



Installation Manual Of PV Energy Storage Machine

Installation & Operation Manual

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1 Brief Introduction

1.1 Preface

This manual will provide the users who use the PV Energy Storage Machine of Growatt SP Series of GROWATT NEW ENERGY TECHNOLOGY CO.LTD.SHENZHEN (Short for Growatt New Energy as below) with the detailed product information and the installation instructions. Please read this manual carefully and put this manual on some place where is convenient to installation, operation, obtain. Any modifications of Growatt new energy, we will not notify the user.

1.2 Target Group

The energy storage machine must be installed by professional electrical personnel who have obtained the certification of the relevant departments. We have two kinds of energy storage machine for different battery one is for lithium battery and the other is for lead-acid battery, we suggest: customer should decide which kind of energy storage machine you want, Growatt can provide only lithium battery with energy storage machine, customer can choose lead-acid energy storage machine with no battery provide by Growatt while they can buy these battery from market easily. Especially if customer choose energy storage system with lithium battery(which must be provide by Growatt) but used for lead-acid battery or used lead-acid battery for lithium battery model, it will be dangerous. Installer can install energy storage machine of Growatt SP Series rapidly and troubleshooting, build communication system through read this manual carefully. If you have any questions in the process of installation, you can login in www.growatt.com and leave some message. Or you can call our 24-hour service hotline 0755-29467281/400-833-9981.

1.3 Product Description

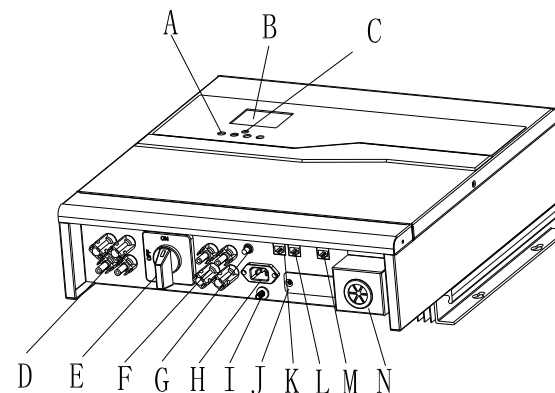
The energy storage machine of Growatt SP Series is used to store excess energy generated by the photovoltaic cell panels in the battery, the excess energy can be sent to power grid through the energy storage machine and the inverter at night. The energy storage machine of Growatt SP Series adopts the conversion of topology in both directions, Can satisfy two kinds of work needs of charge and discharge.

SP series has three kinds of type:

- Growatt-SP1000-S
- Growatt-SP2000-S
- Growatt-SP3000-S

Note: We describe Growatt-SP1000-S . Growatt-SP2000-S and Growatt-SP3000-S as "SP" as below.

Overview:



Position	Description
A	Button
B	LCD display screen
C	LED of status display
D	DC output to PV INVERTER
E	PV switch(optional)
F	PV Strings input
G	Antenna connector
H	AC socket
I	Ground connector
J	RS232 cover board
K	Sensor connector
L	Temperature sensor contactor(only for lead-acid battery)
M	RS485(Only for lithium-ion battery)
N	Battery connector

1.4 Safety Instructions

- 1) Please be clear which kind of battery system you want, lithium battery system or lead-acid battery system, if you choose the wrong system, energy storage system can't work normally.
- 2) Please read this manual carefully before the installation, The company has the right not to quality assurance, If not according to the instructions of this manual for installation and cause equipment damage.
- 3) All the operation and connection please professional electrical or mechanical engineer.
- 4) During installation, Please don't touch the other parts within the box.
- 5) All the electrical installation must comply with the local electrical safety standards.
- 6) If equipments needs to maintain, Please contact with local specify system installation and maintenance personnel.
- 7) Use the equipment to combined to grid needs to obtain the permission of local power supply department.
- 8) When install PV modules in the daytime, make sure disconnect the PV array, Otherwise it will be dangerous as high terminal voltage of modules in the sunshine.

