
# Installation Manual Of Growatt SP2000

# list

# 1 Brief Introduction

## 1.1Preface

This manual will provide the users who use the Growatt SP2000 energy storage system of GROWATT NEW ENERGY TECHNOLOGY CO.LTD.SHENZHEN (Short for Growatt New Energy as below) with detailed product information and installation instructions. Please read this manual carefully and keep the manual where it can be easily referred to if necessary. If there are any upgrades to the SP2000 System you will be notified by the manufacturer.

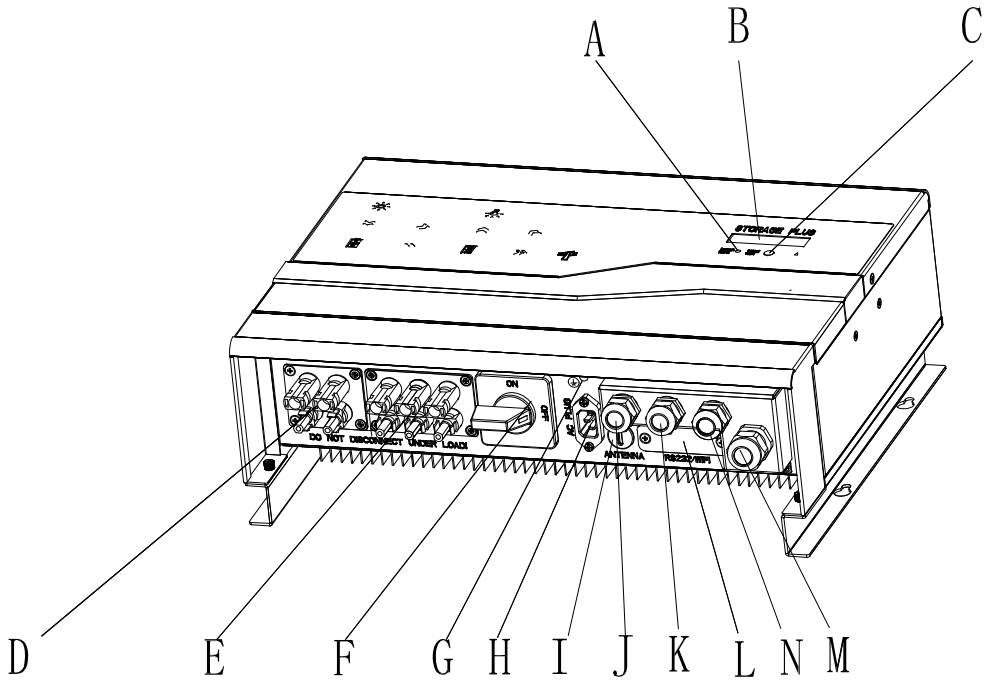
## 1.2Target Group

The SP2000 storage system must only be installed by suitably accredited engineers who have relevant certification for the local regulation requirements. Careful reading of this manual will provide the relevant information for installing, troubleshooting and communications set-up for Growatt SP 2000. If you have any questions in the process of installation or set up, you can contact your local distributor or you can login into www.growatt.com and email message. Or you can call our 24-hour service hotline (+86 755-29467281 & +44 7580-075-155)

## 1.3Product Description

The Growatt SP 2000 is used to store excess energy generated by photovoltaic panels into a battery storage system. The excess energy can then be called on through the SP2000 and the inverter at night. The Growatt SP 2000 adopts the conversion of topology in both directions, and will manage both charge and discharge of the battery storage system.

**Overview:**




| Position | Description |
|---|---|
| A | Tap on the marked area |
| B | LCD display screen |
| C | LED of status display |
| D | DC output |
| E | panel input |
| F | DC switch |
| G | Secondary grounding terminal |
| H | AC socket |
| I | The reserved antenna hole |
| J | Current sensor and NTC sensor(Lead-acid battery only) socket |
| K | LAN cable socket(for cables monitoring) |
| L | RS232 port cover |
| M | battery connection point |
| N | BMS RS485 communication cable socket(Lithium battery only) |

## 1.4 Safety Instructions

1. Pease read this manual carefully before the installation. The manufacturer reserves the right to negate warranty if the installation has not been carried out in accordance to this manual.
2. The installation of the Growatt SP 2000 storage system must only be carried out by suitably qualified installers.
3. During installation, no covers or outer casings should be removed - no parts within the units should be touched.
4. All electrical works must comply with the local electrical safety standards.
5. Any electrical work must be carried out by a suitably qualified engineer. It is recommended that you establish

with your installer any ongoing service and support arrangements for any work carried out.

6. Any equipment supplied to the grid should be registered to the local grid should be registered with.

7. If PV modules are being installed or worked with in daylight, the panels should be covered or isolated due to risk from DC voltage generation.

# 2 Safety

## 2.1 Purpose Use

The system chart of SP2000 storage solution:

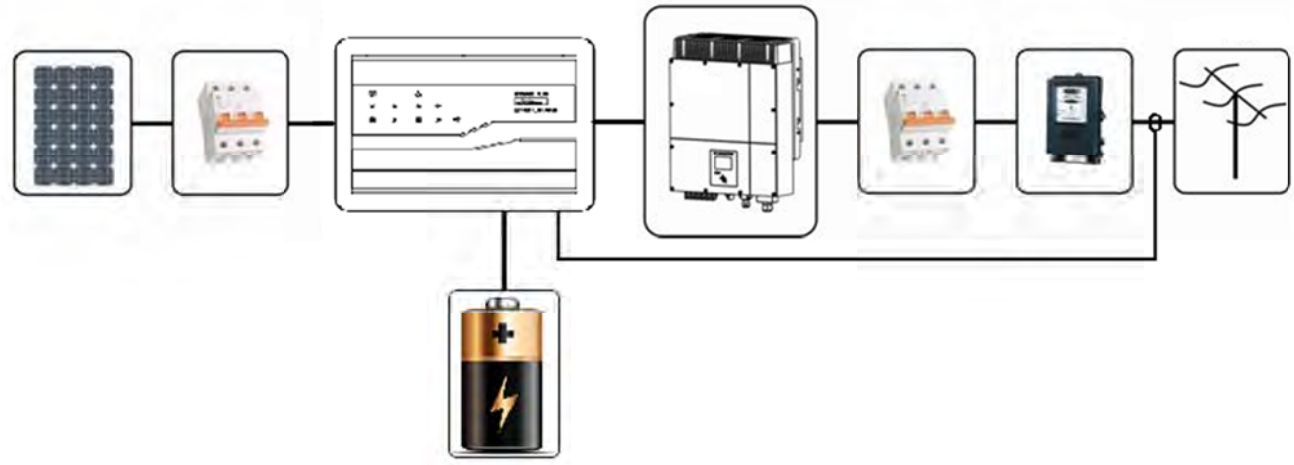


Chart 1.1

As shown above, a standard complete grid-connected PV storage system consists of PV modules, SP2000, battery, PV inverter, utility grid and other components. When including or retrofitting the SP2000 Storage System no other core components are required.

**Attention**:

The SP2000 Storage system uses Lithium or Lead-acid batteries to store DC electricity from the PV panels. Therefore, the installation environment should have ventilation, and should ideally be at the temperature range in between 0-40 degree C with temperature control, moisture range of 5%-85%. The installation environmental conditions should be at least IP20.

## 2.2 Safety Measure


**Risk of high voltage !**

- Relevant operation only by professional personnel
- Keep children, disabled away from the storage system


**Risk of burns due to hot enclosure parts !**

- Some parts of the enclosure may become hot during operation. Do not touch any parts other than the front lid during operation.


**SP2000 may emit slight amount of electromagnetic wave during operation !**

Don't stay a long time within the range of 20cm from the SP2000 storage unit.

## 2.3 Symbols introduction on the SP2000 unit

| symbol | description |
|---|---|
|  | Dangerous voltage! |
|  | Risk of burns ! |
|  | Point of connection for grounding protection |
|  | Direct Current(DC) |
|  | Alternating Current(AC) |
|  | The SP2000 storage unit complies with the requirements of the applicable CE guidelines |

# 3 Product Description

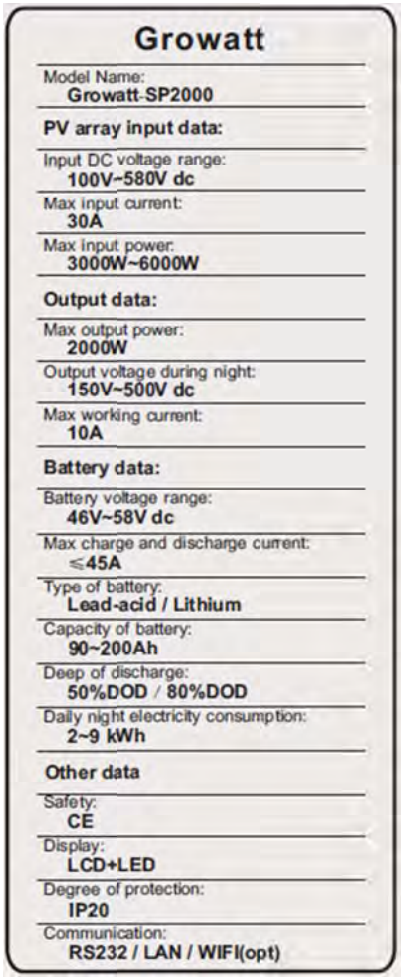
## 3.1 Growatt SP 2000 storage unit

### Display and labels of SP2000 Unit

| Mark | Description | Explanation | |
|---|---|---|---|
| knock here ○ | Tap symbol | Tap to operate SP2000 unit (Detailed in section 6) | |
| Normal Fault ○ STATUS | Status symbol of SP2000 | Green light on | SP2000 running normally, charging or discharging |
| | | Red light on | fault state |
| | | Red light blinking | 1.Alarm state<br>2.Software updating |

## 3.2 Product Label Explanation

Label contains the following information:



Description of label：

| Product Model | Growatt SP2000 |
|---|---|
| Input voltage range | 100-580Vdc |
| Max input power range of SP2000 | 3000-6000W |
| Max input current | 30A |
| Max charge and discharge power | 2000W |
| Discharge voltage range at night | 150-500Vdc |
| Max charge and discharge current of SP2000 | 10A |
| Battery voltage range | 46-58Vdc |
| Max charge and discharge current of battery | ⩽45A |
| Suitable battery types | Lead acid battery or lithium battery |
| Recommended battery capacity range | 90-200Ah |
| The discharge depth control of battery | Lead battery50%DOD<br>Lithium battery80%DOD |
| Discharge capacity at night | 2-9kWh |
| Safety certification | CE |
| Display | LED status display<br><br>LCD information display |
| Degree of protection | IP20 |
| Communication type | RS232/LAN/WIFI(choice) |

## 3.3 Size and weight

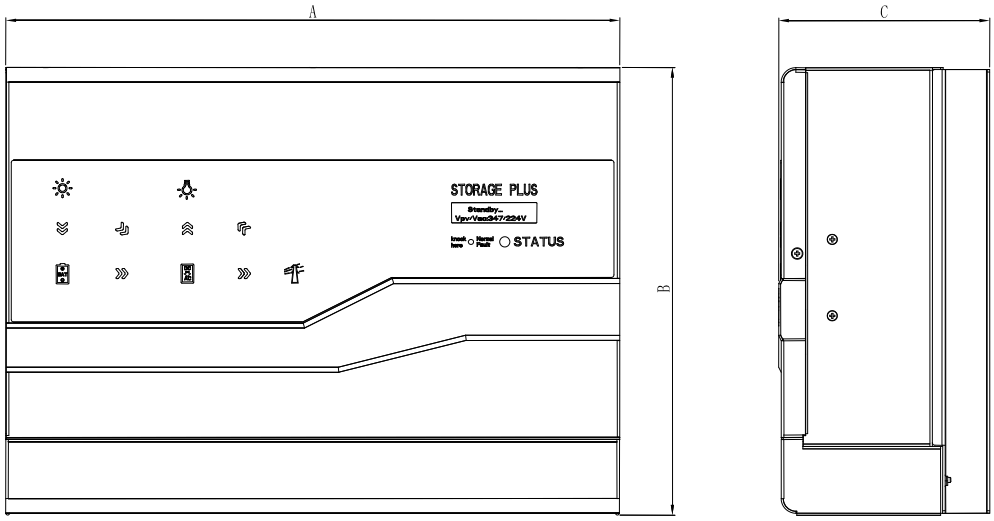



Chart 3.1

| | A(mm) | B(mm) | C(mm) | weight(kg) |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| Growatt SP 2000 | 482 | 355 | 166 | 12 |

## 3.4 The advantages of Growatt SP2000 storage system

Features below:

- Simple addition to existing PV system with standard string inverter
- Battery management system, To satisfy pattern of Lead battery and lithium battery
- Wide working voltage range：100V~580V。
- Easy installation。
- Max efficiency 94%。
- Wireless or cabled monitoring via Internet.

# 4 Unpacking

Please check whether external packaging has any damage before unpacking

At the point of unpacking the system, please check for any damage or missing parts. This must be reported immediately to the supplier.

Growatt SP2000 unit parts and accessories are follows:

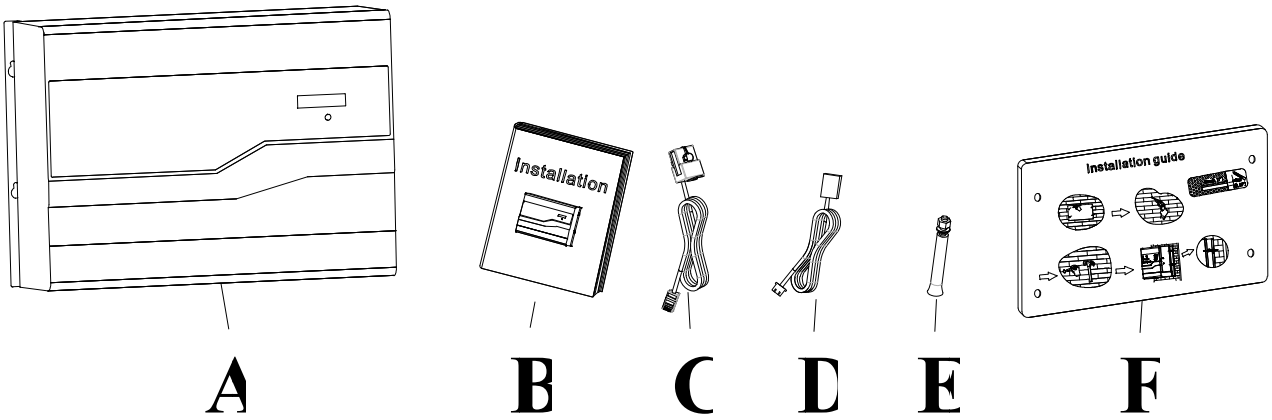



Chart 4.1

| Item | Number | Description |
|---|---|---|
| A | 1 | Growatt SP2000 unit |
| B | 1 | User Manual |
| C | 1 | electric current sensor (Standard wire length 5m) |
| D | 1 | Battery temperature sensor(Standard wire length 1.5m/ **only for lead-acid battery**) |
| E | 4 | M6 Setscrew |
| F | 1 | Paper board(installation guide) |

# 5 Installation

## 5.1 Basic installation requirements

A The installation location must be suitable for the SP2000(and the lithium battery pack)'s weight for a long period time

B The installation location must be suitable for the dimension of the SP2000 storage system(SP2000 unit + battery)

C Do not install the units on structures constructed of flammable materials

D Do not install the SP2000 storage system near flammable material.

