over temperature	Internal temperature is too high.	 Check the ambient temperature and fans. If the error message still remains, please contact your installer.
07	Relay fault	Internal components failed.	Please contact your installer.
08	CT sensor fault	Internal components failed.	Please contact your installer.
09	Solar input power abnormal	 Solar input driver damaged. Solar input power is too much when voltage is more than 850V. 	 Please check if solar input voltage is higher than 900V. Please contact your installer.
11	Solar over current	Surge	 Restart the inverter. If the error message still remains, please contact your installer.
12	GFCI fault	Leakage current excceds the limit.	1. Check the wire and panels which may cause the leakage.
13	PV ISO fault	The resistance between PV and ground is too low.	2. If the error message still remains, please contact your installer.

14	INV DC current over	Utility fluctuates.	 Restart the inverter. If the error message still remains, please contact your installer.
16	GFCI sensor fault	GFCI sensor failed.	Please contact your installer.
17	DSP&MCU communication loss	Internal components failed or FW update failed	
18	DSP&MCU protocol incompatibility	DSP&MCU FW incompatibility	
22	Battery high voltage fault	Battery voltage exceeds the limit.	 Check the battery voltage. If the error message still remains, please contact your installer.
23	Over load	The inverter is loaded with more than 110% load and time is up.	Reduced the connected load by switching off some equipment.
26	INV short	Output short circuited.	Check if wiring is connected well and remove abnormal load.
27	Fan lock	Fan failed.	Please contact your installer.
32	DCDC current over	Surge	 Restart the inverter. If the error message still remains, please contact your installer.
33	INV voltage low	Internal components failed.	Please contact your installer.
34	INV voltage high	Internal components failed.	Please contact your installer.
38	MPPT input was shorted circuit	Internal components failed.	Please disconnect the solar input immediately and contact your installer.
51	Transformer current over	Surge	 Restart the inverter. If the error message still remains, please contact your installer.
52	Solar1 over temperature	Internal temperature is too	1. Check the ambient temperature and fans.
53	Solar2 over temperature	high.	2. If the error message still remains, please contact your installer.

19. Specifications

MODEL	15KW		
RATED POWER	15000 W		
PV INPUT (DC)			
Maximum DC Power	22500 W		
Nominal DC Voltage	720 VDC		
Maximum DC Voltage	900 VDC		
Working DC Voltage Range	350 VDC ~ 900 VDC		
Start-up Voltage / Initial Feeding Voltage	320 VDC / 350 VDC		
MPP Voltage Range / Full Load MPP			
Voltage Range	350 VDC ~ 850 VDC / 400 VDC ~ 800 VDC		
Maximum Input Current	PV1: 37.2 A; PV2: 18.6 A		
Max. inverter back feed current to the	0.4		
array	U A		
GRID OUTPUT (AC)			
Nominal Output Voltage	230 VAC (P-N) / 400 VAC (P-P)		
Output Voltage Range	184 - 265 VAC per phase		
Output Frequency Range	47.5 ~ 51.5 Hz or 59.3~ 60.5Hz		
Nominal Output Current	21.7 A per phase		
Inrush Current/Duration	25.5 A per phase / 20ms		
Maximum Output Fault Current/Duration	68 A per phase / 1ms		
Maximum output Overcurrent Protection	68 A per phase		
Power Factor Range	0.9 lead – 0.9 lag		
AC INPUT			
AC Start-up Voltage	120-140 VAC per phase		
Auto Restart Voltage	180 VAC per phase		
Acceptable Input Voltage Range	170 - 280 VAC per phase		
Nominal Frequency	50 Hz / 60 Hz		
AC Input Power	15000VA/15000W		
Maximum AC Input Current	40 A		
Inrush Input Current	40 A / 1ms		
Generator INPUT	r		
Maximum Input Power	16000W		
Acceptable Input Voltage Range	170~280 VAC per phase		
Acceptable Input Frequency Range	40.0 ~ 60.0 Hz		
Maximum AC Input Current	40 A		
BATTERY MODE OUTPUT (AC)			
Nominal Output Voltage	230 VAC (P-N) / 400 VAC (P-P)		
Output Frequency	50 Hz / 60 Hz (auto sensing)		
Output Waveform	Pure sine wave		
Output Power	15000VA/15000W		
Efficiency (DC to AC)	91%		
Transfer time	<15ms(On-grid mode to off-grid mode)		
Transfer time in parallel mode	\leq 50ms(On-grid mode to off-grid mode)		

BATTERY & CHARGER (Lead-acid/Li-ion)					
DC Voltage Range	40 – 62 VDC				
Nominal DC Voltage	48 VDC				
Maximum Battery Discharging Current	500 A				
Maximum Charging Current	300 A				

GENERAL						
PHYSICAL						
Dimension, D X W X H (mm)	820 x 650 x 224					
Net Weight (kgs)	62					
INTERACE						
Communication Port	RS-232/USB					
Intelligent Slot	Optional SNMP, Modbus and AS-400 cards					
	available					
ENVIRONMENT						
Protective Class	I					
Ingress Protection Rating	IP20					
Humidity	0 ~ 90% RH (No condensing)					
Operating Temperature	-10 to 55°C (Power derating above 50°C)					
Altitude	Max. 2000m*					

* Power derating 1% every 100m when altitude is over 1000m.