2.1 Purpose Use

The system chart of PV energy storage:

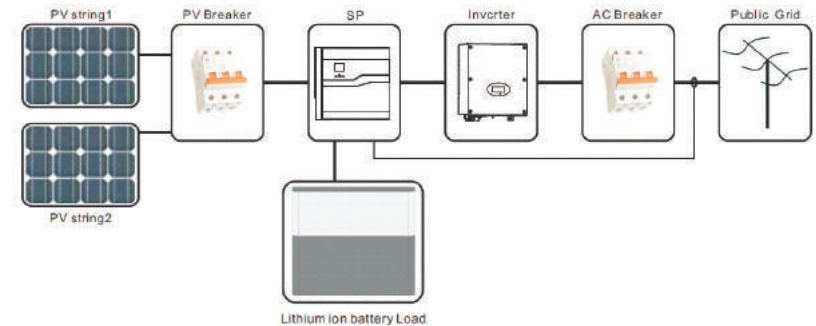




Chart 1.1

As shown above, a complete grid-connected system of PV storage consists of PV modules, storage machine, battery, PV inverter, utility grid and other components. In the PV energy storage system, energy storage machine and inverter are the key parts of component parts.



Attention:

As the system refer to battery use, We must make sure ventilation of the service environment and temperature control in order to prevent the danger of battery explosion, Battery recommended installation environment must be strictly in accordance with the specification in IP20 environment, the pollution degree of the unit is PD2, meanwhile the temperature should be control in the 0-40°C of indoor ventilation and the humidity should be 5%-85%. If the chosen PV modules needs to positive or negative ground connection, please contact with Growatt for technical support before installation.



2.2 Safety Measure

  **Risk of high voltage !**


- Relevant operation for professional personnel.
- Please notice children, disabled, laypeople do not close.
- Supervise and make sure children don't play near the installation position of energy storage machine.

  **Risk of burns on the parts shell of energy storage machine !**


During the work, Cover, shell around, radiator is likely to be hot.

  **Energy storage machine exists radiation maybe affect health !**





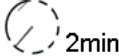





Don't stay a long time within 20cm range from energy storage machine.

 **Energy storage machine ground connection**

Please ensure energy storage machine ground connection is reliable for make sure people's safety.

 Photovoltaic array is exposed to light. It supplies a d.c. voltage to the PCE



2.3 Symbols introduction on the energy storage machine

Symbol	Description
	Caution: Risk of electrical shock!
	Caution : hot surface
	Caution: risk of danger
  2min	Danger to life due to high voltage in Storage-plus There is residual voltage in Storage-plus, Storage-plus requires 2 minutes to discharge. • Please wait 2 minutes before you open the upper lid or the DC lid.
	Protective conductor terminal
	Direct Current(DC)
	Alternating Current(AC)
	The inverter complies with the requirements of the applicable CE guidelines
	Refer to the operating instructions.

3 Product Description

3.1 Growatt SP series inverter

Marks of energy storage machine

Mark	Description	Explanation	
	Push-button	Operation of display screen and set system	
	Status symbol of energy storage machine	Green light on	Energy storage machine run normally, charge or discharge
		Red light on	Fault state
		Red light blinking	1. Alarm state 2. Software updating

3.2 Label Explanation

Label contains the following information: for example SP3000-S shows as below:

Growatt	
Model Name:	Growatt-SP3000-S
PV input data:	
Input DC voltage range:	100V~580V dc
Max input current:	15A / 15A
Max input power:	6000W
Technical data of storage plus:	
Max charging and discharging power:	3000W
Output voltage while discharging:	150V~450V dc
Max working current:	10A / 10A
Number of mpp trackers / strings per mpp tracker:	2 / 1
Battery data:	
Battery voltage range:	46V~58V dc
Max charge and discharge current:	≤66A
Type of battery:	Lead-acid / Lithium
Capacity of battery:	150~500Ah
Deep of discharge:	50%DOD / 80%DOD
Daily night electricity consumption:	3~12 kWh
Other data:	
Normal input grid voltage and frequency:	230Vac/50Hz
Max AC charging power:	1000W
Operating temperature range:	0°C ~ +40°C
Protection class:	I
Safety:	CE
Display:	LCD+LED
Degree of protection:	IP20
Communication:	RS232 / WIFI(opt)

Description of label:

the type of product	Growatt-SP3000-S
Input voltage range	100-580Vdc
Max input power	6000W
Max input current	15A/15A
Max charge and discharge power	3000W
Output voltage while discharging	150-450Vdc
Max charge and discharge current of energy storage machine	10A/10A
Battery voltage range	46-58Vdc
Max charge and discharge current of battery	≤66A
Suitable battery types	Lead battery and lithium battery
Recommend battery capacity range	100-500Ah
The discharge depth control of battery	Lead battery50%DOD Lithium battery80%DOD
Daily night electricity consumption	3-12kWh
Safety certification	CE
Display	LED status display
Level of protection	IP 20
Communication type	RS232/WIFI(choice)

