



Powerfree Cube

User manual

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About this manual

This manual is intended to explain the Powerfree Cube technical parameters, usage methods and precautions, and to provide you with more comprehensive information about this product. If you are uncertain about any of the requirements, recommendations, or safety procedures described in this manual, contact PAND immediately for advice and clarification.

The information included in this manual is accurate at the time of publication. However, the product specifications are subject to change without prior notice. In addition, the illustrations in this manual are meant to help explain system configuration concepts and installation instructions. The illustrated items may differ from the actual items at the installation location.

1 Safety

1.1 Safety instructions

For safety reasons, installers are responsible for familiarizing themselves with the contents of this manual and all warnings before performing installation.

General safety precautions



WARNING

Failure to observe the precautions described in this section can cause serious injury to persons or damage to property.

Observe the following precautions:

- Risks of explosion
 - Do not subject the battery pack to strong impacts.
 - Do not crush or puncture the battery pack.
 - Do not burn or dispose of the battery pack in a fire.
- Risks of fire
 - Do not expose the battery pack to temperatures in excess of 60°C.
 - Do not place the battery pack near a heat source, such as a fireplace.
 - Do not expose the battery pack to direct sunlight.

– Do not allow the battery connectors to touch conductive objects such as wires.

- Risks of electric shock

– Do not disassemble the battery pack.

– Do not touch the battery pack with wet hands.

– Do not expose the battery pack to moisture or liquids.

– Keep the battery pack away from children and animals.

- Risks of damage to the battery pack

– Do not allow the battery pack to get in contact with liquids.

– Do not subject the battery pack to high pressures.

– Do not place any objects on top of the battery pack.

Battery handling guide

- Use the battery pack only as directed.

- Do not use the battery pack if it is defective, appears cracked, broken or otherwise damaged, or fails to operate.

- Do not attempt to open, disassemble, repair, tamper with, or modify the battery pack. The battery pack is not user serviceable.

- To protect the battery pack and its components from damage when transporting, handle with care.

- Do not impact, pull, drag or step on the battery pack. Do not subject it to any strong force.

- Do not insert foreign objects into any part of the battery pack.

- Do not use cleaning solvents to clean the battery pack.

1.2 Response to emergency

Situations

The product comprises multiple batteries that are designed to prevent hazards resulting from failures. However, we cannot guarantee their absolute safety.

Leaking Batteries

If the product leaks electrolyte, avoid contact with the leaking liquid or gas.

If one is exposed to the leaked substance, immediately perform the actions described below.

Inhalation: Evacuate the contaminated area, and seek medical attention.

Contact with eyes: Rinse eyes with flowing water for 15 minutes, and seek medical attention.

Contact with skin: Wash the affected area thoroughly with soap and water, and seek medical attention.

Ingestion: Induce vomiting, and seek medical attention.

Fire



In case of fire, it is recommended to have an ABC or carbon dioxide extinguisher



WARNING

The product may catch fire when heated above 150°C

If fire breaks out in the place where the product is installed, perform the following countermeasures:

1. Extinguish the fire before the product catches fire.
2. If it is nearly impossible to extinguish the fire but you have time, move the product to a safe area before it catches fire.
3. If the product has caught fire, do not try to extinguish the fire on the product, but evacuate people immediately.



WARNING

When the product is burning, it produces poisonous gases.

Wet the product

If the product is wet or submerged in water, do not try to access it. Contact VILION or your distributor for technical assistance.

Damaged product

Damaged product are dangerous and must be handled with extreme caution. They are not fit for use and may pose a danger to people or property. If the product seems to be damaged, pack it in its original container, and return it to VILION.

1.3 Qualified installers

This manual and the tasks and procedures described herein are intended for use by skilled workers only. A skilled worker is defined as a trained and qualified electrician or installer who has all of the following skills and experience:

- Knowledge of the functional principles and operation of on-grid systems.
- Knowledge of the dangers and risks associated with installing and using electrical devices and acceptable mitigation methods.
- Knowledge of the installation of electrical devices
- Knowledge of and adherence to this manual and all safety precautions and best practices.