Appendix I: Parallel Installation Guide

Introduction

This inverter can be used in parallel with maximum 6 units. The supported maximum output power is 90KW/90KVA.

Warning: Please make sure the output neutral of each inverter is always connected when they are configured in parallel working, or it will damage the inverter.

Warning: Please makes sure the solar input of each inverter is independent, or it will damage the inverter.

Parallel cable

You will find the following items in the package:



Parallel communication cable



Current sharing cable





- 1. Parallel communication port
- 2. Current sharing port

Mounting the Unit

When installing multiple units, please follow below chart.



NOTE: For proper air circulation to dissipate heat, it's necessary to allow a clearance of approx. 20 cm to the side and approx. 50 cm above and below the unit. Be sure to install each unit in the same level.

Wiring Connection

The cable size of each inverter is shown as below:

Recommended battery cable and terminal size for each inverter:

Ring terminal:

		Ring			
Model	Wire Size		Dimensions		Torque value
		Cable mm ²	D (mm)	L (mm)	-
15KW	2*3/0	170	8.4	54.2	7~12 Nm

WARNING: Be sure the length of all battery cables is the same. Otherwise, there will be voltage difference between inverter and battery to cause parallel inverters not working.

Recommended AC input and output cable size for each inverter:

Model	AWG no.	Conductor cross- section	Torque	
15KW	10~8 AWG	5.5~10 mm ²	1.4~1.6Nm	

You need to connect the cables of each inverter together. Take the battery cables for example. You need to use a connector or bus-bar as a joint to connect the battery cables together, and then connect to the battery terminal. The cable size used from joint to battery should be X times cable size in the tables above. "X" indicates the number of inverters connected in parallel.

Regarding cable size of AC input and output, please also follow the same principle.

CAUTION!! Please install a breaker at the battery side. This will ensure the inverter can be securely disconnected during maintenance and fully protected from overcurrent of battery.

Recommended breaker specification of battery for each inverter:

Model	One unit*	
15KW	450A/60VDC	

*If you want to use only one breaker at the battery side for the whole system, the rating of the breaker should be X times current of one unit. "X" indicates the number of inverters connected in parallel.

Recommended battery capacity

Inverter parallel	2	3	4	5	6
numbers					
Battery Capacity	800AH	1200AH	1600AH	2000AH	2400AH

CAUTION! Please follow the battery charging current and voltage from battery spec to choose the suitable battery. The wrong charging parameters will reduce the battery lifecycle sharply.

Approximate back-up time table

Load (W)	Backup	Backup	Backup	Backup	Backup
	Time	Time	Time	Time	Time
	@ 48Vdc				
	800Ah	1200Ah	1600Ah	2000Ah	2400Ah
	(min)	(min)	(min)	(min)	(min)
5,000	240	360	480	600	720
10,000	112	168	224	280	336
15,000	60	90	120	150	180
20,000	40	60	80	100	120
25,000	20	30	40	50	60
30,000	16	24	32	40	48

PV Connection

Please refer to user manual of single unit for PV Connection.

CAUTION: Each inverter should connect to PV modules separately.

Inverters Configuration

Two inverters in parallel:

Power Connection



Communication Connection



Three inverters in parallel:

Power Connection



Communication Connection



Four inverters in parallel:

Power Connection



Communication Connection



Five inverters in parallel:

Power Connection



Communication Connection



Six inverters in parallel:

Power Connection



Communication Connection

Setting and LCD Display Setting Program:

The parallel function setting is only available by SolarPower. Please install SolarPower in your PC first.

For setting, you can set the inverter one by one through RS232 or USB port.

But we suggest to use SNMP or Modbus card to combine the system as a centralized monitoring system. Then, you can use "SYNC" function to set all the inverters at the same time. If using SNMP or Modbus card to set up program, the bundled software is SolarPower Pro.

• Use SNMP card to synchronize the parameters:

Each inverter should be installed one SNMP card. Make sure all of the SNMP cards are connected to the router as a LAN.

• Use Modbus card to synchronize the parameters:

Each inverter should be installed one Modbus card. Make sure all of the Modbus cards are connected to each other and one of the Modbus cards is connected to the computer by RS-485/RS232 converter.

Launch SolarPowerPro in computer and select Device Control >> Parameter Setting >> Parallel output. Two options: Enable or Disable.

If you want to use parallel function, please choose "Enable" and press "

button. Then, " button will be shown is the screen. Please be sure to click

" Sync " button before clicking " Apply " button.

There is a "Sync" button in each parameter setting. When "Sync" is clicked and "Apply" is pressed, this new setting will be applied to all inverters. If not, this setting is only effected in current inverter you choose.

Note: Without centralized monitoring system, "Sync" function is not effective. Then, you have to set up the inverter one by one through serial communication port.

