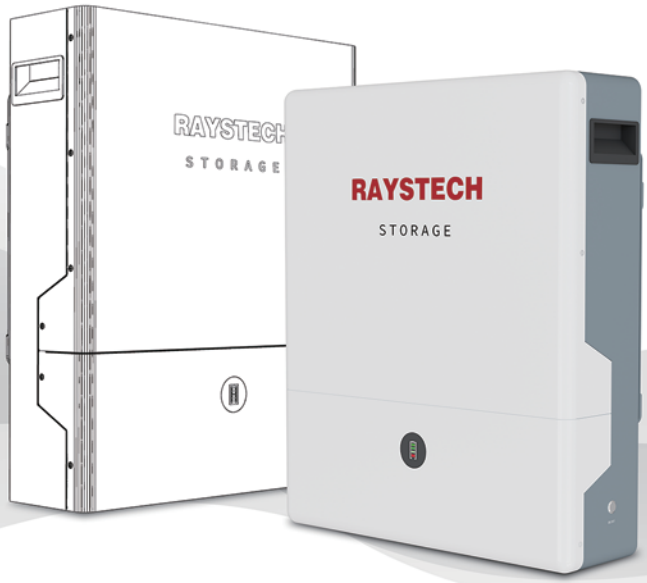
RAYSTECH

Your Trusted Solar Partner

PORWALL BATTERY USER MANUAL



51.2V 100AH Home Energy Storage Battery

- Advanced BMS with current limiting function
- CAN Bus, fully integrates and communicates with leading Inverter brands(Growatt, SOLAX,LUXPower,DEYE,MUST, Voltronic,Victron,SMA...etc.)
- Excellent high temperature performance
- High Cycle Life and Service Life1C High Performance Lithium battery
- High Energy Density and conversion efficiency
- Complete with integrated Battery Management System
- Compatible with most Inverters and chargers
- Low self discharge
- Easy wall mount or shelf rack installation
- Heavy duty side handles for easy handling and mounting on the wall
- Built in protection for over-charge, over-discharge & over-temperature
- Can parallel BMS communication up to 10 units.

Content

Statement of Law

This product complies with the design requirements of environmental protection and personal safety. The storage, use and disposal of the products shall be carried out in accordance with the product manual, relevant contract or relevant laws and regulations.

Please note that the product can be modified without prior notice.

Safety Precautions

Warning

- Please do not put the battery into water or fire, in case of explosion or any other situation that might endanger your life.
- Please connect wires properly while installation, do not reverse connect.
  To avoid short circuit, please do not connect positive and negative poles with conductor (Wires for instance).
- Please do not stab, hit, trample or strike the battery in any other way.
- Please shut off the power completely when removing the device or reconnecting wires during the daily use or it could cause the danger of electric shock.
- Please use dry powder extinguisher to put out the flame when encountering a fire hazard, liquid extinguisher could result in the risk of secondary disaster.
- For your safety, please do not arbitrarily dismantle any component in any circumstances unless a specialist or an authorized one from our company, device breakdown due to improper operation will not be covered under warranty.

Caution

- We have strict inspection to ensure the quality when products are shipped out, however, please contact us if case bulging or another abnormal phenomenon.
- For your safety, device shall be ground connected properly before normal use.
- To assure the proper use please make sure parameters among the relevant device are compatible.
- **Please do not mixed-use batteries from different manufacturers, different types and models, as well as old and new together.**
- Ambient and storage method could impact the life span and product reliability, please consider the operation environment abundantly to make sure device works in proper condition.
- For long-term storage, the battery should be recharged once every 6 months, and the amount of electric charge shall exceed 80% of the rated capacity.
- Please charge the battery in 18 hours after it discharges fully and starts over-discharging protection.
  Formula of theoretical standby time: T=C/I (T is standby time, C is battery capacity, I is total current of all loads).

Preface

Manual declaration

The lithium iron phosphate battery energy storage system can provide energy storage solutions for photovoltaic power generation users through parallel combination. During the day, the excess power of photovoltaic power generation can be stored in the battery. At night or when needed, the stored electrical energy can be used to supply power to the electrical equipment, which can improve the efficiency of photovoltaic power generation, peak load shifting, and emergency power backup.

This user manual details the basic structure, parameters, basic procedures and methods of installation and operation and maintenance of the equipment.