E The (Ingress protection) rate is IP20 which means the unit can only be installed indoors.

F The battery unit should be installed close to the Controller unit.

G The humidity of the installation location should be 0 ~ 95%

HThe ambient temperature should be within -25℃ ~40 ℃

I The SP2000 Storage Unit can be installed in vertical or leaning back position, but not leaning forward or flat position. Please refer to the below

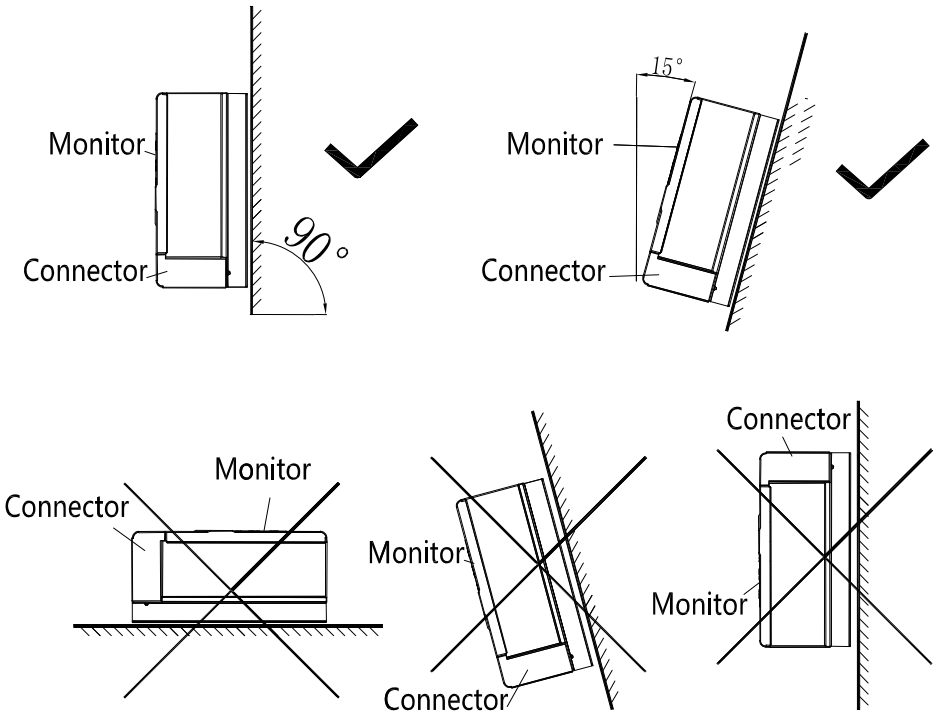



Chart 5.1

J In order to ensure optimal operation and easy access to the SP2000 unit, please refer to the diagram below for the installation:

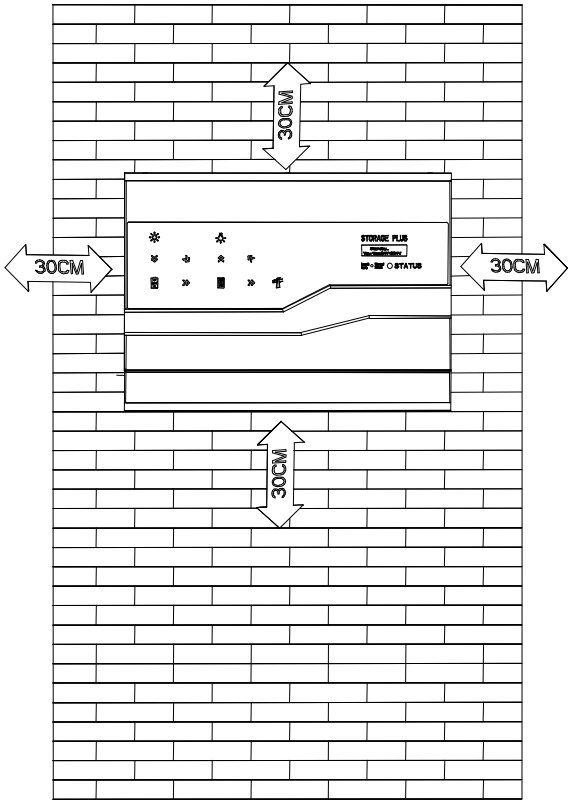



Chart 5.2

K Do not install the SP2000 unit near television antenna or any other antennas and antenna cables
L Do not install the system in a living area – roof spaces and garages are ideal.
M Ensure that the system is out of the reach of children or non-competent adults.

PLEASE NOTE: The SP2000 storage system CANNOT BE INSTALLED NEAR FLAMMABLE MATERIAL. Improper installation or broken cable may cause arc which may cause serious fire if there is flammable material nearby. Growatt will assume no liability for any loss caused by improper installation or failure to observe the installation manual.

## 5.2 Installation Instructions

Note：
Before installation, please first confirm if it is an existing grid-connected PV system or a totally new installation. If it's a new installation, please install and commission the grid-connected inverter first, then follow the steps below to integrate the Storage plus system into the PV system.

### 5.2.1 Installation Layout

The installation plan for installing the SP2000 System in a property is as follows:
The SP 2000 needs to be installed near the mains entry to the property.(The red line in the diagram below is current sensor line, The wire length is 5m（no more than 15m）,Installation position needs to consider distance less

than it)

The SP2000 requires an AC plug point for AC power to the unit. The positioning of the unit must also consider the need to connect a current sensor from the controller unit to the outgoing AC supply from the property. The RJ45 cable (with sensor attached) is 5m in length. The maximum length should not exceed 25m. YOU MAY NEED TO PROVIDE A NETWORK CABLE AND RJ45 CABLE COUPLER TO EXTEND THE LENGTH IF THE REQUIRED DISTANCE IS MORE THAN 5M.)

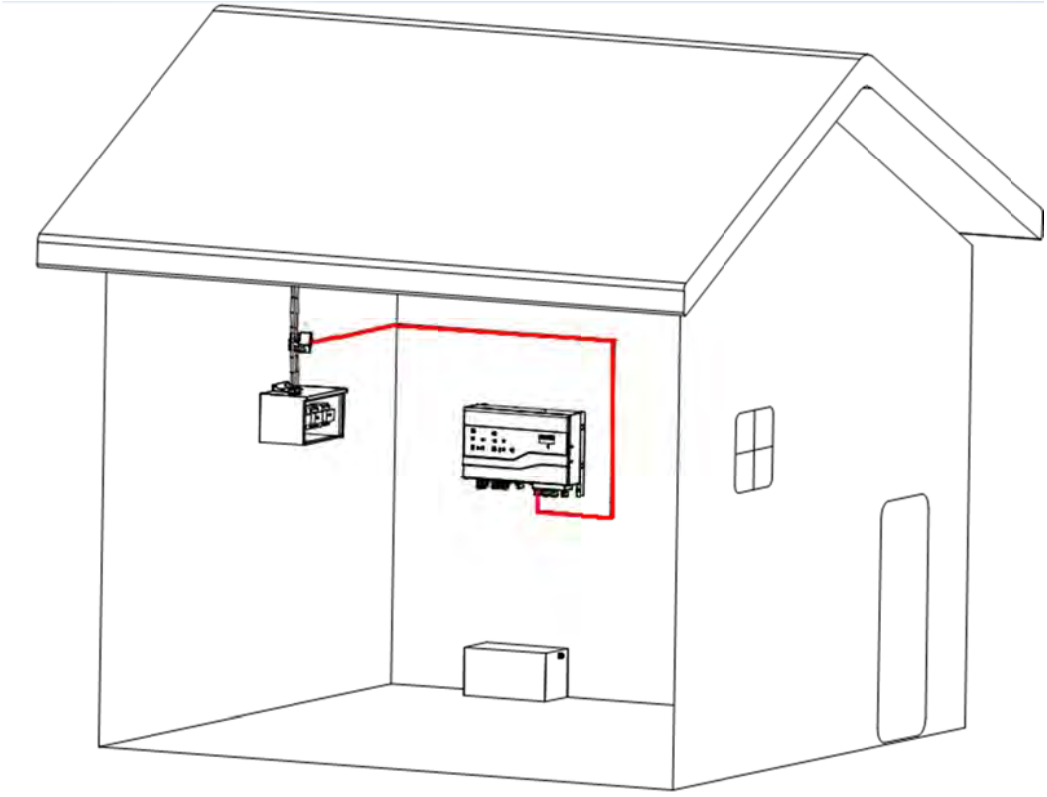


Chart 5.3 *** AN AC SUPPLY SOCKET IS REQUIRED TO POWER UP THE SP2000 UNIT**

The whole system diagram is as follows ：

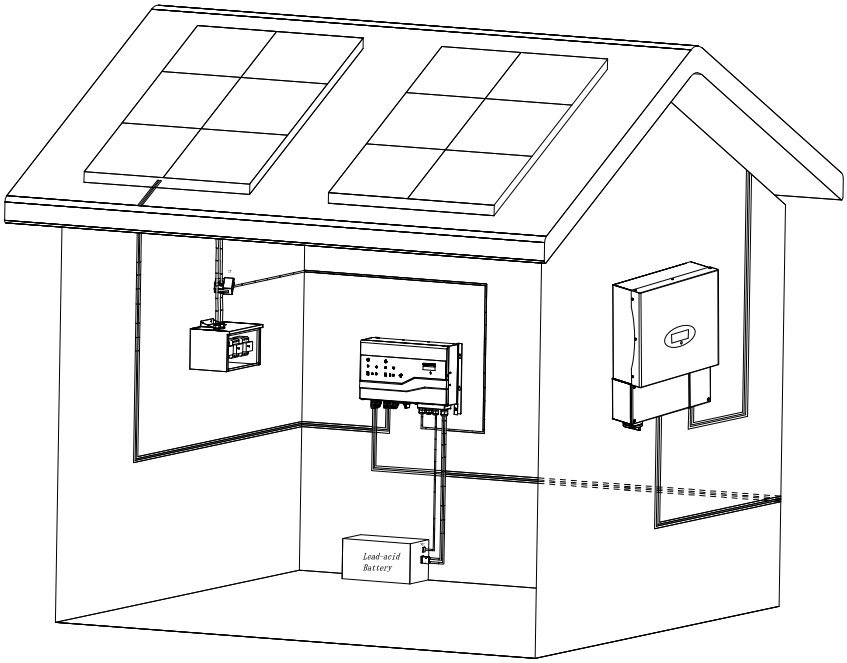
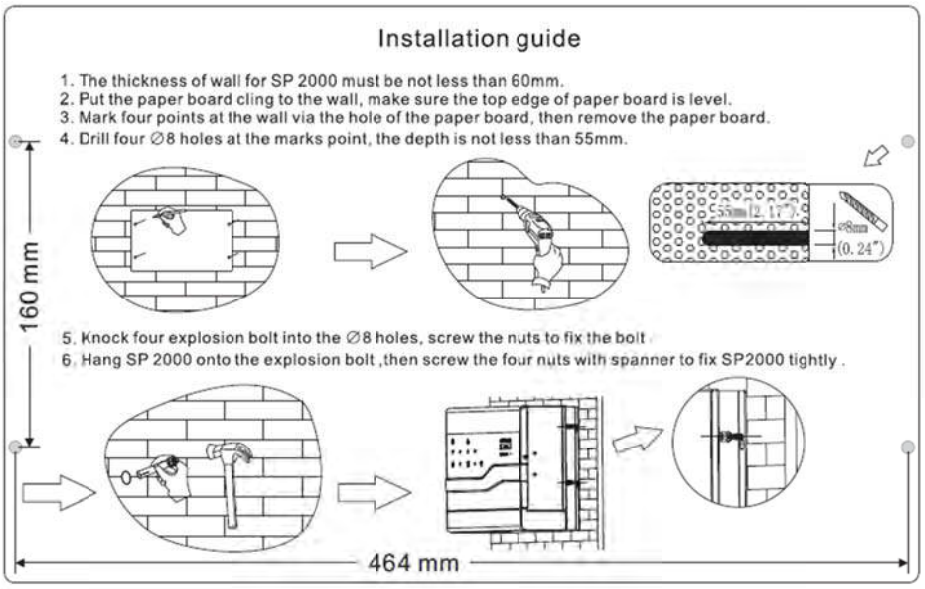


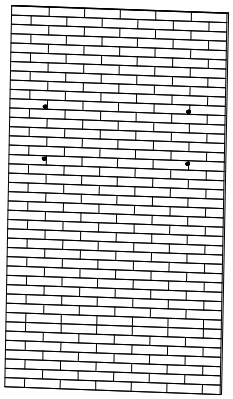

Chart 5.4

### 5.2.2 Installation of energy storage machine

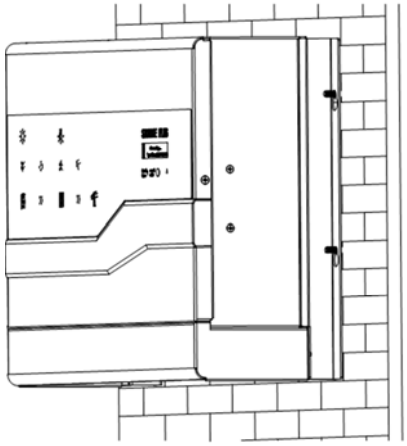
1. The controller unit weighs 12 kg, and the Lithium Battery unit weighs 45 kg. Therefore sufficiently strong locations must be provided in order to attach the units vertically.
2. A paper fixing guide is provided to assist with locating the necessary fixing points for the controller.（As the chart 5.5a below）
3. Mark four points on the wall using the plan guide.
4. Drill four Φ8 holes at the marked points, the depth is a minimum of 55mm.
5. Fix the four expansion bolts into Φ8 holes（As the chart 5.5b below）
6. Hang the SP2000 unit on the four fixings（As the chart 5.5c below）
7. Lock the nut of setscrew（As the chart 5.5d below）
8. The whole installation has finished（As the chart 5.5e below）


Installation guide
1. The thickness of wall for SP 2000 must be not less than 60mm.
2. Put the paper board cling to the wall, make sure the top edge of paper board is level.
3. Mark four points at the wall via the hole of the paper board, then remove the paper board.
4. Drill four ∅8 holes at the marks point, the depth is not less than 55mm.
55mm(2.17")
∅8mm
(0.24")
160 mm
5. Knock four explosion bolt into the ∅8 holes, screw the nuts to fix the bolt .
6. Hang SP 2000 onto the explosion bolt ,then screw the four nuts with spanner to fix SP2000 tightly .
464 mm

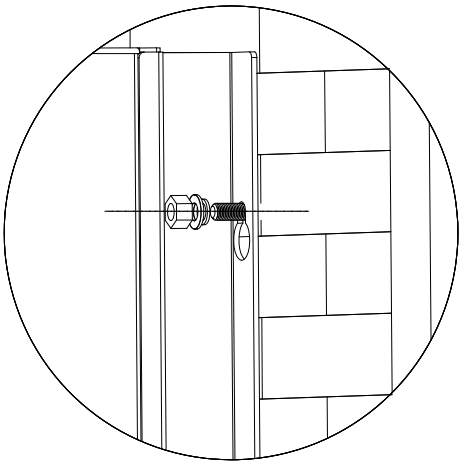
a)



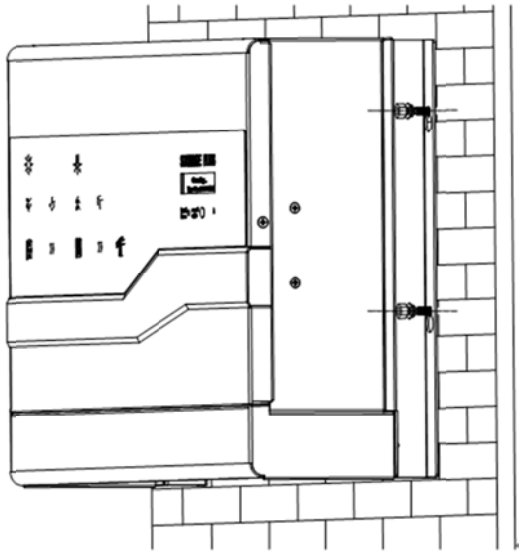
b)



c)



d)



e)

Chart 5.5

## 5.3SP2000 Storage System application schematic

### 5.3.1 Difference between Traditional Photovoltaic System and Storage System

The Growatt SP 2000 storage system is for use with single-phase grid-connected string inverters. Up to 3 equal strings can be connected to the SP 2000.