1.4 battery recycling

This product has a built-in lithium-ion battery, which needs to be disposed of in accordance with local regulations. For battery product disposal, please contact the dealer where you purchased the product or our contact center.

2 Product Introduction

2.1 Identifying the Product

The nameplate and the warning label is attached to the upper left corner of Powerfree Cube.



产品名称/Product Name: Rechargeable Li-ion Battery System
 产品型号/Product Model: Powerfree Cube
 额定电压/Rated Voltage: 51.2V
 额定容量/Rated Capacity: 200Ah
 额定电量/Rated Power: 10kWh
 设计代码/Designation: IFpP63/146/416/[8S(2S)]E/-20+50/85
 净重/N.W: 150kg±5
 尺寸/Meas: 650mm*630mm*590mm
 Do not disassemble or modify
 Do not dispose in fire
 制造商/Made: Shenzhen Pandpower Co., Ltd.



CAUTION

Before the battery system is activated, all switches between the battery system and the inverter must be closed, otherwise the system will report a short circuit fault.

Warning label



Caution!

Failing to observe a warning indicated in this manual may result in injury.



Caution, risk of electric shock



Neither place nor install near flammable or explosive materials.



Install the product out of reach of children.



Heavy weight may cause serious injury to the back.



Read the instruction manual before starting installation and operation



Do not dispose of the product with household wastes.



Recyclable



Disconnect the equipment before carrying out maintenance or repair.



Observe precautions for handling electrostatic discharge sensitive devices.



Make sure that the battery polarity is connected correctly.



The battery pack may leak corrosive electrolyte

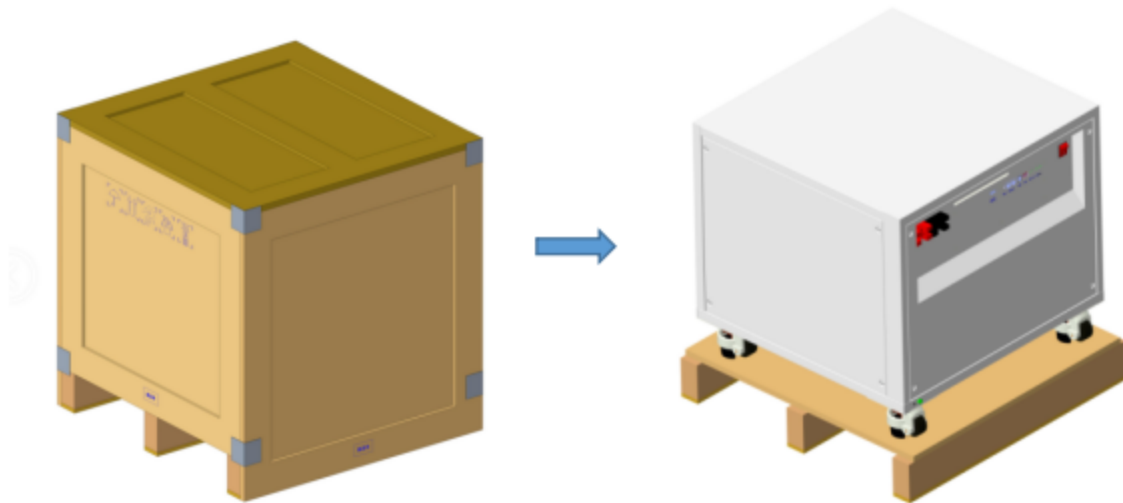
2.2 Technical data

Project	Technical Parameters
System parameter	51.2V/200Ah
Nominal Total Energy	10.0 kWh
Useable Energy	9.0 kWh
Depth of Discharge	90%
Rated DC Power	5kW
Round-Trip Efficiency	>94%
System composition	1P16S
Rated Capacity	200Ah
Discharge method	CC/CP
Maximum discharge current	100A
charging method	CC/CP/CV
Maximum charging current	100A
Communication	CAN/ RS485
Enclosure Protection Rating	IP30
Dimensions	650*630*590 mm
Net Weight	148±5.0kg
Operating Voltage Range	40~58.4 V