1 Introduction

1.1 Brief Introduction

Lithium iron phosphate battery system is a standard battery system unit, customers can choose a certain number of according to their needs, by connecting parallel to form a larger capacity battery pack, to meet the user's long-term power supply needs. The product is especially suitable for applications with high operating temperatures, limited installation space, long power backup time and long service life.

1.2 Product Properties

This energy storage product's anode materials are lithium iron phosphate, battery cells are managed effectively by BMS with better performance, the system's features as below:

- Comply with European ROHS, Certified SGS, employ non-toxic, non-pollution environment-friendly battery.
- Anode materials are lithium iron phosphate (LiFePO4), safer with longer life span.
- Carries battery management system with better performance, possesses protection function like over-discharge, over-charge, over-current, abnormal temperature.
- Self-management on charging and discharging, Single core balancing function.
- Flexible configurations allow parallel of multi battery for longer standby time.
- Self-ventilation with lower system noise.
- Less battery self-discharge, then recharging period can be up to 6 months during the storage.
- No memory effect so that battery can be charged and discharged shallowly.
- With wide range of temperature for working environment, -20°C ~ +65 °C, circulation span and discharging performance are well under high temperature.
- Less volume, lighter weight.

1.3 Product identity definition

	**Be careful with your actions and be aware of the dangers.**
	**Read the user manual before using.**
	**The scrapped battery cannot be put into the garbage can and must be professionally recycled.**
	**After the battery life is terminated, the battery can continue to be used after it recycled by the professional recycling organization and do not discard it at will.**
	**This battery product meets European directive requirements.**
	**Battery voltage is higher than safe voltage, direct contact with electric shock hazard.**
	**Dangerous goods warning label on the top of the battery module.**

2 Product Specification

2.1 Size and Weight

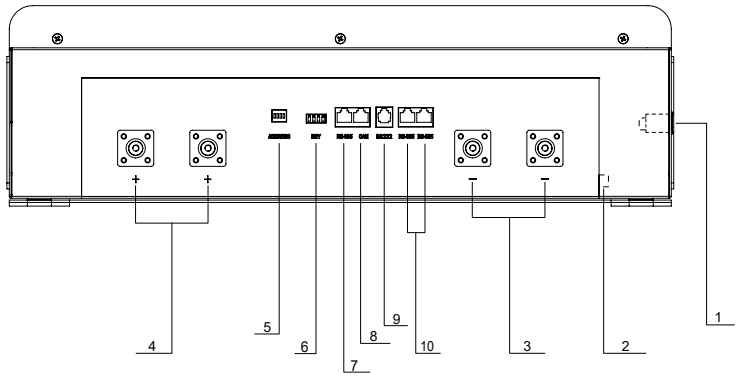
Product	Nominal Voltage	Nominal Capacity	Dimension	Weight
LiFePO4 Battery	DC 51.2V	100Ah	660*550*160mm	≈55kg

2.2 Performance Parameter

Item	Parameter value
Nominal Voltage(V)	51.2
Max. Work Voltage Range(V)	40~58.4
Nominal Capacity(Ah)	100
Nominal Energy(kWh)	5
C Rating	1C
Discharge Cutoff Voltage(V)	44.8
Equalized Charge Voltage(V)	58.4
Max. Continuous Charging Current(A)	100
Max. Continuous Discharging Current(A)	100

2.3 Interface Definition

This section elaborates on interface functions of the front interface of the device.



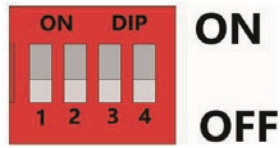
Item	Name	Definition
1	Power Switch	ON/OFF.must be in the“ON”state when battervin use
2	Ground terminal	Connect the ground cable
3	Negative Terminal	Battery output negative or parallel negative line
4	Positive Terminal	Battery output positive or parallel positive line
5	ADDR	DIP switch for battery address setting
6	Dry Contact	To connect optional externalalarm
7	RS485	Inverter communication portsupports RS485 communication
8	CAN	Inverter communication portsupports CAN communication
9	RS232	Communication port.battery connectionto hostcomputer
10	RS485-Parallel1	Battery to battery RS485 parallel communication ports
	RS485-Parallel2	Battery to battery RS485 parallel communication ports

2.3.1 DIP switch definition and description

DIP switch position (host communication protocol and baud rate selection)			
#1	#2	#3	#4
Baud rate selection			
CAN: 500K RS485: 9600			

DIP switch description:

When the battery pack is connected in parallel, the host can communicate with the slave through the RS485-1 & RS485-2 interface. The host summarizes the information of the entire battery system and communicates with the inverter through CAN or 485. The connection mode is divided into the following two cases:



Pack	Codes the switch position			
	#1	#2	#3	#4
1 (master)	OFF	OFF	OFF	OFF
2 (slave 1)	ON	OFF	OFF	OFF
3 (slave 2)	OFF	ON	OFF	OFF
4 (slave 3)	ON	ON	OFF	OFF
5 (slave 4)	OFF	OFF	ON	OFF
6 (slave 5)	ON	OFF	ON	OFF
7 (slave 6)	OFF	ON	ON	OFF
8 (slave 7)	ON	ON	ON	OFF
9 (slave 8)	OFF	OFF	OFF	ON
10 (slave 9)	ON	OFF	OFF	ON
11 (slave 10)	OFF	ON	OFF	ON
12(slave 11)	ON	ON	OFF	ON
13 (slave 12)	OFF	OFF	ON	ON
14 (slave 13)	ON	OFF	ON	ON
15 (slave 14)	OFF	ON	ON	ON
16 (slave 15)	ON	ON	ON	ON

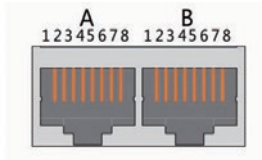
Pin Definition

RS485-1 / CAN Communication Interface Definition:

A

PIN NO	RS485 Port
PIN 1	RS485-B
PIN 2	RS485-A
PIN 3	RS485-GND
PIN 4	NC(empty)
PIN 5	NC(empty)
PIN 6	RS485-GND
PIN 7	RS485-A
PIN 8	RS485-B

RS485 port definition



X1(dual RJ45) Port

B

PIN NO	CAN Port
PIN 1	NC(empty)
PIN 2	CGND
PIN 3	NC(empty)
PIN 4	CAN-H
PIN 5	CAN-L
PIN 6	NC(empty)
PIN 7	NC(empty)
PIN 8	NC(empty)

CAN port definition

LED bar status indicators

State	Normal/Alarm/Protection	The power Level is indicated by LED BARS				Description
		L4	L3	L2	L1	
Power Off	ALL OFF					Power Off
Standby	Normal	Number of LED bars on according to the sate of charge				Standby
Charge	Normal	Number of LED bars on according to the sate of charge				Battery working in Normal
	Overcharge Protection	On	On	On	On	Indicated battery is fully charged
	Temperature, Overcurrent Protection	Off	Off	Off	Off	Charge stopped
Discharge	Normal	Number of LED bars on according to the sate of charge				Battery working in Normal
	Undervoltage Protection	Off	Off	Off	Off	Indicated battery is fully discharged
	Temperature, Overcurrent,short circuit	Off	Off	Off	Off	Discharge stopped
Fail		Off	Off	Off	Off	Charge and discharge stopped

LED Bar Working Status Indication

State		Charge				Discharge			
Capacity Indicator Light		L4	L3	L2	L1	L4	L3	L2	L1
Battery Power(%)	0 - 25%	Off	Off	Off	On	Off	Off	Off	On
	25% - 50%	Off	Off	On	On	Off	Off	On	On
	50% - 75%	Off	On	On	On	Off	On	On	On
	75% - 100%	On	On	On	On	On	On	On	On

LED flashing instruction

Flash	ON	OFF
Flash1	0.25Sec	3.75Sec
Flash2	0.5Sec	0.5Sec
Flash3	0.5Sec	1.5Sec

2.5 Buzzer Operation (Optional)

Model	Description and Status
Fault	Buzzing 0.25S per 1Sec
Protection	Buzzing 0.25S per 2Sec (expect for over-charge protection)
Alarm	Buzzing 0.25S per 3Sec (expect for over-charge alarm)

NOTE: Buzzer function can be set by monitor software, the default is on.

2.4 Battery Management System(BMS)

2.4.1 Voltage Protection

Discharging Low Voltage Protection:

When any battery cell voltage is lower than the protection value during discharging, The over-discharging protection starts, and the battery buzzer makes an alarm sound. Then battery system stops supplying power to the outside. When the voltage of each cell recovers to rated return range, the protection is over.

Charging Over Voltage Protection:

When total voltage or any battery cell voltage reaches the protection value during charging, battery stops charging. When total voltage or a cell recover to rated return range, the protection is over.