THIS SYSTEM IS NOT DESIGNED FOR MULTI-TRACKING INPUTS. If you have dual MPPTs (this is where panels are in odd numbers, or facing different directions such as East and West) then the option is to use one of the MPPT inputs(usually the one with the most panels).

A typical single-phase inverter system is shown as below:

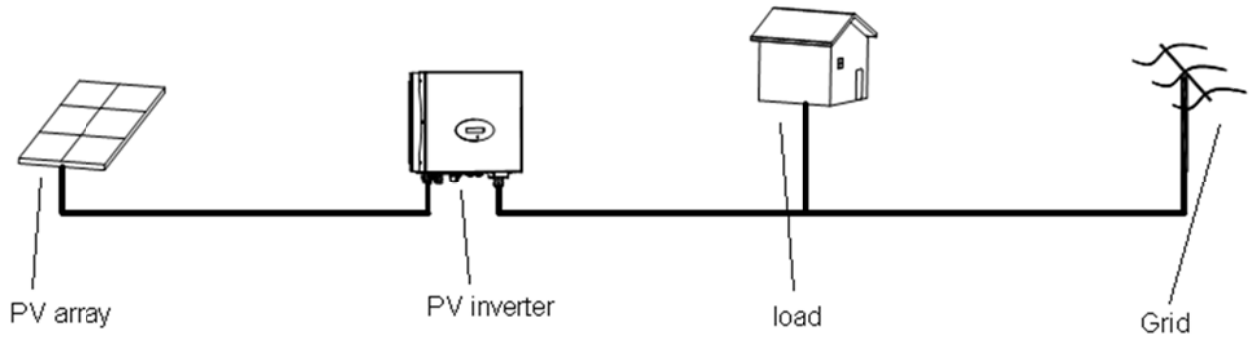



Chart 5.6

Typical single-phase inverter system consists of PV panels, PV inverter, load and power grid. The inverter supplies the power generated by solar panels to the property load. Extra electricity will be fed to the grid when generated power is more than the property load demands. Where demand is higher than the PV panels are generating, the grid will supply the additional required load.

PV Storage System with SP2000 is shown as below:

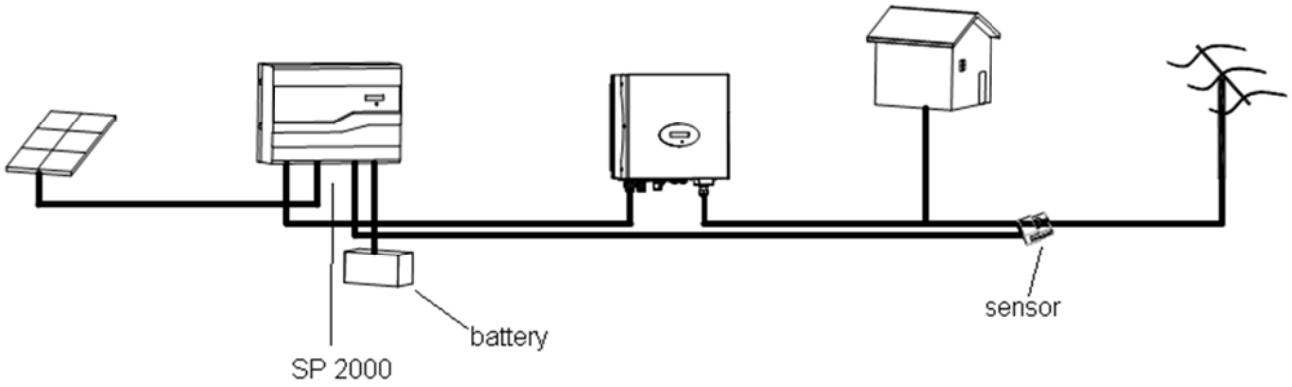



Chart 5.7

In the above the SP2000 unit, the battery pack, and the sensor have been added to a typical PV system. The SP2000 and Battery pack are installed on the DC side, and the SP2000 is registering any power being exported from the property.

### 5.3.2 Storage System installation with Dual-MPPT inverter

If an installation uses a Dual or Twin tracking inverter because the installation has panels on two opposing roofs, or the installation strings have different number of panels, then you can use one of the 2 MPPT inputs – generally whichever has the greatest generation, and leave the other string(s) going directly to the inverter. Installation diagram as below:

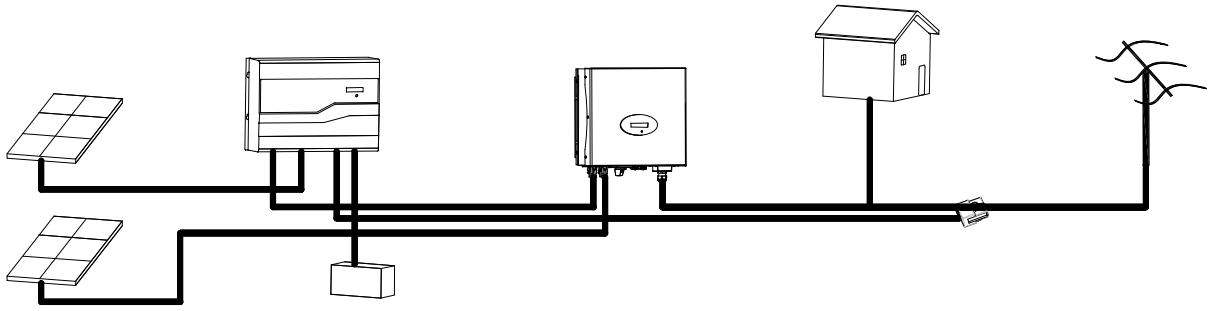


Chart 5.8

If the installation wishes to use both strings of a Dual Tracking inverter, then as in the diagram below each string will need its own storage system(SP2000, battery pack and sensor).

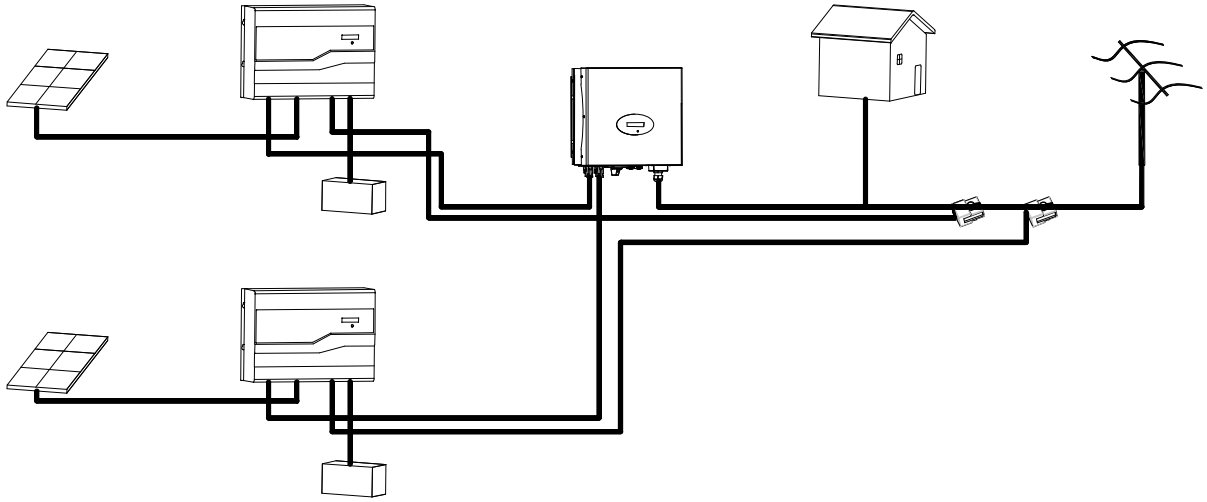


Chart 5.9

**Notice:** During the installations above, please note the position of the sensors.

### 5.3.3 Installation steps for Upgrading an existing PV system

Steps to add the SP2000 storage system to an existing PV system are as follow:

Step 1: Fully isolate the DC and AC supplies to the system before carrying out any work. Using MC4 connectors attach the string or strings from the PV panels into the inputs on the SP2000 Controller.

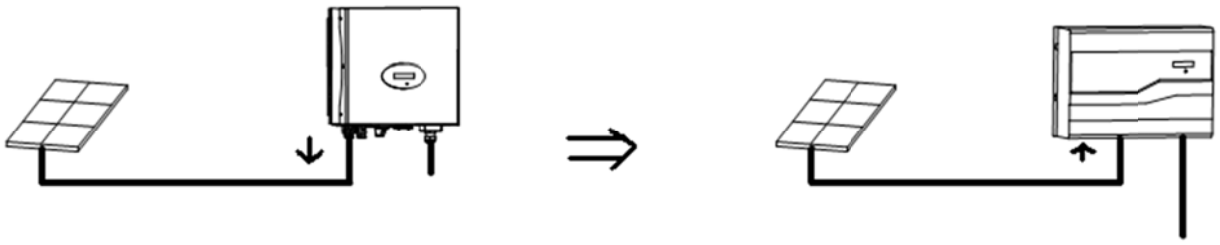


Chart 5.10

Step 2: Connect the output of SP2000 to the input of your PV inverter, as the diagram show:

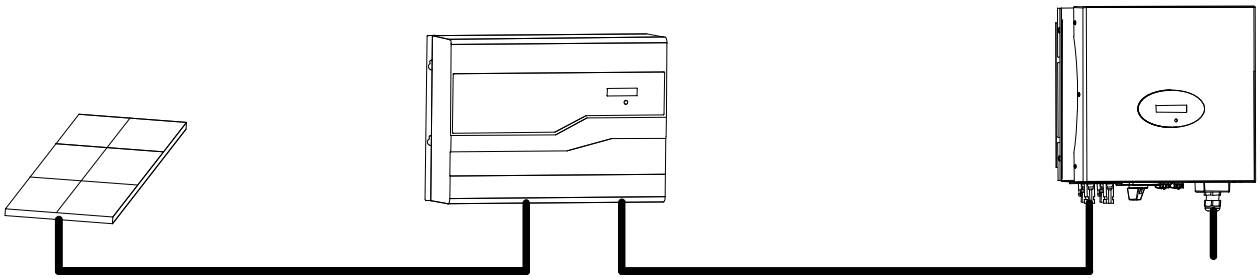


Chart 5.11

Step3: Connect the battery to SP2000, you can refer to 5.4.7 for connection of battery.

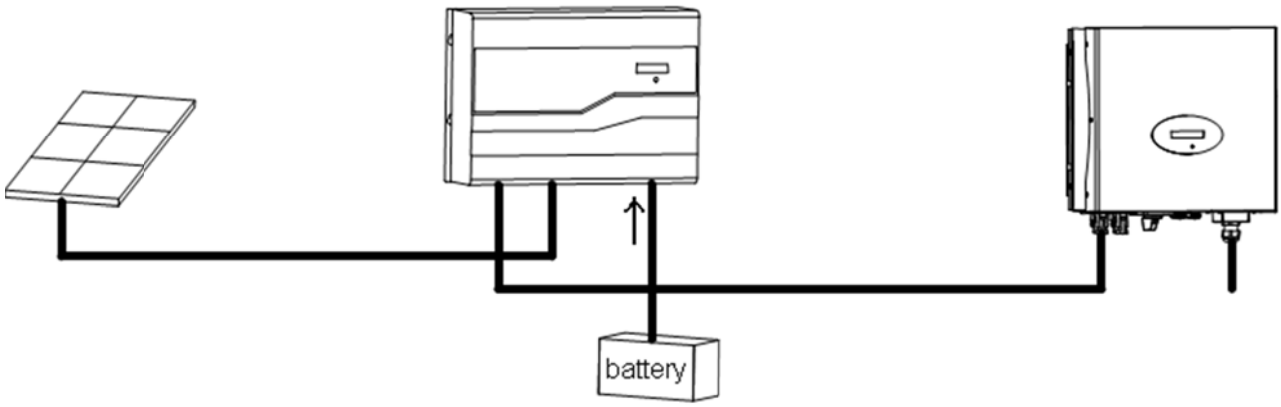



Chart 5.12

Step 4: clamp the current sensor on the property inlet live line, and connect the RJ45 end to the RJ45 socket marked with CT sensor on the SP2000, at the same time plug the AC PLUG on the SP2000 to electricity, and finally the entire system is ready to work smoothly.

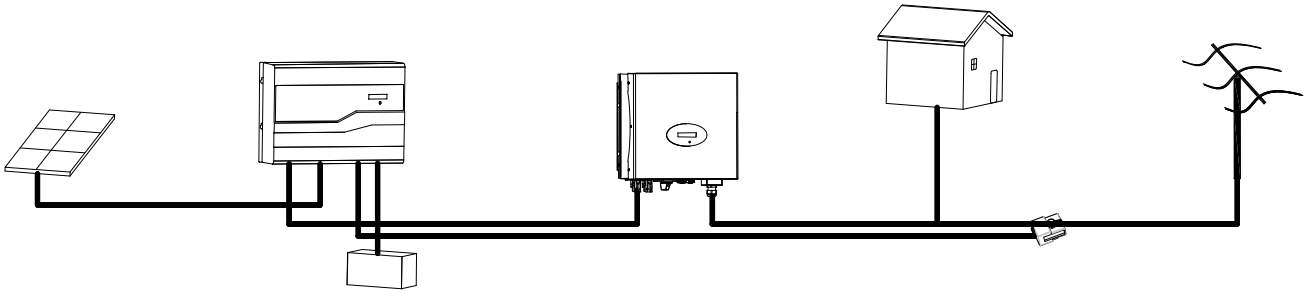


Chart 5.13

**Please note: AN AC PLUG POINT IS REQUIRED FOR THE SP2000 UNIT**

## 5.4 System Electrical Connection

### 5.4.1 SP2000 AC power supply connection

Preparations before connection:

A measure the grid voltage and frequency and make sure the voltage is 220/230Vac , the frequency is 50/60Hz in single phase.