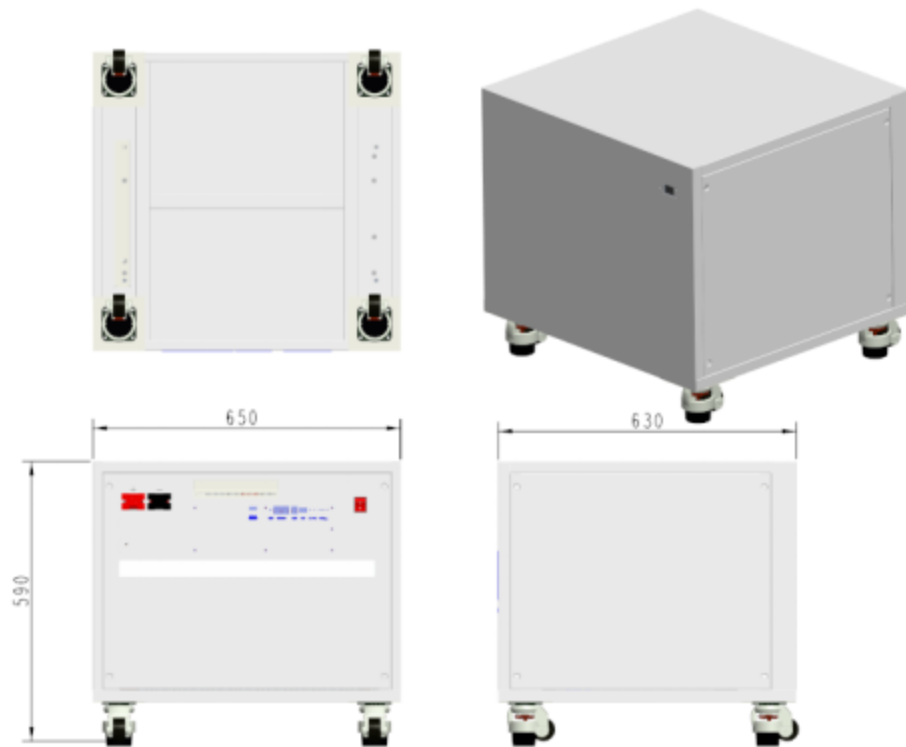
Cooling method	Natural cooling
Charging Temperature Range	0°C~+50°C
Discharge Temperature Range	-20°C~+55°C
Certificate & Safety Standard	IEC62619/IEC60730/UN38.3
Scalability	Max 8 systems in Parallel / 80 KWh
Certified Compatible Inverters	Voltronic/ Growatt/Solis/GoodWe/Megarevo/SRNE/Deye
Application	On Grid (Self consumption / On Grid + Backup) and Off Grid

2.3 Appearance

Package



Dimensions



2.4 Interface

Interface	Definition
+	Battery Positive
-	Battery Negative
2/1	Dry contact (Reserved)
RESET	Battery system restart button
RS485 / CAN	Pin1/3/6 : RS485_B Pin2/7 : RS485_A Pin8 : GND Pin4 : CAN_H Pin5 : CAN_L