Parallel for output: Enable

Min grid-convected votage List gr V E Sync	The waiting time price grid connection is grid sec.
Max grid-connected voltage 264.5 gr V Sync	Max. grid connected average voltage 253 Bd V Synce
Min. grid-connected frequency 47.4 Hz B Syre.	Max feed-in grid power 10000 H W T Sync
Max grid-connected frequency 51.5 🛃 Hz 🔳 Sync 🔤	Feed-is power factor (3 👹 🖷 Sync 🔤
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Max #V input voltage 🛛 1000 📑 V 🔠 Syrc 🗐	Battery re-discharging voluge when Grid is available 🛛 54 📑 V 🤨 👾 🖬
Milis. MPP voltage 🛛 550 📑 V 🖉 Sync 🖷	Battery cut-off discharging voltage when Grid is unavailable 🛛 🛃 V 😁 🦛 🗖 🛤
Max. MHV voltage 🛛 150 📳 V 🚿 Syre 🗐	Rattery re-discharging voltage when Grid is unavailable 🛛 🖪 V 📷 🦡 🗰
Max. changing current 🛛 59.8 📑 🔺 🔳 Sync 🗐	Max. battary discharge current in hybrid mode 🛛 300 📑 A 🖷 Sync 📰
Max. AC charging current 59.5 📑 A 🔳 Syre 🗐	Battery temperature compensation 🛛 📑 🗤 🔳 sync 📰
Sulk charging voltage(CV, voltage) 56 👩 V 🥳 👘	Feeding grid power calibration B. 👩 💽 W 🔳 sync 💷
Roating charging voltage 🛛 🔁 V 👩 👾 🧊	Feeding grid power calibration 5 🛛 🚼 W 🔳 sync 🖬
Start LCD screen saver after 🛛 🗰 Sec. 🔳 Sync 📲	Feeding grid power calibration T 🛛 🔮 🗤 🚍 Syle.
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Parallel for output: Disable

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Min. gr.d. connected voltage 🛛 🖬 🔀 V 👘 📰	The waiting time before grid connection (80 👩 Sec 📷
Max grid-connected voltage 204.5 🔝 V 🔤 🐨	Nex and connected average voltage (251 🛛 🖓 V 🔤
Mex grid-connected hequency 47.4 🔞 Hz 🗱	Met, feed-in grid pomer 12000 😭 W
Max grid-convected feasarcy	Feid-is power factor 1
Mini. PV Input voltage 300 📑 V 💷	Battory cut off discharging voltage when Grid 11 available 🛛 all 📑 V 🔤 🕅
Max PV input voltage 902 📑 V 🔤	Battery re-docharging voltage when Gild is available 🛛 54 🛛 😫 🗸 👘
Min: XAPI voltage 350 🛐 V 💴	Battery cut-off discharging voltage when Gird is unsualid/a 🛛 😣 V 🔤 💷
Max MPP voltage (850 😭 V 🔤	Battary ne discharging voltage when Gird is unavailable 🛛 😣 💌 🚥 👘
Max. changing current 59.9 😭 A 🕅 🕅	Mix. battery dacharge current in hybrid mode 🛛 100 📑 A 🔤 🖬
Max AC sharping current 59.9 🔞 A 📰 👘	Balbery temperature compensation 🗴 📑 🕬 🗰
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When float charging current is less than X (A) and continued T (A/m, the	n danger off when battery voltage is less than V of then charger on again.
Any activital endancy e will affect the parent generated and shall be conservatively made.	
system fime 2015-07-14	
A CARLES AND A CARLES A	

Fault code display:

Fault Code	Fault Event	Icon on
60	Power feedback protection	<u>50 A</u>
71	Firmware version inconsistent	
72	Current sharing fault	
80	CAN fault	80 🕰
81	Host loss	
82	Synchronization loss	

Commissioning

Step 1: Check the following requirements before commissioning:

- Correct wire connection.
- Ensure all breakers in Line wires of load side are open and each Neutral wire of each unit is connected together.

Step 2: Turn on each unit and set "enable parallel for output" on SolarPower or SolarPower Pro. And then, shut down all units.

NOTE: Master and slave units are randomly defined. Warning 02 is AC GRID voltage low.

Step 4: Switch on all AC breakers of Line wires in AC input. It's better to have all inverters connect to utility at the same time. If not, it will display fault 82 in following-order inverters. However, these inverters will automatically restart. If detecting AC connection, they will work normally.

Step 5: If there is no more fault alarm, the parallel system is completely installed. Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

Trouble shooting

Situation			
Fault Code	Fault Event Description	Solution	
60	Current feedback into the inverter is detected.	1. 2. 3. 4.	Restart the inverter. Check if L1/L2/L3/N cables are not connected with wrong sequence in all inverters. Make sure the sharing cables are connected in all inverters. If the problem remains, please contact your installer.
71	The firmware version of each inverter is not the same.	1. 2.	Update all inverter firmware to the same version. After updating, if the problem still remains, please contact your installer.
72	The output current of each inverter is different.	1. 2.	Check if sharing cables are connected well and restart the inverter. If the problem remains, please contact your installer.
80	CAN data loss	1.	Check if communication cables are
81	Host data loss		connected well and restart the inverter.
82	Synchronization data loss	2.	If the problem remains, please contact your installer.

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