B Connect the AC cable certificated with corresponding safety regulation to the AC PLUG section.

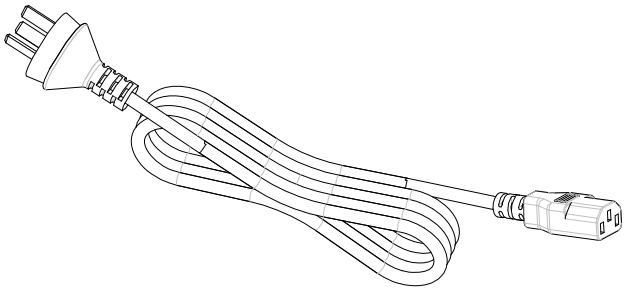
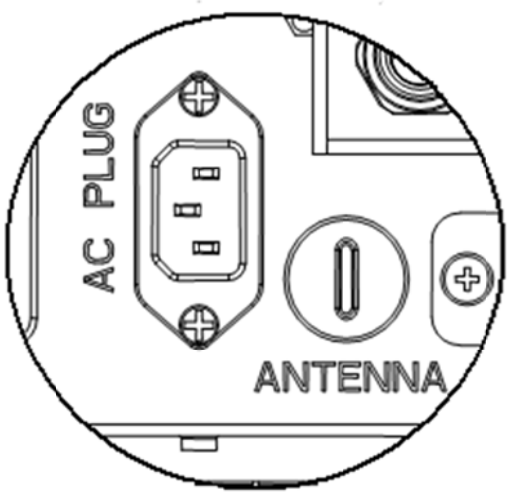


Chart 5.14



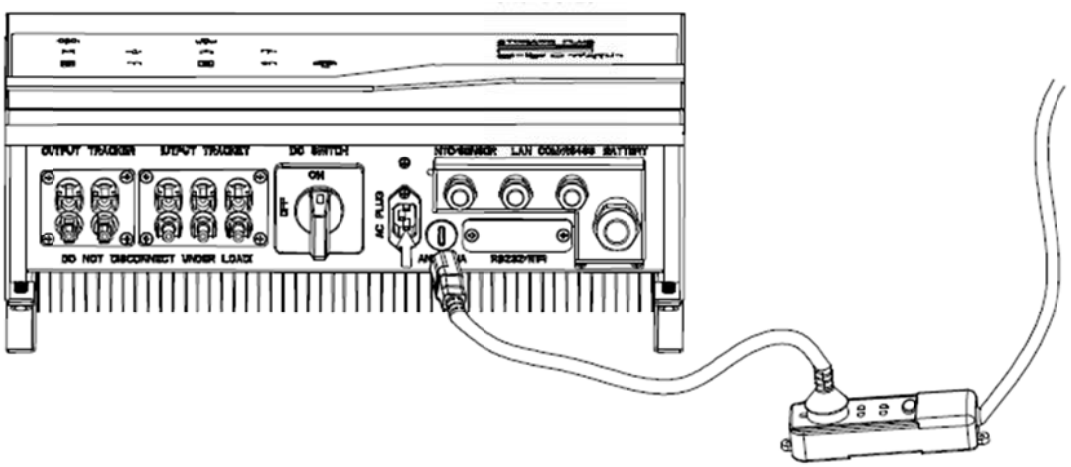


Chart 5.15

### 5.4.2 SP2000 PV Connection

1. Ensure that any cables are not installed with crossed polarity. Any reverse may cause unrecoverable damage. Ensure that the short-current (amps) of the PV strings do not exceed the max input current of the Storage Plus.
2. The diagrams below show the PV connections. The connectors are installed in pairs (male and female). The connectors for PV arrays and inverters are standard MC4.

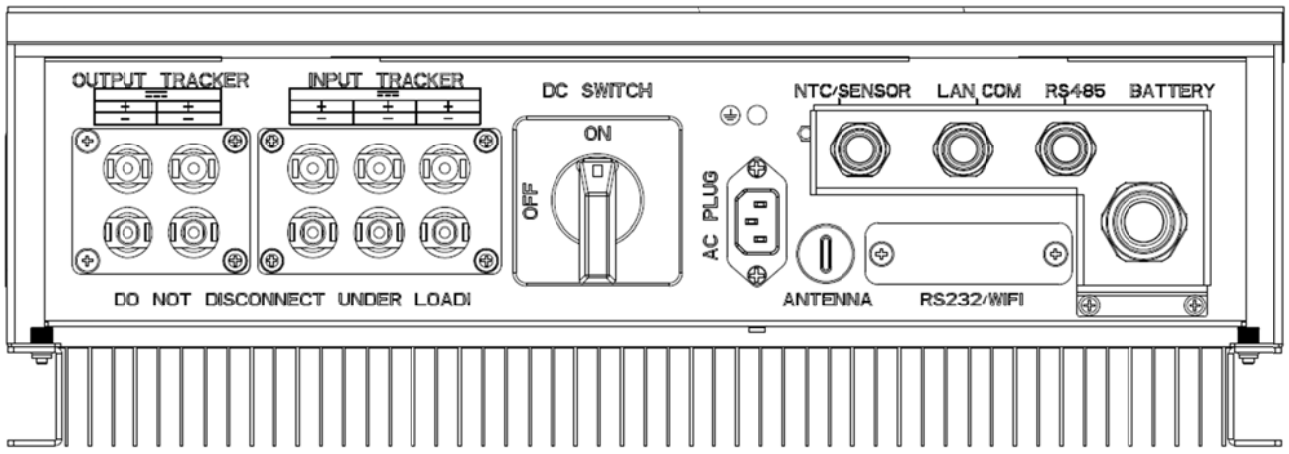



Chart 5.16

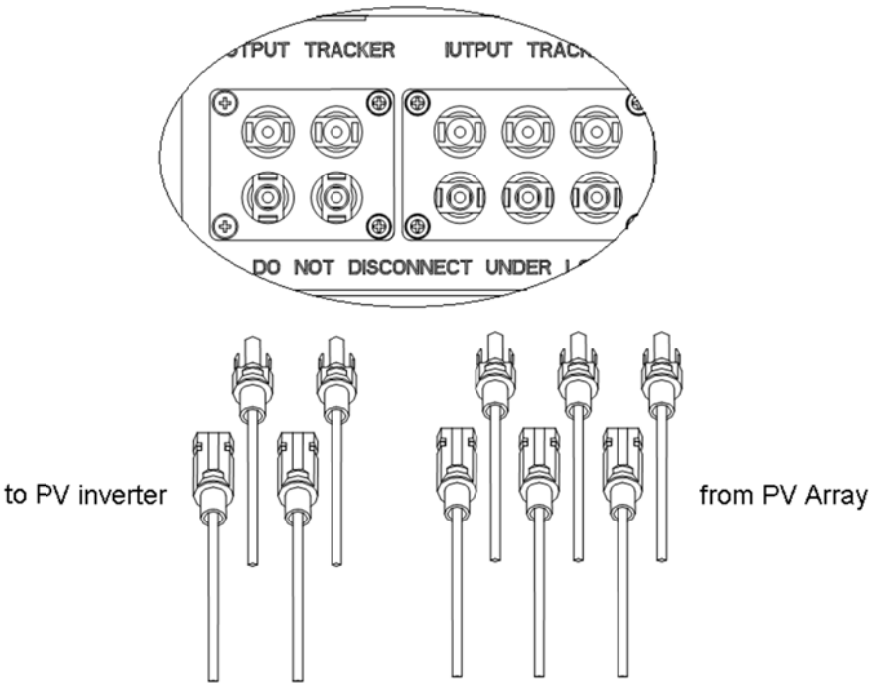



Chart 5.17

3. The table below shows the maximum input currents:

| Type | Max PV input current | Max output current to inverter |
|---|---|---|
| Growatt SP 2000 | 30A | 30A |

* Recommended cable size ≥4mm$^2$/12 AWG

### 5.4.3 Connection of Temperature sensor for Lead-acid battery

1. Please confirm your battery type before connection. For installations using Lead-acid battery, you will need to use the temperature sensor. Lithium battery has BMS system to communicate with the SP2000 unit, all the running data will be acquired through the communication, so temperature sensor is not needed, but a network cable is needed to connect the SP2000 unit to lithium battery.

2. Remove the cover plate at the terminal before connection.

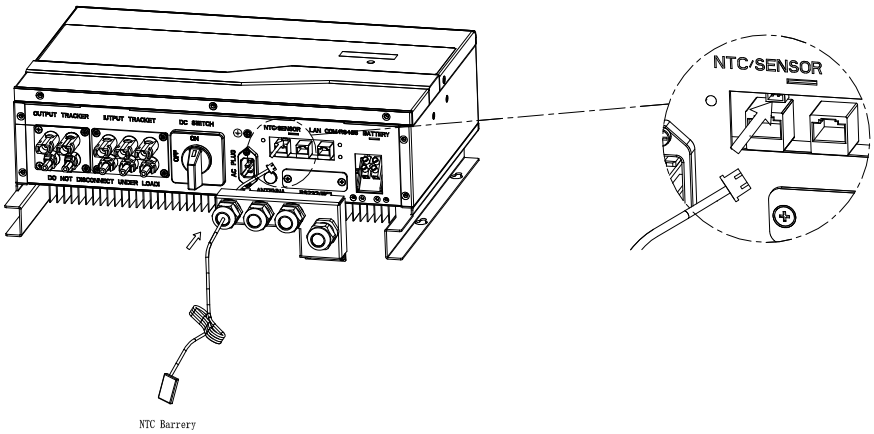



Chart 5.18

As pictured above, with the cover plate removed, take the white 2PIN female plug of the battery temperature sensor through the cover plate, and insert it into the 2PIN male plug marked with NTC/SENSOR.

**Remark:** temperature sensor wire (1.5m in length) specifications: UL1332 26 AWG TS 200℃ 300V.

### 5.4.4 Connection of current sensor

There are 2 sockets at the section of NTC/SENSOR, If you are using lead-acid battery, both temperature sensor and current sensor need to be plugged in. but for Lithium battery, only current sensor needs to be connected.

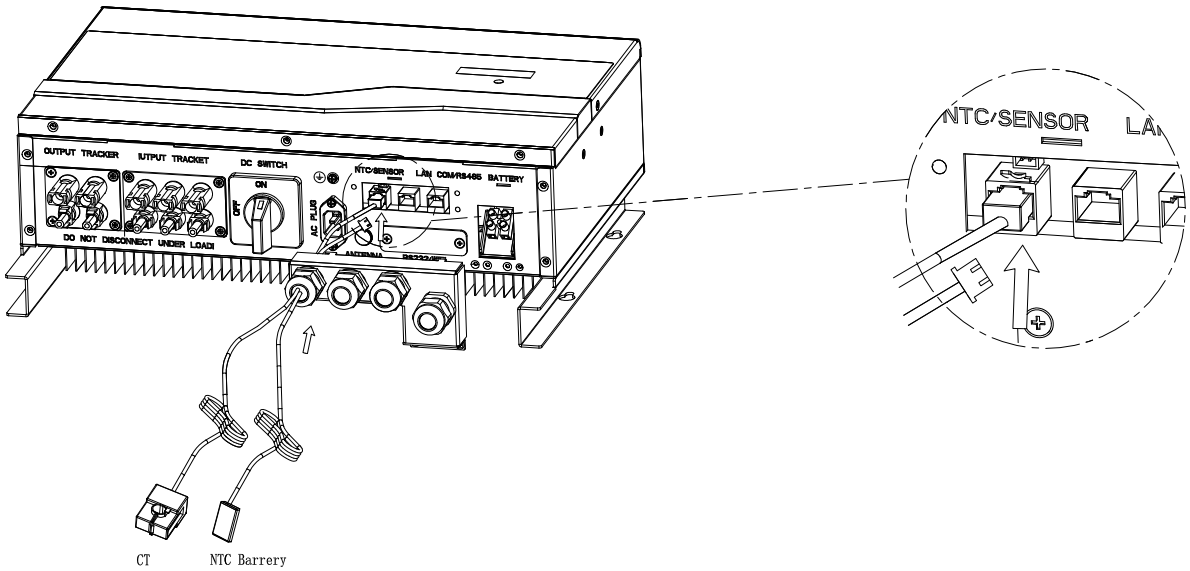



Chart 5.19

Install the temperature sensor for lead-acid battery as the diagram above.

**Current sensor connection**

The SP2000 installation requires a current sensor to be clamped on the live line of the incoming property AC supply. The current sensor should be plugged in the socket shown below,

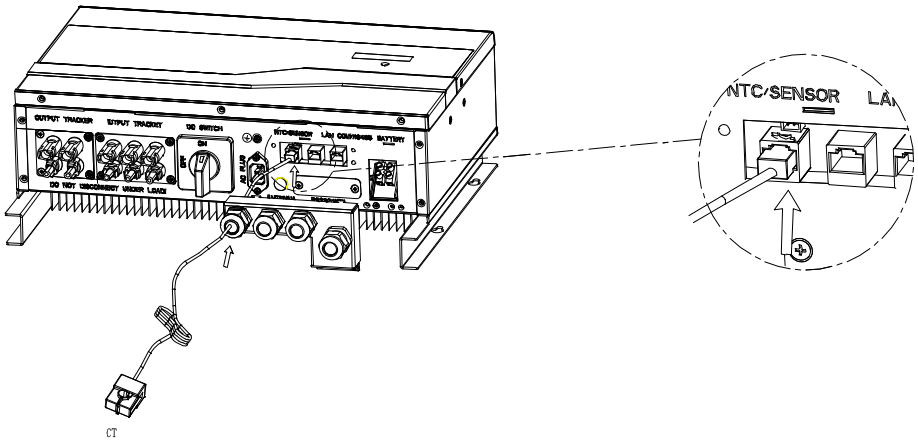



Chart 5.20

Remark: The RJ45 sensor cable is 5m in length (one end with 8P modular plug, the other connected with sensor). If

this length is not sufficient an extension can be used as shown below up to a maximum of 25m. This is shown below:

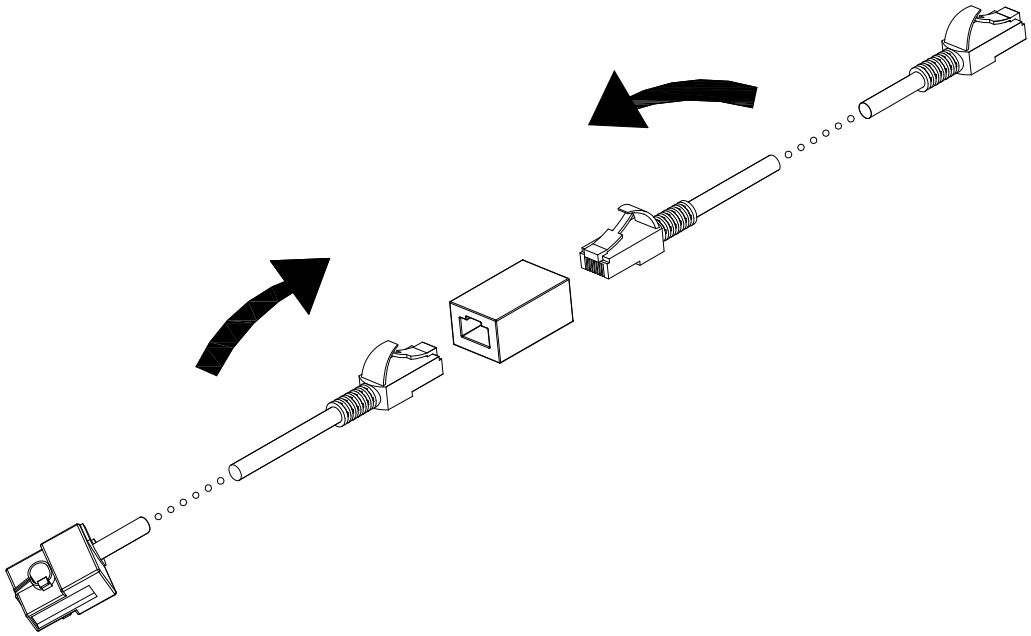


Chart 5.21

IT IS VERY IMPORTANT TO INSTALL THE AC SENSOR CORRECTLY. Please see the diagram below:

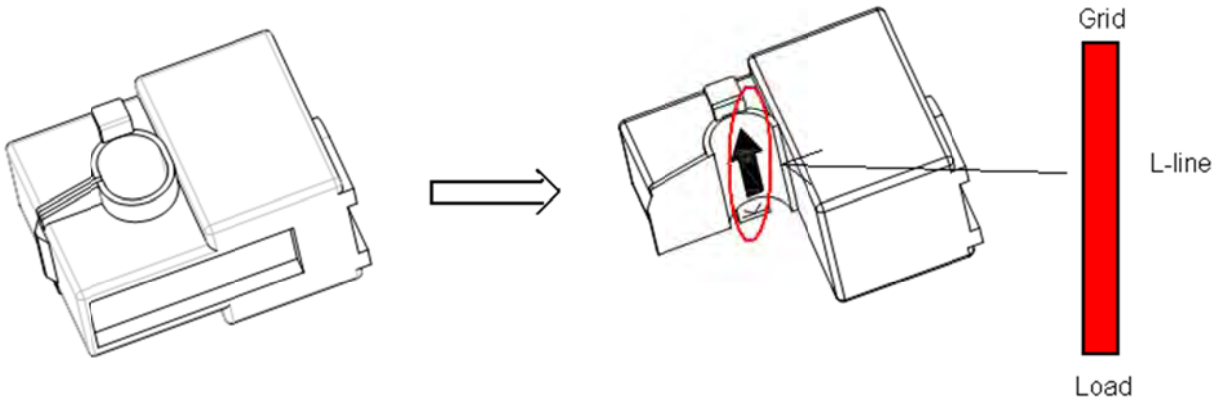



Chart 5.22

As illustrated above, open the sensor and clamp on the live line of the AC supply cable with the arrow pointing towards the Grid and away from the property. Then close and secure the sensor to complete the fitting.

### 5.4.5 Connection of Hard Wired (LAN) Monitoring

If you wish to monitor the storage system via cable (LAN), the installation steps are as follow:

1. Remove the cover plate.
2. Use the second access hole through the cover plate (Lan line), and insert it into the socket under the labeled words LAN/RS485.

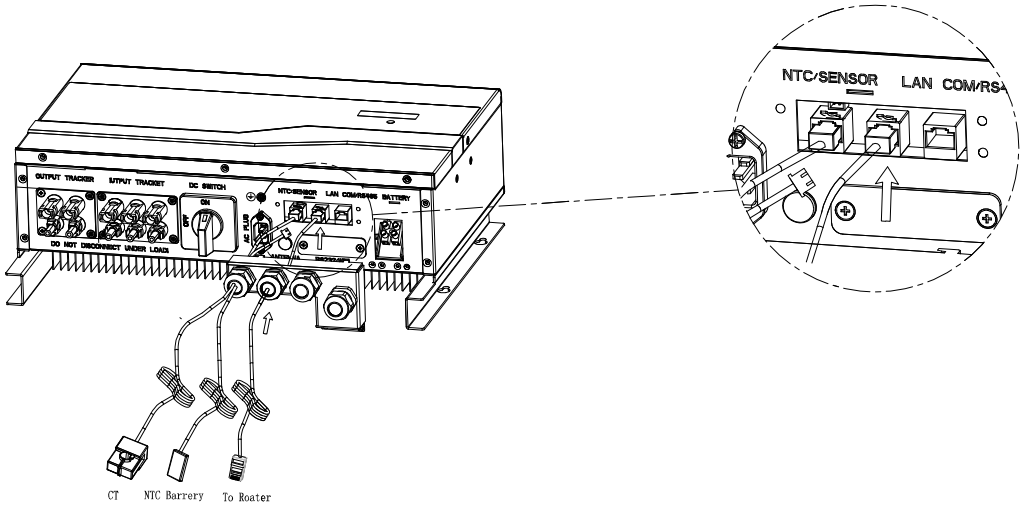



Chart 5.23

Remark: LAN line specification: RJ45, standard LAN line (with 8P modular plug at both ends).

### 5.4.6 Battery Connection

1. Ensure the polarity is correct before connecting to battery input.
2. Remove the cover plate at the terminal before connection.
3. The battery connection is located on the right side as the diagram below:

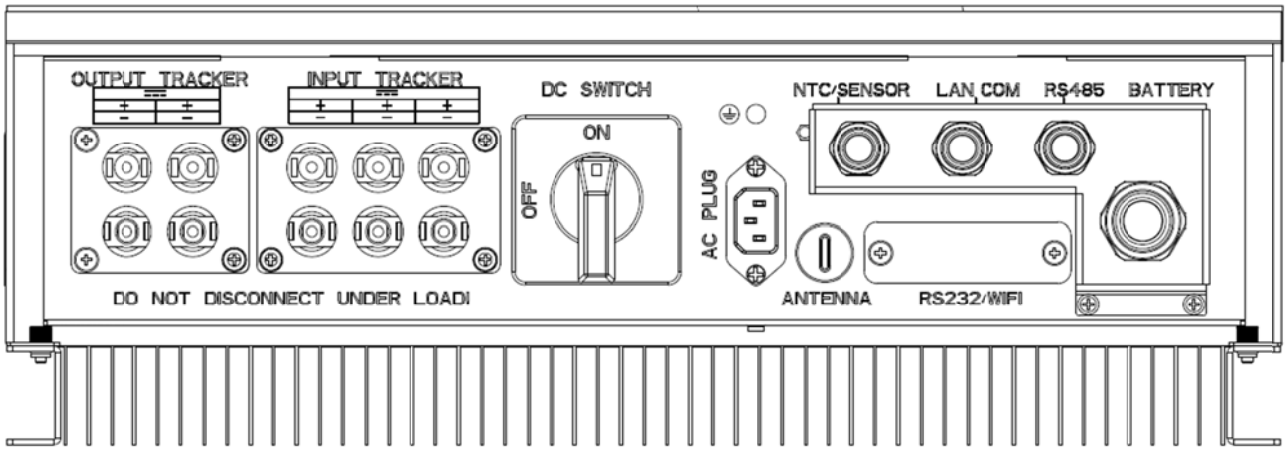



Chart 5.24

Electrical connection of battery is shown as below:

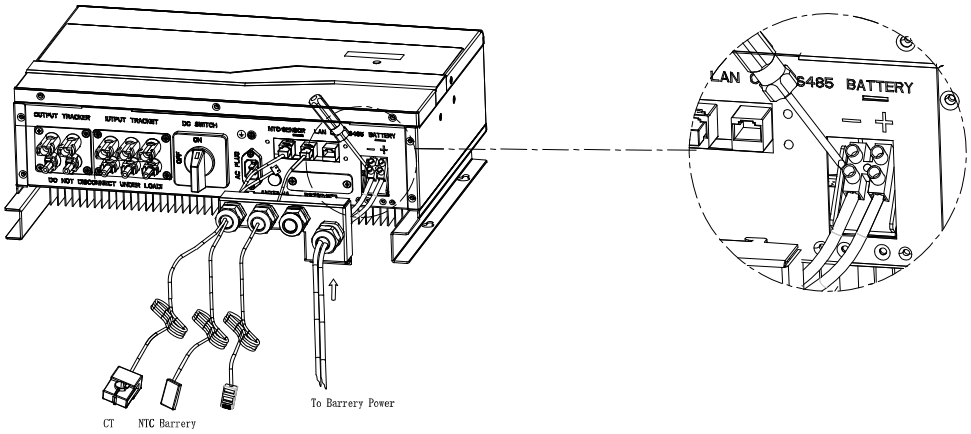



Chart 5.25

The cable connecting the Lithium Battery Pack to the Controller needs to be sized at least 8mm$^2$ or AWG8.
The length of this cable should be a maximum of 1.5m.

### 5.4.7 Communication connection between SP2000 and Lithium battery's BMS

There are communication between SP2000 and lithium battery's battery management system(BMS), so a RJ45 network cable is required to connect the battery to the COM socket of SP2000. Installation steps are as follow:

1. Firstly confirm the distance between Battery Pack and the SP2000 unit, the network cable has RJ45 fittings on both ends.
2. Ensure the LED status indicator on the battery is OFF before connecting between the Battery Pack and the SP2000.
3. Connect to the Lithium Battery Pack and into the COM port on the SP2000 unit as shown below.

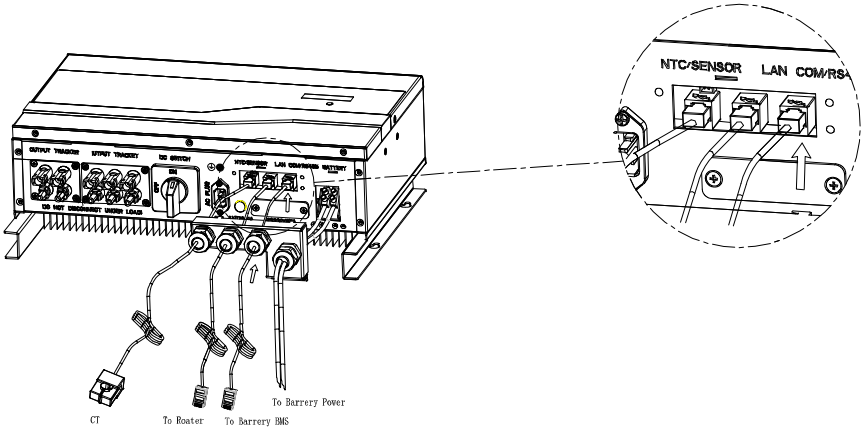



Chart 5.26

### 5.4.8 Connection to Lead-acid Battery

Before connection to the lead-acid battery, please confirm the items below:

1. The output voltage of the lead-acid batteries is 48V.
2. Total Capacity of lead-acid battery is no less than 80AH.
3. The installation cabinet of lead-acid is in a suitably ventilated area and fully meets manufacturers' specifications.

Installation of lead-acid battery is shown as follow:

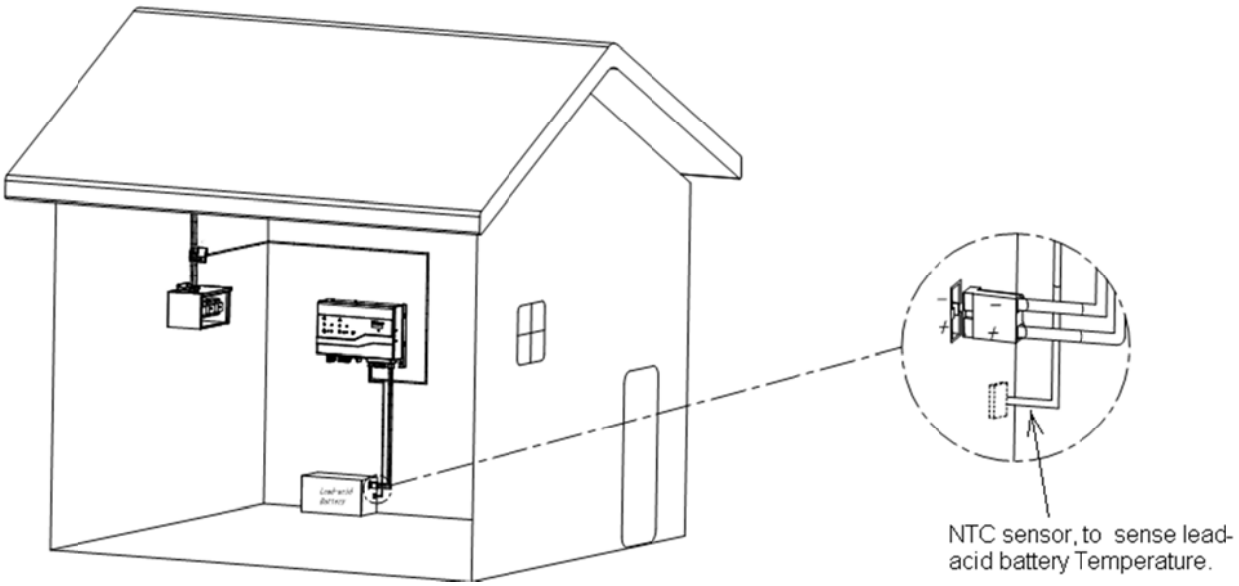



Chart 5.27

Step 1. Connect the positive pole of lead-acid battery to the positive terminal on the SP2000 unit, connect the negative pole of battery to the negative terminal of SP2000. Ensure the power cable used is at least 8mm$^2$ or AWG8.

For safety and convenience to maintain, A pair of Anderson connectors(e.g. KST BMC2S or same kind of other brand battery connectors) or a DC isolator is recommended between the SP2000 and lead-acid battery.

Step 2. Fix the NTC sensor used to detect ambient temperature of lead-acid battery onto the top of lead-acid battery cabinet. (e.g. you can use a double-sided tape to adhere the NTC sensor onto the battery cabinet).

The connection of lead-acid battery is completed.