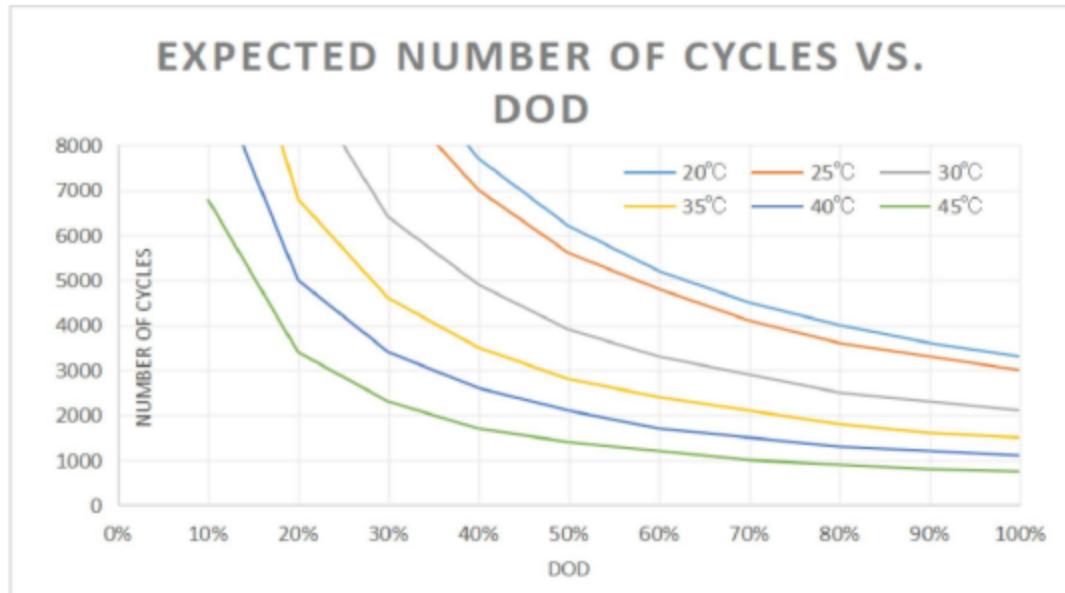
RS232	Pin3 : BMS TX; Pin4 : BMS RX; Pin5 : GND Pin1/2/6 : NC
ON/OFF	Battery system switch

PIN	1	2	3	4	5	6	7	8
Color	white and orange	orange	white and green	blue	white and blue	green	white and brown	brown



2.5 DOD vs. Cycles data

Expected number of cycles VS DOD at Different Temperatures



3 Methods and Procedures

3.1 Battery System start

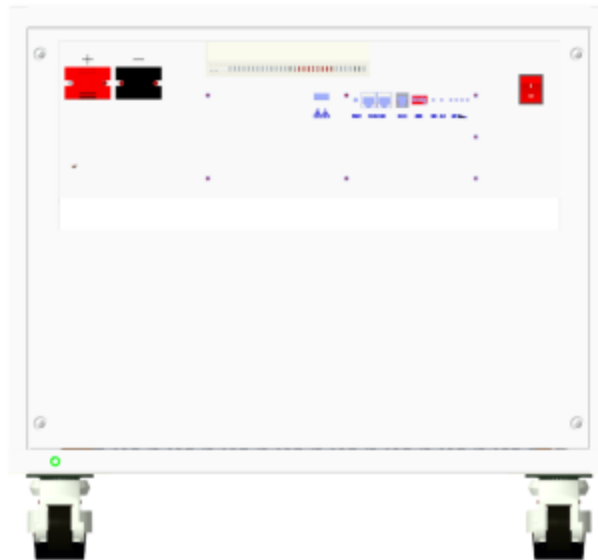
- (1) Make sure all wiring connections of the system are complete and correct;
- (2) All switches between the battery system and the inverter must be closed;

(3) Start battery system: Press the OFF/ON rocker switch to ON, the indicator light of the BMS will light up, and the system will be activated.



CAUTION

Before the battery system is activated, all switches between the battery system and the inverter must be closed, otherwise the system will report a short circuit fault.



Start battery system

Once started, the LED lights of BMS will be in different status according to battery status as below:

LED status when normal start

Item	LED	Function
1	Run	Indicates battery operating status
2	ALM	Indicates if the battery is running with alarms or faults
3	SOC	Displays remaining battery capacity

LED Indicators

System Status	Events	RUN	ALM	SOC LED
OFF	/	OFF	OFF	OFF
Steady	Normal	Blinking1	OFF	According to SOC
	Alarm	Blinking1	Blinking3	
	Over Current, Short Current Protection	OFF	ON	
	High Temperature Protection	OFF	ON	OFF
Charging	Normal	ON	OFF	According to SOC
	Alarm	ON	Blinking3	
	Over Charging Protection	ON	OFF	ON
	High temperature, Over Current, Disable Protection	OFF	ON	OFF
Discharging	Normal	Blinking3	OFF	According to SOC
	Alarm	Blinking3	Blinking3	
	Low Discharging Protection	Blinking3	OFF	OFF
	Over Current, Short Current Protection	OFF	ON	OFF
Disable		OFF	ON	OFF