2.4.2 Current Protection

Over Current Protection in Charging:

When the charging current is greater than the protection value, the battery buzzer alarms and the system stops charging. Protection is removed after rated time delaying.

Over Current Protection in Discharging:

When the discharge current is greater than the protection value, the battery buzzer alarms and the system stops discharging. Protection is released after rated time delaying.

Note:

The buzzer sound alarm setting can be manually turned off on the background software, and the factory default is on.

2.4.3 Temperature Protection

Less/Over temperature protection in charging:

When battery's temperature is beyond range of 0 ℃ ~+45 ℃ during charging, temperature protection starts, device stops charging.
The protection is over when it recovers to rated return range.

Less/Over temperature protection in discharging:

When battery's temperature is beyond range of -20℃~+55℃ during discharging, temperature protection starts, device stops supplying power to the outside.

2.4.4 Other Protection

Short Circuit Protection：

When the battery is activated from the shutdown state, if a short circuit occurs, the system starts short-circuit protection for 30 seconds.

Self-Shutdown：

When device connects no external loads and power supply and no external communication for over 72 hours, device will dormant standby automatically.

Caution

Battery's maximum discharging current should be more than load's maximum working current.

3 Installation and Configuration

3.1 Ready for installation

Safety Requirement

This system can only be installed by personnel who have been trained in the power supply system and have sufficient knowledge of the power system.
The safety regulations and local safety regulations listed below should always be followed during the installation.

- All circuits connected to this power system with an external voltage of less than 48V must meet the SELV requirements defined in the IEC60950 standard.
- If operating within the power system cabinet, make sure the power system is not charged. Battery devices should also be switched off.
- Distribution cable wiring should be reasonable and has the protective measures to avoid touching these cables while operating power equipment.
- when installing the battery system, must wear the protective items below:

The isolation gloves

Safety goggles

Safety shoes

Figure3-1

3.1.1 Environmental requirements

Working temperature: -20 °C ~ +55 °C

- Charging temperature range is 0°C~+45 °C
- Discharging temperature range is -20 °C ~+55 °C

Storage temperature: -10 °C ~ +35 °C
Relative humidity: 5% ~ 85%RH
Elevation: no more than 4000m
Operating environment: Indoor installation, sites avoid the sun and no wind, no conductive dust and corrosive gas.
And the following conditions are met:

- Installation location should be away from the sea to avoid brine and high humidity environment.
- The ground is flat and level.
- There is no flammable explosive near to the installation places.
- The optimal ambient temperature is 15°C ~ 30 °C
- Keep away from dust and messy zones

3.1.2 Tools and data

Hardware tool
Tools and meters that may be used are shown in below

Name	
Screwdriver (word, cross)	AVO meter
Wrench	Clamp meter
Inclined pliers	Insulating tape
Needle nose pliers	The thermometer

Name	
Clip forceps	Wrist strap
Wire stripper	AVO meter
Electric drill	Tape

3.1.3 Technical preparation

Electrical interface check

Devices that can be connected directly to the battery can be user equipment, power supplies, or other power supplies.

- Confirm whether the user's PV power generation equipment, power supply or other power supply equipment has a DC output interface, and measure whether the DC power output voltage meets the voltage range requirements in Table 2.2
- Confirm that the maximum discharge current capability of the DC power interface of the user's photovoltaic power generation equipment, power supply or other power supply equipment should be greater than the maximum charging current of the products used in Table 2.2
  If the maximum discharge capacity of the DC power interface of the user's photovoltaic power generation equipment is less than the maximum charging current of the products used in Table 2.2, the DC power interface of the user's photovoltaic power generation equipment shall have a current limiting function to ensure the normal operation of the user's equipment.
- Verify that the maximum operating current of the battery-powered user equipment (inverter DC input) should be less than the maximum discharge current of the products used in Table 2.2

The security check

- Firefighting equipment should be provided near the equipment, such as portable dry powder fire extinguisher.
- Automatic fire fighting system shall be provided for the case where necessary.
- No flammable, explosive and other dangerous articles are placed beside the battery.

3.1.4 Unpacking inspection

- When the equipment arrives at the installation site, loading and unloading should be carried out according to the rules and regulations, to prevent from being exposed to sun and rain.
- Before unpacking, the total number of packages shall be indicated according to the shipping list attached to each package, and the case shall be checked for good condition.
- In the process of unpacking, handle with care and protect the surface coating of the object.
- Open the package, the installation personnel should read the technical documents, verify the list, according to the configuration table and packing list, ensure objects are complete and intact, if the internal packing is damaged, should be examined and recorded in detail.