### 5.4.9 Recommendatory connection: Connection Between SP2000 and Darfon Lithium Battery

Darfon is qualified lithium battery manufacturer of Growatt. As to the detailed operation of Darfon Lithium battery you can refer to user manual of Darfon lithium battery in the packing box. Connection between SP 2000 and Darfon battery as follow:

1. Firstly insure the' status' LED indicator of lithium battery is in the extinguished status.
2. Prepare to connect the DC power cables and communication cable between lithium battery and SP2000, the sectional area of the DC power cable should be at least 8mm$^2$, you are advised to use the KST BMC2S connector, which is within the battery packing box, to connect the battery. The communication cable is standard straight through RJ45 network cable crimped with RJ45 modular plugs.
3. Connection of terminals is shown as below:

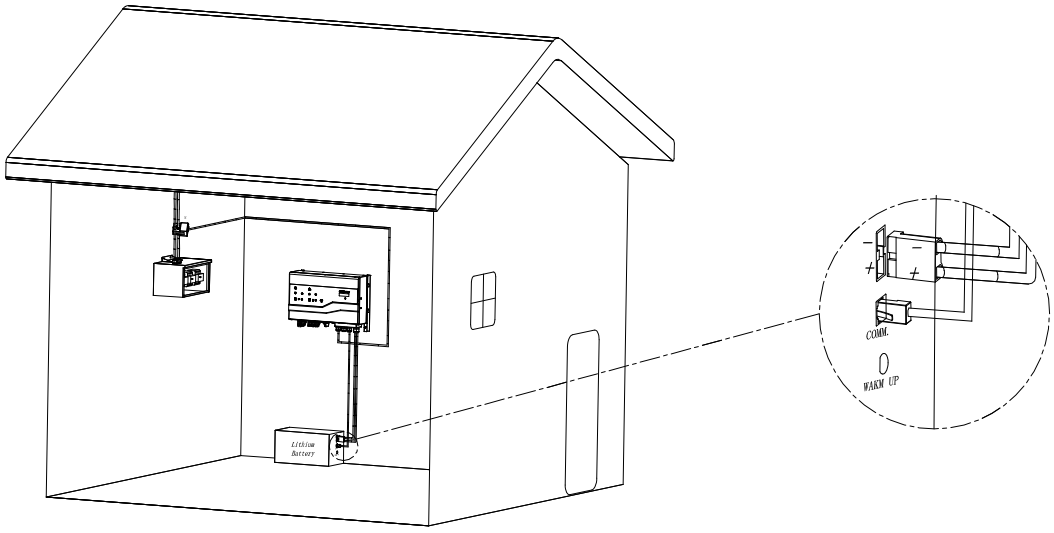



Chart 5.28

After all connections done, gently press the 'wake up' KEY of the lithium battery. While the 'status' LED indicator turns green, the battery starts working.

## 5.5 Grounding

**PV Array Grounding**

The frame and mounting racks of PV panels should be firmly and securely connected to ground.

**DC Grounding**

SP2000 storage system can be used in both grounding system and floating system. If it is used in grounding PV system(PV positive or negative connected to ground), there must be a galvanic isolation transformer installed between inverter and utility grid.

**Grounding Device**

If the positive pole or the negative pole of the PV array needs to be grounded in the PV system, the inverter output should be insulated by an Isolation Transformer.

Connection as below:

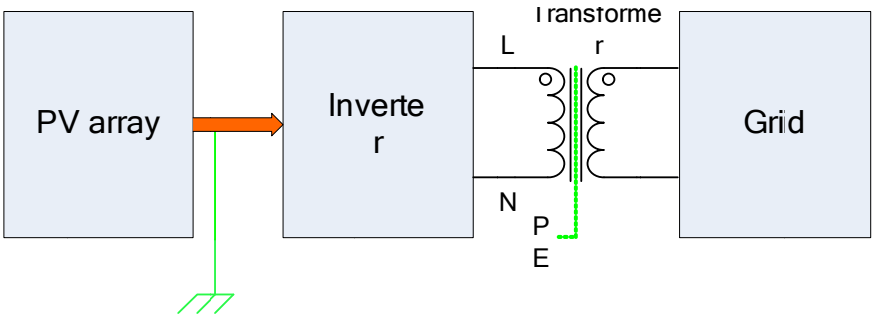



Chart 5.29

# 6 Commissioning

## 6.1 Commissioning of Energy storage machine

1. Check the polarity of PV string inputs, then connect the PV strings into the SP2000's inputs. Keep the built-in DC switch in OFF position.
2. Connect the battery to the SP2000 unit. Make sure the NTC sensor(for lead-acid battery) or communication cable(for lithium battery) is well and correctly connected.
3. Plug the SP2000 unit to an AC supply.
4. Then the SP2000 unit will be turned on and enter standby mode. If there is electricity power over than 100W flowing in from the grid, the SP2000 unit will enter discharging mode in **1** minute.(If there is no load in the property at that moment, it's recommended to turn on a home appliances over than 100W for several minutes to check if the SP2000 can go into discharging)
5. Check the polarity and voltage on SP2000 output, the voltage should be around 450VDC in discharging mode.
6. Unplug the SP2000 unit, connect the outputs of SP2000 to the inverter(positive to positive, negative to negative).
7. Plug again, if there is electricity power greater than 100W flowing into the property, the SP2000 will start discharging and the inverter will be fired up and connect to the grid in 1 minute. SP2000's LCD would scroll the state information. LED area would display the current state.
8. Turn on the built-in DC switch, the whole system will start working.

## 6.2 Operation modes

### 6.2.1 Normal charge mode

When there is good PV generation, the SP2000 Storage system will work in charge Mode.

- When the DC voltage is above 150V and the SP2000 unit has detected power being exported to the grid, it will send any residual electricity to the battery storage.
- When the DC voltage is less than 130V, The energy storage machine will leave the charge mode automatically and return to standby mode until the PV voltage increases.
- When the PV voltage is greater than 150V, and the current sensor didn't detect electricity flowing out to the grid, the SP2000 unit doesn't charge battery and remains in standby mode.

**NOTICE**: SP2000 MUST BE CONNECTED TO AN AC POWER SOURCE FOR IT TO WORK.

### 6.2.2 Normal discharge mode

When the PV generation is low or stopped, then the system will operate normal discharge mode.

- When DC input voltage is less than 100V and SP2000 unit has detected demand from the property, the controller will supply energy from the batteries to the inverter, which will in turn supply the property. the LED indicator will show constant green light.
- When DC voltage is less than 100V but there is no detection of demand from the property, the storage system will remain in stand-by mode.
- When PV voltage is greater than 120V, the SP2000 unit will exit discharge state and return to standby mode.

**NOTICE**: Must connect to AC, or the energy storage system won't start up.

### 6.2.3 Fault mode

The SP2000's intelligent control system will constantly monitor and adjust the system status, if any fault is detected in the system the LCD display will show the fault information. The fault light will illuminate.

NOTICE:

a）For detailed fault information please refer to 9.1

b）Some fault information is in relation to the inverter side issues causing the Storage System to be unable to function.

### 6.2.4 Shutdown mode

The SP2000 unit will be in working status all the time if plugged to AC supply. If you need to shut down the SP2000 unit, just unplug the AC power cable.

NOTICE:

Always switch off the DC Switch to be certain you have disconnected or isolated any supply from the panels.

## 6.3 LED AND LCD'S DISPLAY

### 6.3.1 LED display area

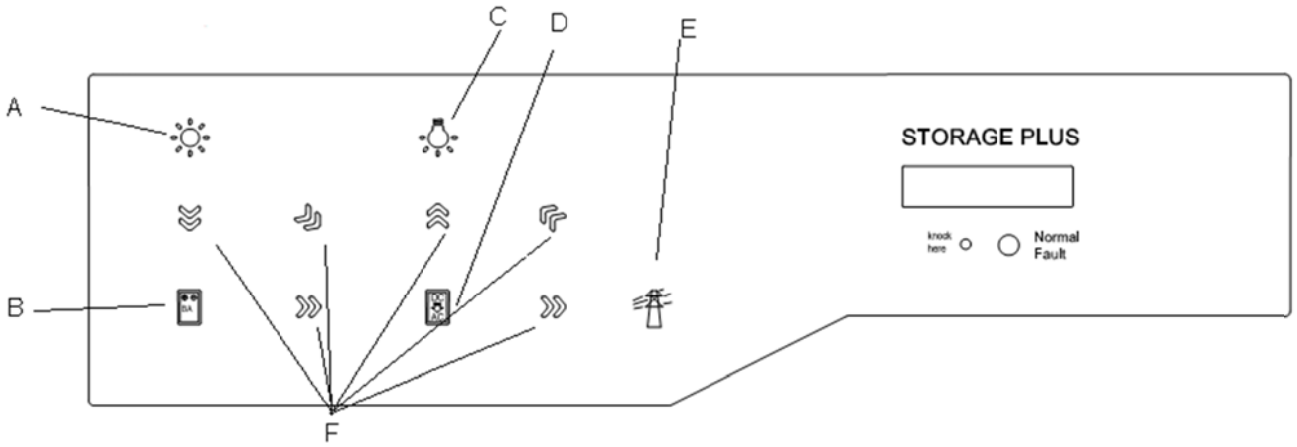



Chart 6.2

| location | description |
|---|---|
| A | PV panel power |
| B | Batteries of the Storage system |
| C | The Property |
| D | PV inverter |
| E | Grid Power |
| F | Power directional flow |

### 6.3.2 Each status' LED light indication schematic

**State one:** Before sunrise, the battery is empty and the property demands electricity energy. The power is supplied from the Grid:

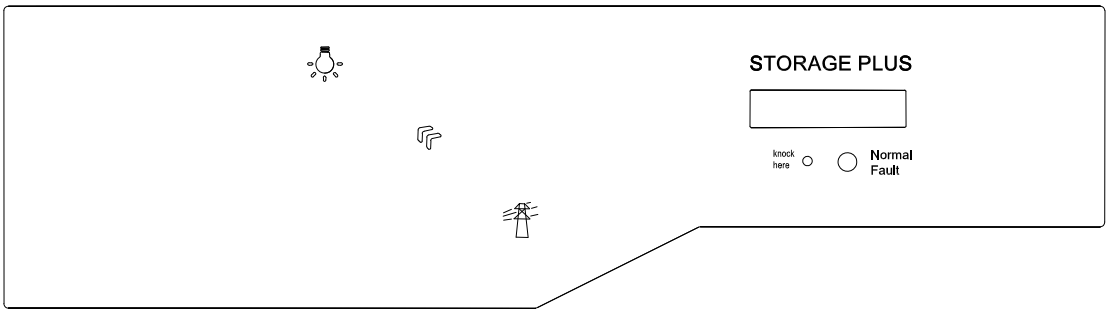



Chart 6.3

**State two:** After sunrise the PV output starts increasing, the power will be first used to supply the property and offset the demand. The insufficient part will be supplied by grid. As the PV output goes up, the electricity power from the grid will become less and less.

**State three:** with the sunlight getting stronger and stronger, the PV panels will generate excess power to charge the battery apart from the part being used to offset the local demand, The SP2000 starts charging at the moment, the energy flow is illustrated as follow:

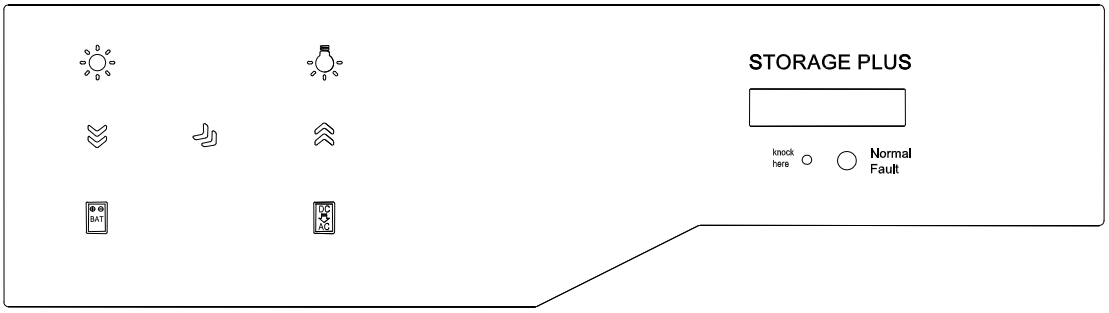



Chart 6.4

**State four:** with the sunlight being more stronger, the PV output will be greater than property load plus maximum charging power of SP2000(2kW) , the residual power will be fed to the grid, power flow is show as follow:

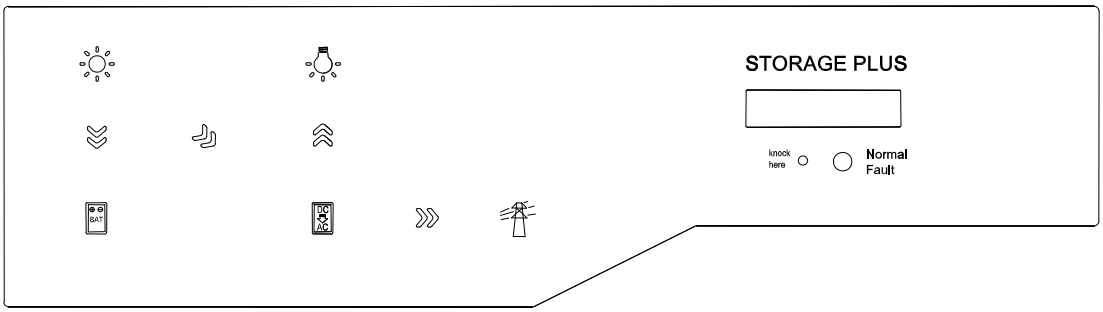



Chart 6.5

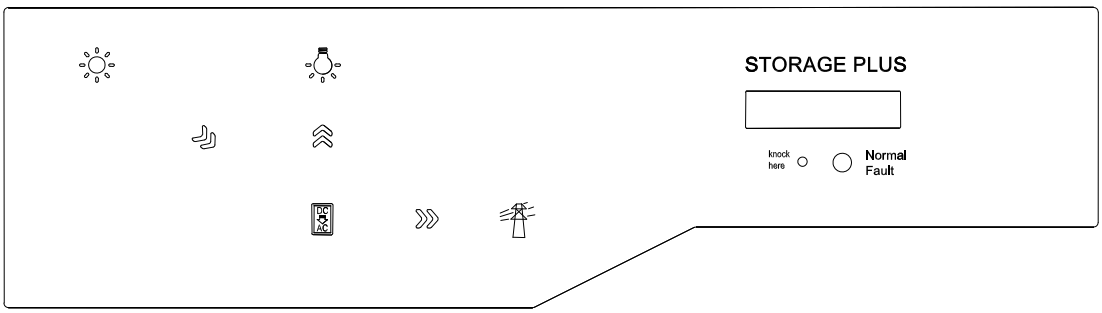



Chart 6.6

Battery is fully charged

**State five**: The same situation as state two, with time going by, the power of the photovoltaic panels is not enough to satisfy the property load ever due to insufficient sunlight, then the power grid would supply the shortage part.