Battery capacity indicator

Status		Charging				Discharging			
Battery capacity LED		L4	L3	L2	L1	L4	L3	L2	L1
SOC (%)	0-25%	OFF	OFF	OFF	Blinking2	OFF	OFF	OFF	ON
	25-50%	OFF	OFF	Blinking2	ON	OFF	OFF	ON	ON
	50-75%	OFF	Blinking2	ON	ON	OFF	ON	ON	ON
	75-100%	Blinking2	ON	ON	ON	ON	ON	ON	ON
RUN LED		ON				Blinking3			

Blinking

Blinking	ON	OFF
Blinking1	0.25S	3.75S
Blinking2	0.5S	0.5S
Blinking3	0.5S	1.5S

3.2 System Shut Down

Before stopping the system, shut down each subsystem according to the recommended steps of the inverter.

Turn off the battery: Press the OFF/ON rocker switch to OFF.

Notes:

After stopping the system, please check below items,

Confirm all the batteries are powered OFF;

All the LEDs are OFF;

Inverter has been powered off.

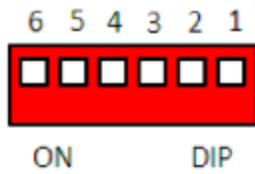
3.3 BMS address set up

After installation, installer should setup BMS address through "ADDR" switch.

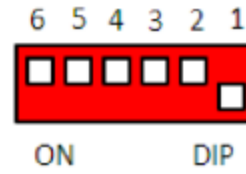
Each DIP switch definition:

There are 6 bit switches, keep the switch on down side means "1", turn up the switch to "ON" means "0".

- 1、DIP1-5 is the address dialing bit, DIP6 is the first end battery and the end battery identification dial bit;
- 2、When multiple batteries are installed in parallel, the first battery and the end battery DIP6 are turned on, DIP1-5 is dialed according to the binary code;
- 3、The default factory setting is Address: 100000;

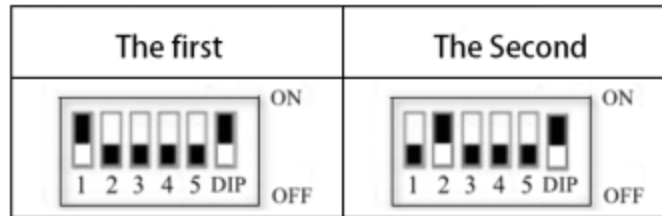


DIP(ADDR): 000000



DIP(ADDR): 100000

For example 1: for a two battery series configuration, “ADDR” setting:

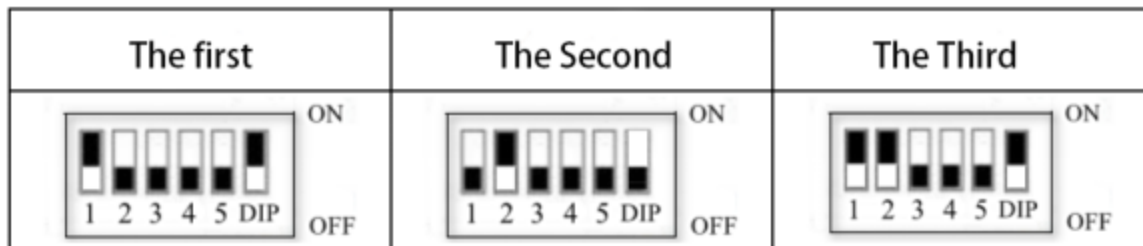


Note: Make sure that one address of BMS connects to BMU communicating with the inverter.