3.1.5 Engineering coordination

Attention should be paid to the following items before construction:

- Power line specification.
  The power line specification shall meet the requirements of maximum discharge current for each product.
- Mounting space and bearing capacity.
  Make sure that the battery has enough room to install, and that the battery rack and bracket have enough load capacity.
- Wiring.
  Make sure the power line and ground wire are reasonable. Not easy to short-circuit, water and corrosion.

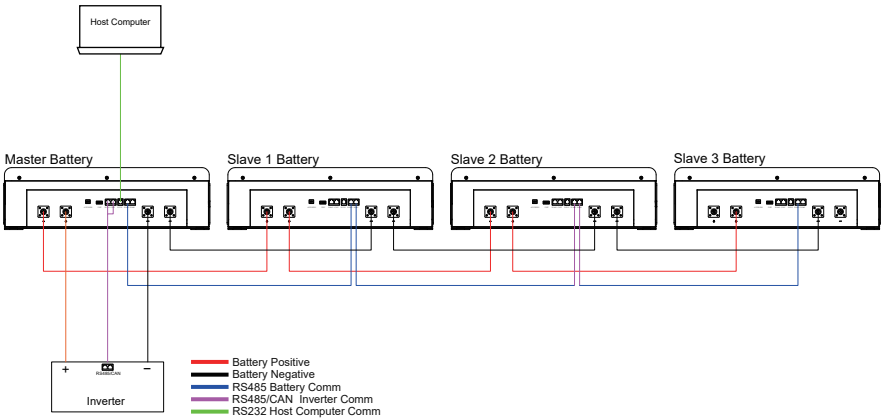
3.2 Equipment installation

3.2.1 Installation steps

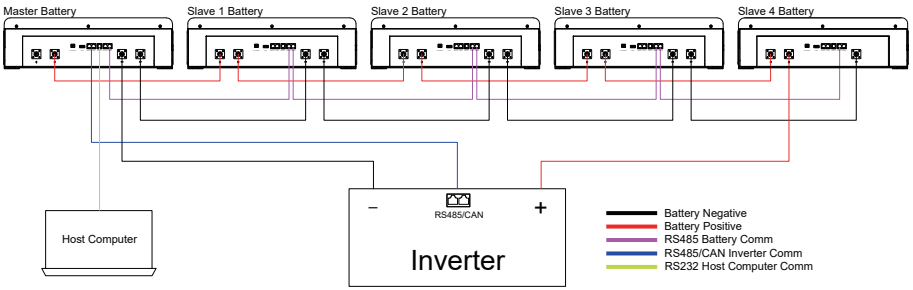
Step1	Installation preparation	Confirm that the ON/OFF switch on the front panel of unit is in the “OFF” state to ensure no live operation.
Step 2	Mechanical installation	1. Battery placement position determination
		2. Cable harness pre-installed
		3. Battery module installation
Step3	Electrical installation	1. Ground cable installation
		2. Battery module parallel cable installation
		3. Battery module total positive cable installation
		4. Battery module total negative cable installation
		5. Internal CAN communication interface connection
Step4	Battery system self-test	1. Press the ON/OFF switch to the "ON" state
		2. BMS system power-on activation
		3. Check the system output voltage
		4. Shut down the system
Step5	Connecting inverter	1. Connect total positive & total negative cable of the battery system to the inverter
		2. Connect the external CAN/RS485 communication cable to the inverter(Details as page 15)

4 Parallel Wiring Diagram

Less than 4 PCS parallel connection diagram



More than 4 PCS parallel connection diagram



5 Communicate inverter

5.1 Method 1:Communicate factory default inverters

Step 1:Select the cables used by the inverter by the labels on the communication cables.Insert the RJ45 connector of the battery end(CAN/RS485) and the inverter end(CAN/RS485) into the interfaces on both sides.
Step 2:Turn on the battery and inverter,and wait until they are working properly. The battery is configured by factory default to communicate with the Voltronic (RS485) inverter and DEYE,Sunsynk,Luxpower, Megarevo, Sofar, TBB (CAN)inverters, the battery will automatically select and communicate with one of these inverters.
Step 3:After successful communication between battery and inverter, battery status will be displayed on inverter: voltage,current,SOC, temperature, etc.