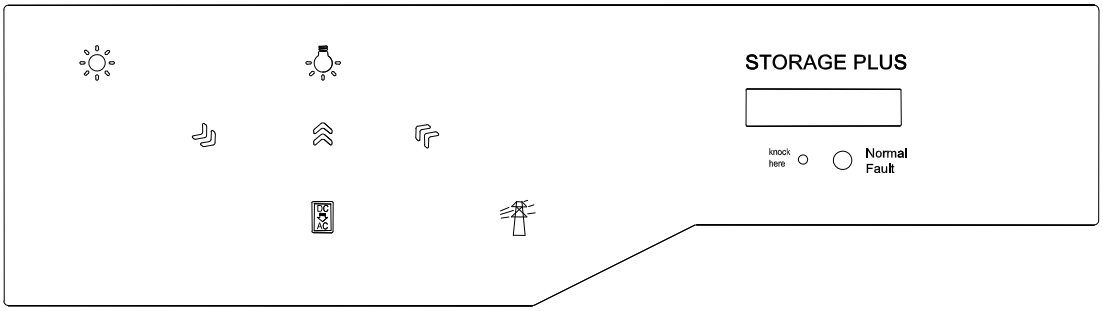



Chart 6.7

**State six:** when the sun goes out completely, the photovoltaic panel will not generate power, When SP2000 has detected electricity being supplied from grid, it will start discharging to satisfy the property's load,

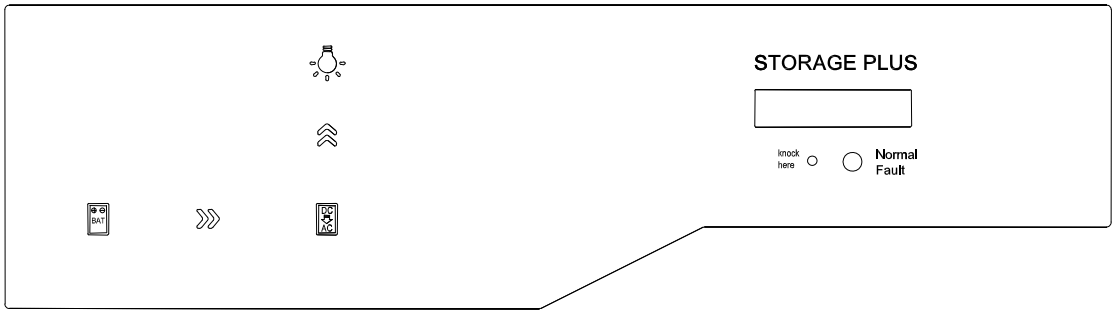



Chart 6.8

**State seven:** At night, when the output of SP2000 cannot satisfy the property demand due to insufficient capacity in battery, the shortage part will be supplied from the grid,

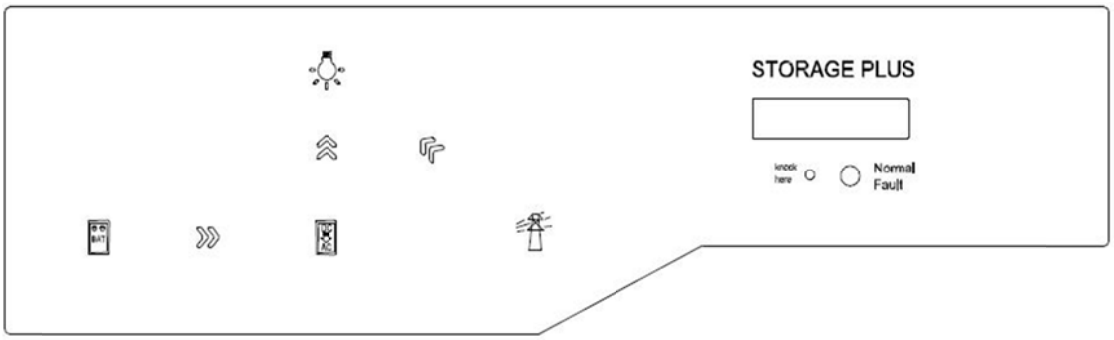



Chart 6.9

### 6.3.3 LCD display column

LCD display column is used to show the current status, basic information and fault information. The corresponding information will be scrolled in turn on LCD display when the SP2000 is powered up.

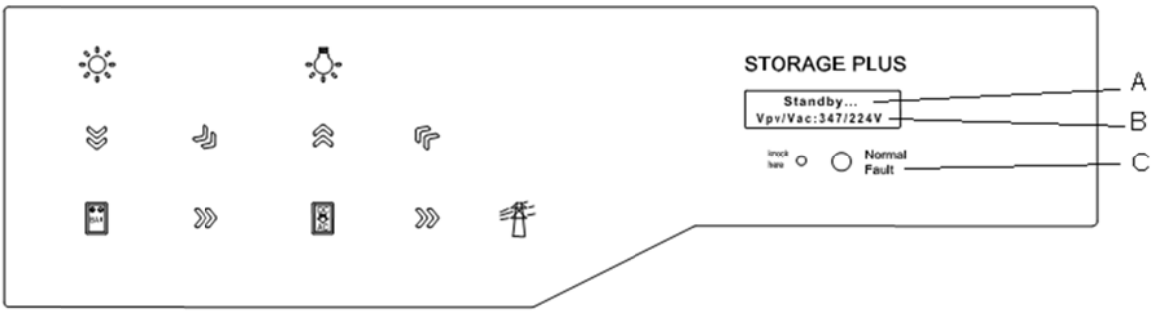



Chart 6.10

| location | description |
|---|---|
| A | The current SP2000 Status |
| B | Various performance information |
| C | Status indication light |

Display options for line A:

1、 Standby state: The machine is in standby state, no charging or discharging.

2、 Charging state: The generated PV power is charging the batteries.

3、 Discharging state： The batteries are discharging power to the inverter.

4、 Warning state: The machine is showing warning, this does not affect the normal operation of the system.

5、 Fault state ： The SP2000 unit has detected a fault, and stopped operating.

6、 Programming state： The SP2000 unit is being programmed.

The second line displays as follow:

In normal status, it scrolls automatically, when tapping on the tap sign area, the displays will change in order as follows:

1. Normal operating:
   Battery Info → Vpv and Vac → Ppv → Pcharge → Pdischarge → Vbuckout → Ec_today → Ed_today → PtoUser → PtoGrid → BatteryInfo（change every 5s）
2. When tapping on front lid

BatteryInfo → VpvandVac → Ppv → Pcharge → Pdischarge → Vbuckout → Ec_today → Ed_today → PtoUser → PtoGrid → Vbus → SN → Model → FWVersion → ComMode → ComAddr → SystemTime → BlueTooth_Zigbee_Wifi → SetWindow → BatteryInfo

3. In the following pages, display will remain two minutes when double tapping BatteryInfo/VpvandVac/Ppv/Pcharge/Pdischarge/Vbuckout/Ec_today/Ed_today/PtoUser/PtoGrid/Vbus/SN/Model/FWVersion/ComMode/ComAddr/SystemTime/BlueTooth_Zigbee_Wifi
4. Under FW Version page，double tap, the Firmware build version will appear
5. In Set Window page，double tap will enter the setting interface:
   Set Window → knock on twice continuously →Input 123（finish entering the password, triple tap）→language Set → ComAddr Set → ComMode Set → SystemTime Set

**Accuracy of measurement**

Display values shown by this system are guidelines only. The data is not calibrated to be accurate for purposes such

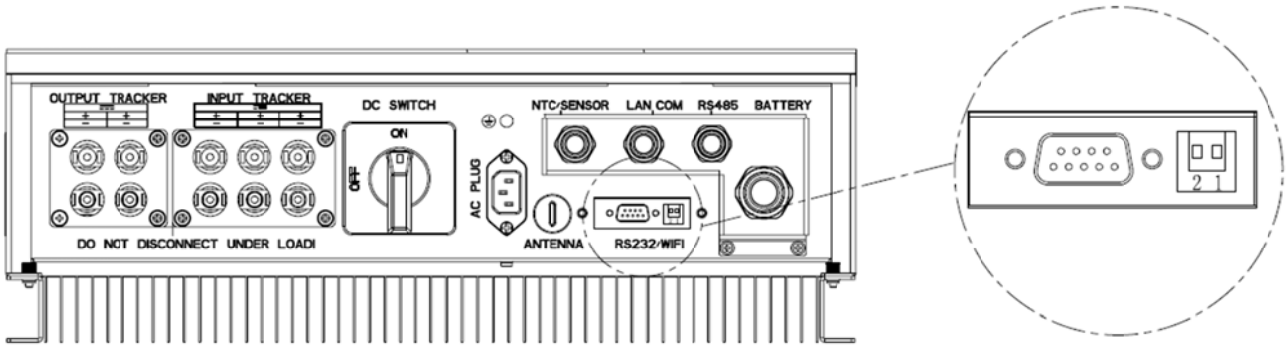
as billing.

## 6.4Communication

### 6.4.1 Use the PlusBus software to set up the SP2000 storage controller

The PlusBus software can be downloaded from download section of Growatt official website.


A USB to RS232 cable is required to connect the SP2000 to your laptop for the parameter check or modifying. The 2-bit DIP switch adjacent to the RS232 port should be in OFF position for parameter setting:




The wiring diagram is as follows:

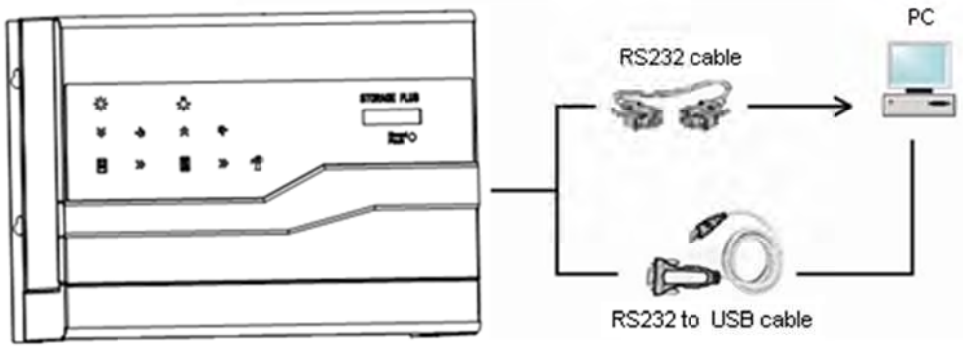



Chart 6.11

### 6.4.2 Monitoring the SP2000 Storage System

The SP2000 can be monitored either by a Wi-Fi dongle or by a hardwired solution. Both of these solutions will work only with the Growatt Shine Server software.

**Scheme A :**

- Use the Wi-Fi dongle for wireless remote monitoring.

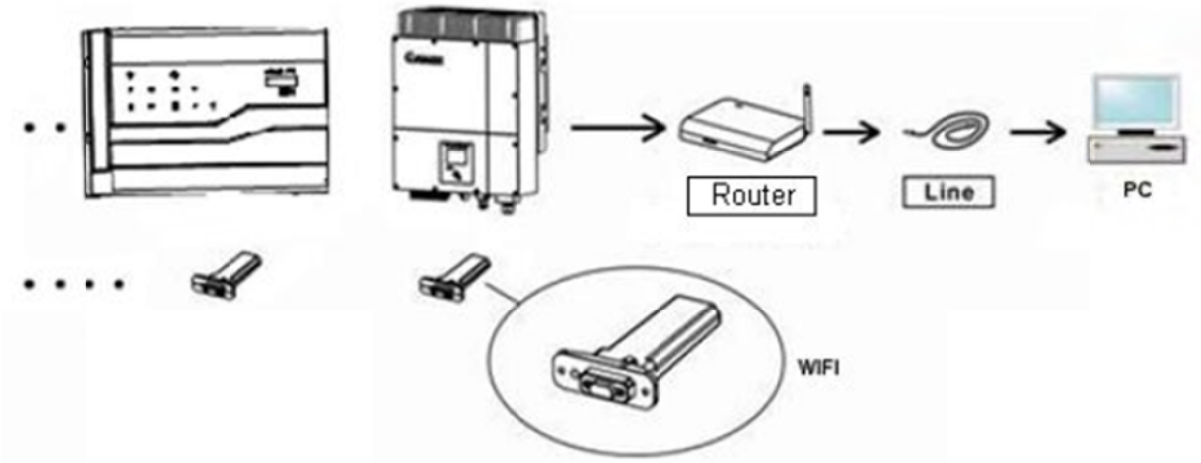
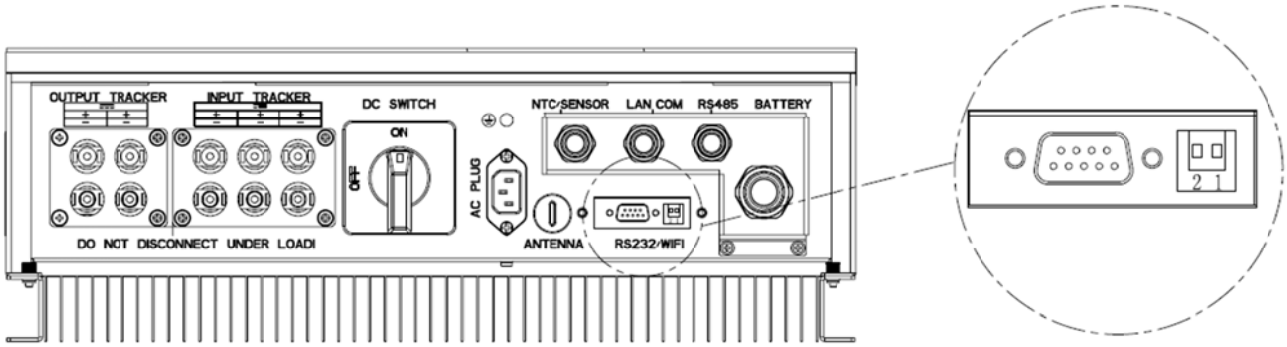



Chart 6.12

Before plugging in the WIFI dongle, set both bits of the DIP switch to ON:




**Scheme B :**

- Connect the SP2000 to router via network cable for hardwired monitoring.

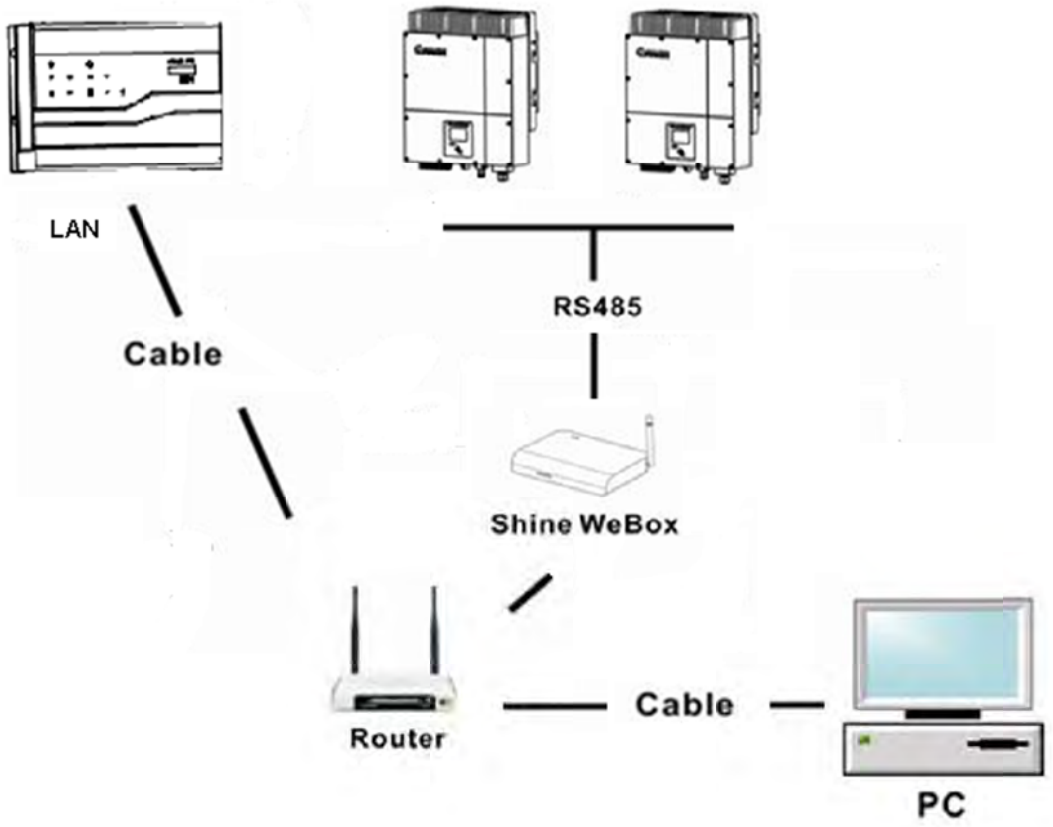



Chart 6.13

NOTICE: the length of LAN cable is decided by users themselves according to actual situation

# 7 Start-up and shut down SP2000 storage system

## 7.1Start-up the SP2000 storage system

1. Switch on AC and DC isolator of the inverter;
2. Plug the AC power cord of SP2000 into the wall socket, it will start automatically;
3. Turn on the built-in DC switch of SP2000.