ADDRESS scheme for parallel configuration

	ADDR	DIP
master	1	100001
slave	2	010001

For example 2: for a three battery series configuration, “ADDR” setting:

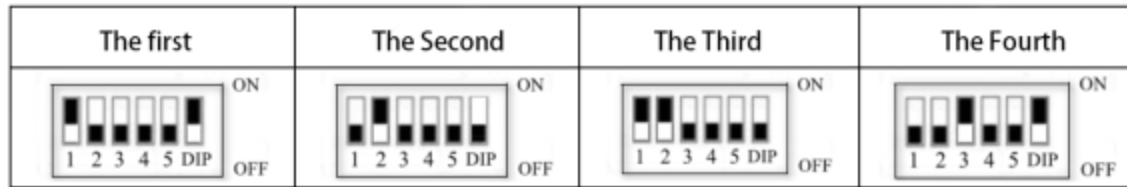


Note: Make sure that one address of BMS connects to BMU communicating with inverter.

ADDRESS scheme for parallel configuration

	ADDR	DIP
master	1	100001
slave	2	010000
slave	3	110001

For example 3: for a four battery series configuration, “ADDR” setting:



Note: Make sure that one address of BMS connects to BMU communicating with inverter.

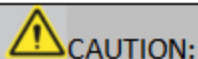
ADDRESS scheme for parallel configuration

	ADDR	DIP
master	1	100001
slave	2	010000
slave	3	110000
slave	4	001001

NOTE: The address of the BMS must start with 1, must be consecutive, cannot have 0. Only the BMS with the first address is connected to the inverter.

4 Precautions

4.1 Cleaning



CAUTION:

Before cleaning the Powerfree Cube, the system must be switched off.

The Powerfree Cube system is recommended to be cleaned periodically. If the enclosure is in a dirty condition, please use a soft and dry brush or a vacuum cleaner to remove the dirt.

Do not try to use liquids such as solvents, abrasives or corrosive liquids to clean enclosure.

4.2 Recharge requirement with normal storage

The Powerfree Cube should be installed in locations with a ambient temperature range

of $0^{\circ}\text{C}\sim+50^{\circ}\text{C}$ and where the humidity is less than 80%.

When battery storage time exceeds 5 months (before storage, ensure that the SOC is not less than 30%), a regular maintenance schedule according to the following table must be followed. Charge battery with current of 0.2C (40A) for 2 hours when maintenance.

Storage parameters under different storage conditions-1

Storage environment temperature	Relative humidity of storage environment	Storage time	SOC
Below -20°C	/	Avoid	/
$-20\sim 25^{\circ}\text{C}$	5%~70%	≤ 12 months	$30\%\leq\text{SOC}\leq 60\%$
$25\sim 35^{\circ}\text{C}$	5%~70%	≤ 6 months	$30\%\leq\text{SOC}\leq 60\%$
$35\sim 45^{\circ}\text{C}$	5%~70%	≤ 3 months	$30\%\leq\text{SOC}\leq 60\%$
Above 50°C	/	Avoid	/

4.3 Recharge requirement with over discharge storage

If module is over-discharged during storage, the module will be damaged after several days if the module has not been recharged on time. (Before charging the over-discharge battery, ensure that the voltage of the single battery is higher than 2.5V)

Storage parameters under different storage conditions-2

Storage environment temperature	Storage time
$-20\sim 25^{\circ}\text{C}$	≤ 15 days
$25\sim 45^{\circ}\text{C}$	≤ 7 days

4.4 Battery over discharged

In the case of power cuts, continuous rainy days etc., the battery may get over-discharged. It will still provide limited energy, but users should pay attention to the backup time of the battery.

4.5 Force Majeure

Catastrophic accidents, including lightning, floods, earthquakes, fires and other natural disasters, can bring unpredictable damage to the whole system.

4.6 Emergency

Please cut off the power supply and turn off the battery in emergency. Contact our after-sales service immediately.

5 Service contact

In order to protect your rights and interests, after you purchase our products, if you encounter problems with the installation and use of the product, you can contact us or the dealer, and we will provide you with after-sales service as soon as possible.