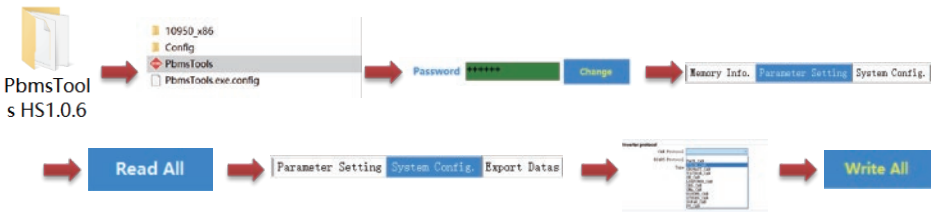
5.2 Method 2:Communicate optional inverters(protocol select)

When communicating with other brands of inverters,such as: Victron, Deye, Luxpower, SMA, GoodWe, G rowatt, Voltronic etc.

Step 1:Turn on the battery,ensure BMS is normally powered on and not in sleep state, the RS232 crystal head of the communication cable is inserted into the battery communication port, the USB end is inserted into the computer;

Step 2:Unzip the package of BMS monitoring software to the current computer(Windows Microsoft .NET Framework 2.0 or above). This software does not need to be installed independently, only the environment is satisfied, double-click the main program icon(BMS exe file) to run and use. Enter the password:**123456**(space is green, the password is correct).

Step 3: Click “Parameter ”at the top of system page, click“Read All”button to read battery parameter.Select the inverter protocol at “Protocol type” eg: PYLON_CAN is Pylontech protocol.Click the”Write all”button to set the protocol,after the system displays the operation succeeds, protocol selection is complete(Please refer to the following pictures).



Step 4:Select the cables used by the inverter by the label on the communication cables.Insert the RJ45 connector of the battery end(CAN/RS485) and the inverter end(CAN/RS485) into the interfaces on both sides. Restart the battery and inverter. The battery will automatically communicate with the inverter corresponding to the selected protocol.

5.3 Remark of inverter protocol code

RS485 Protocol	
Protocol Name	Compatible with other inverter brands
PACE	
Voltronic	MOTOMA/Opti_Solar/Darfon/Phocos
Growatt	ESENER/SMANK
MUST	
SRNE	PACE/EPEVER
Baykee	
SMANK	

CAN Protocol	
Protocol Name	Compatible with other inverter brands
PACE	
GOODWE	SOLARFAM
Growatt	
SOLAX	
MUST	
Victron	
PYLONTECH	DEYE/TBB/Luxpower/INVT/Meagrevo /SUNSYNK/SOFAR/CHINT
SMA	SOROTEC/SOFAR/Studer
Schneider	
Solis	
Studer	

6 Product Warranty

1. If you have purchased this product from factory, you should be aware that this warranty is provided in addition to other rights and remedies held by a consumer at law.

2. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

3. For the above mentioned products, you receive the factory warranty valid for 5-10 years from the date of delivery from factory. The factory warranty covers any costs for repair or spare parts during the agreed period beginning on the date of delivery of the device, subject to the following conditions.

4. Factory Warranty Scope

The factory warranty does not cover damages caused by following reasons:
--Breaking the product seal (opening the casing)
--Transport damage
--Incorrect installation or commissioning
--Failure to observe the user manual, quick installation instructions
--Incorrect usage or inappropriate operation
--Insufficient ventilation of the device
--Failure to observe the applicable safety regulations
--Force majeure
Neither does it cover cosmetic defects which do not influence the energy production.

5. Warranty conditions
If the battery becomes defective during the agreed factory warranty period and, unless this should be impossible or disproportionate, one of the following options will be selected at the discretion of factory :
--Battery repair or
--Battery repair at on-site, or
--Exchange for a replacement device of equivalent value with regard to model and age.
In the latter case, the remainder of the warranty entitlement will be transferred to the replacement device and your entitlement will be documented at factory.

Excessiveness in the meaning above exists in particular if the cost the measures for factor will be unreasonable.
--In view of the value that the device would have without the defect
--Taking in account of the significance of the defect, and
--After consideration of alternative work around possibilities at factory customers could revert to without significant inconvenience.

Please fill the required information in and send this page to factory when you need to apply warranty service support

Warranty Card

User Information

Company / User Name: Address:_____

Telephone:_____

Email:_____

Project installation location:_____

Product Information

Battery Model:_____

Serial No :_____

Invoice Number :_____

Purchase Date :_____

Commission date :_____

Fault/Error Description:_____

RAYSTECH

Your Trusted Solar Partner

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