## 7.2 Shut down

1. Switch off DC and AC isolator
2. Turn off the inverter
3. Disconnect the battery
4. Unplug SP2000's AC power cord
5. Waiting until LED,LCD display have gone out, the SP will be shut down completely

# 8 The installation environment, maintenance and cleaning

The SP2000 Storage System is designed to be installed in areas with temperatures of 0-40 degrees C. Particular attention should be paid to locate the installation in areas of good ventilation. This will assist in regulating build up to heat which may affect the performance of the system. The Growatt SP 2000 Controller unit functions without an

inbuilt fan, therefore good ventilation is required to assist with cooling. The Lithium Battery pack does have integrated fans, although again good ventilation will assist in temperatures being controlled.

If the storage system fails due to temperature parameters, check the following points:

- Check there are no obstructions to airflow around the units, choose an appropriate position for the installation.
- If using lead-acid batteries, check if the NTC sensor is fitted correctly.
- Check whether the battery temperature is within the operational range.

# 9 Fault Finding

All products are fully tested and certified before leaving the manufacturing facility. If you are having difficulties with planning or carrying out an installation please contact you distributor, or log on to www.growatt.com, where you can check the Q&A program.

If a fault occurs with your SP2000 Energy storage system, please inform Growatt and be prepared to provide related information in order to assist with fault deduction. Our professional aftersales service personnel will assist you.

Typical information that will be needed will be as follows:

Serial number
Model
Fault information on LCD
Brief description of problems
The battery voltage
The dc input voltage
Can you retell the failure problem? If you can, what kind of a situation
Did the problem happen in the past?
Solar panels model and PV array configuration

If you are using lead-acid batteries, please also provide

Battery manufacturer and model.
The total output voltage of the batteries
How long have the batteries been working since commissioning.

## 9.1 System fault information list and troubleshooting suggestions

| LCD display | Fault description | Fault When | SP Status | Suggestion |
|---|---|---|---|---|
| Error: 100 | Firmware version mismatch | Firmware version mismatch | Fault | Update FW with right version |
| Error: 101 | Communication fault | M3 cannot receive data from DSP | Fault | 1. Check communication cable |

| | | | | |
|---|---|---|---|---|
| | | | | 2. Restart Solar Plus |
| BMS COM Fault | Communication fault | Communication failure between M3 and BMS | Fault | 1. Check 485 cable between SP and battery<br>2. Check if battery is sleeping |
| BMS Error: xxx | BMS failure and neither charge and discharge is allowed | BMS failure and neither charge and discharge is allowed | Fault | Depend on BMS error code |
| Error: 116 | Over current protection triggered by Trip Zone | Over-current | Fault | 1. Check PV input terminals<br>2. Restart Solar Plus |
| Error: 117 | Over current protected by software | Over-current | Fault | 1. Restart Solar Plus |
| Error: 118 | Over BUS-voltage protection | BUS voltage high | Fault | 1. Check battery terminals when charge<br>2. Check dummy load when discharge |
| Error: 119 | Communication fault | DSP cannot receive data from M3 | Fault | 1. Check communication cable<br>2. Restart Solar Plus |
| Error: 119 | Communication fault | DSP cannot receive data from M3 | Fault | 3. Check communication cable<br>4. Restart Solar Plus |
| PV Voltage High | PV Voltage High | PV voltage higher than 580V for 100ms | Fault | Check PV input voltage |
| PV Short-circuit | PV input short-circuited | PV voltage lower than 20V and PV current higher than 5A | Fault | 1. Check PV input terminals |
| Battery reversed | Battery terminals reversed | PV voltage lower than -10V for 100ms | Fault | 1. Check battery terminals |
| PV Access Wrong | PV input and discharge output of Solar Plus misconnected | PV voltage lower than 20V and BUCK voltage higher than 50V and cannot be dragged down by 30s dummy load on | Fault | 1. Check PV input and BUCK output terminals |

| | | | | |
|---|---|---|---|---|
| PV Reversed | PV terminals reversed | PV voltage check signal is higher than 2.57V | Fault | Check PV terminals |
| L-N Reversed | AC terminals reversed | The voltage between N and Earth higher than 100V for 100ms | Fault | Check AC terminals |
| No AC | AC voltage low | AC voltage lower than 50V | Fault | Check AC voltage |
| NTC Open | NTC open | NTC open | Fault | Check NTC terminals |
| Fuse Open | Fuse Open | Vdrop on fuse higher than 10V for 200ms | Fault | Check fuse |
| Battery Open | Battery terminal open (only for lithium battery) | Battery voltage sampled by SP is 10V lower or higher than BMS | Fault | Check battery terminal |
| MPPT Trouble | MPPT Trouble | Exit discharge for no MPPT five times | Fault | Check state of PV inverter |
| SS Timeout | Soft start run out of time | Bus or BUCK voltage cannot get target value after 2min soft start | Fault | Check voltage sample of BUS or BUCK |
| BMS Error: xxx | BMS failure and either charge or discharge is allowed | BMS failure and either charge or discharge is allowed | Warning | Depend on BMS error code |
| Bat voltage low | Battery voltage low | Battery voltage lower than 44V for 100ms | Warning | Check battery terminals |
| Bat T Outrange | Battery temperature out of specified range for charge or discharge | Battery temperature out of specified range for charge or discharge(range is settable) | Warning | Check battery temperature |
| No AC power flow | No AC power flow | Power flow between grid and user lower than 50W for 10 minutes | Warning | Check if AC current sensor is connected well |

# 10 Manufacturer Warranty

This certificate represents a 5 year warranty for the Growatt products listed below. Possession of this certificate validates a standard factory warranty of 5 years from the date of purchase.

### Warranted products

This warranty is applicable solely to the following products:
Growatt SP2000.

## Limited Product Warranty

(Applicable under normal application, installation, use and service conditions)Growatt warrants the above listed products to be free from defects and/or failure specified for a period not exceeding five (5) years from the date of sale as shown in the Proof of Purchase to the Original purchaser.

The warranties described in these "Limited Warranty" are exclusive and are expressly in lieu of and exclude all other warranties, whether written, oral, expresser implied, including but not limited to, warranties of merchantability and of fitness for a particular purpose, use ,or application, and all other obligations or liabilities on the part of GROWATT , unless such other obligations or liabilities are expressly agreed to it in writing signed and approved by GROWATT , GROWATT shall have no responsibility or liability whatsoever for damage or injury to persons or property, or for other loss or injury resulting from any cause whatsoever arising out of or related to the modules, including, without limitation, any defects in the modules or from use or installation. Under no circumstances shall GROWATT be liable for incidental, consequential or special damages howsoever caused; loss of use, loss of production, loss of revenues are therefore specifically and without limitation excluded to the extent legally permissible, GROWATT 's aggregate liability, if any, in damages or otherwise, shall not exceed the invoice as paid by the customer.

The "**Limited Product Warranty**" described above shall not apply to, and Growatt shall have no obligation of any kind whatsoever with respect to, any machine which has been subjected to:

- Misuse, abuse, neglect or accident;
- Alteration, improper installation or application;
- Unauthorized modification or attempted repairs;
- Insufficient ventilation of the product;
- Transport damage;
- Breaking of the original manufacturers seal;
- Non-observance of Growatt installation and maintenance instruction;
- Failure to observe the applicable safety regulations
- Power failure surges, lighting, flood, fire, exposure to incorrect use, negligence, accident, force majeure, explosion, terrorist act, vandalism or damage caused by incorrect installation, modification or extreme weather conditions or other circumstances not reasonably attributable to Growatt.

The warranty shall also cease to apply if the product cannot be correctly identified as the product of Growatt. Warranty claims will not be honored if the type of serial number on the machines have been altered, removed or rendered illegible.

## Liability

The liability of Growatt in respect of any defects in its machines shall be limited to compliance with the obligations as stated in these terms and conditions of warranty. Maximum liability shall be limited to the sale price of the product. Growatt shall accept no liability for loss of profit, resultant of indirect damage, any loss of electrical power and / or compensation of energy suppliers within the express meaning of that term.

The warranty rights as meant herein are not transferable or assignable to any third party excepting the named warranty holder.

**Warranty Conditions**

If a device becomes defective during the agreed Growatt factory warranty period and provided that it will not be impossible or unreasonable, the device will be, as selected by Growatt:

1、 Shipped to a Growatt service center for repair;
2、 Repaired on-site;
3、 Exchanged for a replacement device of equivalent value according to model and age.

The warranty shall not cover transportation costs in connection with the return of defective modules. The cost of the installation or reinstallation of the modules shall also be expressly excluded as are all other related logistical and process costs incurred by all parties in relation to this warranty claim.

# 11 Decommissioning

## 11.1 Dismantling the energy storage

1. Disconnect the storage machine such as mentioned in section 7。
2. Disconnect the upper cable of the storage machine

watch out the SP's shell heat and prevent to scald
wait 20 minutes until the SP cooling and then to disassembly!

3. Unscrew all the connecting cable
4. Unscrew the radiator and wall-mounted's anchor screw and then take down the machine from wall

## 11.2 Packing the energy storage machine

Usually placed energy storage machine in the packing box with tape sealing, If the energy storage machine cannot reoccupy, You can choose a cheap carton for packaging. Carton requirements must meet the size of the inverter and can support energy storage machine overall weight.

## 11.3 Storing energy storage machine

Store the energy storage machine in a dry place where ambient temperatures are always between -25°C and +60°C

## 11.4 Disposing of the energy storage machine

Do not dispose of energy storage machine together with household waste. Please accordance with the disposal regulations for electronic waste which apply at the installation site at that time. Ensure that the old

unit and, where applicable, any accessories are disposed of in a proper manner

# 12 Product specification

## 12.1 Growatt SP series energy storage machine product specification

| Model / Specification | **Growatt-SP2000** |
|---|---|
| **PV array input and output data:** | |
| Input PV voltage range | 100V~580VDC |
| Max input current from PV array | 30A *1 |
| Max power | 2000W |
| Full load input DC voltage range | 200V~450VDC |
| output voltage range | 150V~500VDC |
| Rated output voltage(mpp voltage for inverter) | 380V |
| Max current to SP2000 | 10A |
| Rated output current | 5.3A |
| Number of independent MPP trackers/strings per MPP tracker | 1/3 |
| Output strings from SP2000 to inverter | 3 |
| **Battery data** | |
| Battery voltage range | 44V~58VDC |
| Max charging voltage | 57VDC/58VDC*2 |
| Max charging current | ≤45A |
| Max discharging current | ≤45A |
| Type of battery | Lead-acid battery/Lithium battery) |
| Battery capacity | 90~200AH |
| Deep of discharge | 50% DOD/80% DOD*3 |

| | |
|---|---|
| daily night electricity consumption | 2~9KWH |
| **Others:** | |
| Maximum efficiency | 94.0% |
| Input grid voltage range（single phase） | 230Vac±15% |
| Operating temperature range： | 0℃~+40℃ |
| Altitude | 2000m |
| Cooling concept | Natural |
| Environmental Protection Rating | IP20 (indoor used) |
| Noise emission (typical) | ≤40dB |
| Certificates and approvals： | CE |
| over voltage protection | yes |
| Low voltage protection | yes |
| over current protection | yes |
| over load protection | yes |
| Output current short protection | yes |
| PV and battery reverse polarity protection | yes |
| Warranty： | (Five years) |
| Connection for PV array side | H4/MC4(opt) |
| Connection for battery | Screw terminal |
| communication： | RS232/LAN/WIFI（opt） |
| display | LED+LCD |
| Dimensions(W/H/D) | 520/340/160 |
| Weight | 15kg |

## 12.2 DC input terminal parameter

H4 specification:

| | **2.5mm²/14AWG** | **4mm²/12 AWG** | **6mm²/10 AWG** | **10mm²/8AWG** |
|---|---|---|---|---|
| Rated current (90 ℃ environment) | 32A | 40A | 44A | 65A |
| Nominal system voltage | 600V DC(UL)<br>600V DC(TUV) | | | |
| Contact resistance | 0.25mΩ（model） | | | |
| Protection grade | IP68 | | | |

| | |
|---|---|
| Socket contact materials | Copper, tin |
| Insulation materials | Thermoplastics UL94 V-0 |
| Ambient temperature range | -40℃ to +90℃ |
| Wire stripping length | 7.0mm(9/32) |
| Cable casing diameter | 4.5 to 7.8mm(3/16: to 5/16") |

## 12.3 Torque

| | |
|---|---|
| Upper cover screws | 1.3Nm(10.8 1bf.in) |
| Shell and RS232screws | 0.7Nm(6.2 1bf.in) |
| Dc connector | 1.8Nm(16.0 1bf.in) |
| M6 screwdriver | 2Nm(18 1bf.in) |
| Grounding screw | 2Nm(18 1bf.in) |

## 12.4 Appendix

The following chart is the energy storage machine optional appendix list, if there is a need please contact the Growatt New Energy Technology Co., Ltd or dealer orders.

| **name** | **description** | **GROWATT P/N** |
|---|---|---|
| Shine Webbox | Communication data record | MR00.0001700 |
| | | |
| Shine Vision receiver | Receptor of Communication data record | MR00.0000201 |
| Shine Vision emitter | Launchers of Communication data record | MR00.0000601 |
| Zigbee | COM interface | 200.0007000 |
| Wi-Fi | COM interface | MR00.0001400 |
| Bluetooth | COM interface | MR00.0002200 |

# 13 Certificate

Growatt SP2000 apply within the scope of the world, So the inverter have to satisfy different countries and regions of different safety standards

| **model** | **Certificate** |
|---|---|
| Growatt SP2000 | CE,SAA,RCM |

# 14 Contact

If you have technical problems about our products, contact the Growatt Service line or dealer. We need the following information in order to provide you with the necessary assistance:

1. Energy storage machine Serial number
2. Energy storage machine module information
3. Energy storage machine communication mode
4. Energy storage machine fault information code
5. Energy storage machine Display content
6. The manufacturer and model of the battery
7. Battery capacity and connection mode

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