3.3 Size and weight

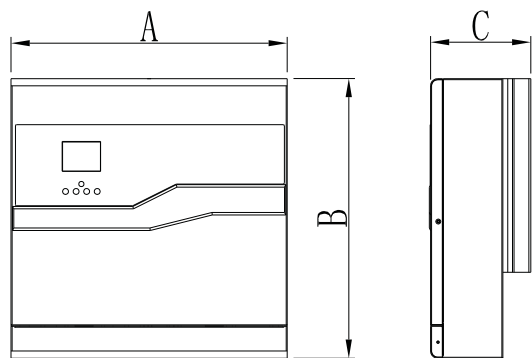


Chart 3.1

	A(mm)	B(mm)	C(mm)	weight (kg)
Growatt SP 1000-S	445	450	162	16.7
Growatt SP 2000-S	445	450	162	16.7
Growatt SP 3000-S	445	450	162	16.7

3.4 The advantage of the unit of Growatt SP

Features below:

- Adapt to existing PV system with general inverter and new system.
- Battery management system, To satisfy pattern of Lead battery and lithium battery.
- Wide working voltage range : 100V~580V.
- Easy installation.
- Max efficiency 94.5%.
- Two mpp tracker input.
- Charging battery by utility grid energy.
- Satisfy RS232 and WIFI wireless communication monitoring.

Please check whether external damage to the goods before unpacking

After unpacking, Please check whether the unit damage or missing parts, If it is happen, Please contact with supplier.

Energy storage machine of Growatt SP series and accessories as follows:

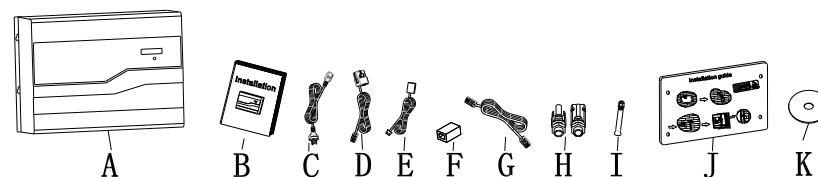


Chart 4.1

Item	Number	Description
A	1	Energy storage machine of Growatt SP series
B	1	User Manual
C	1	AC grid cable (standard wire length 2m)(opt)
D	1	Electric current sensor (Standard wire length 5m)
E	1	Battery temperature detection line (Standard wire length 1.5m for lead-acid battery)
F	1	RJ45 connector (used for connect E and G if necessary)(opt)
G	1	Network cable(opt)
H	4	MC 4 terminal(opt)
I	4	M6 Setscrew
J	1	Paper board(installation guide)
K	1	Installing CD, it is used to introduce shinepluebus manual and installation directory(opt)

5 Installation

5.1 Basic installation requirements

A The installation location must be suitable for the energy storage machine's weight for a long period time.

B The installation location must conform with dimension of energy storage machine.

C Do not install the unit on structures constructed of flammable or thermo labile materials .

D The Ingress Protection rate is IP20 and the pollution degree is PD2, The install area shall be generally conditioned in term of temperature, humidity and air filtration.

E Battery installation option is not far away from the position of energy storage machine.

F The humidity of the installation location should be 5 ~ 85%.

G The ambient temperature should be 0°C ~ 40 °C.

H Energy storage machine can be installed in vertical or lean back on plane, Please refer to the below .

I Installation position shall not prevent access to the disconnection means.

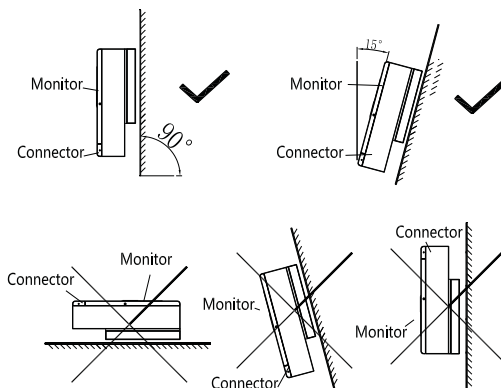


Chart 5.1

J In order to ensure machine can run normally and easy to operate, please pay attention to provide adequate space for energy storage machine, Please refer to below:

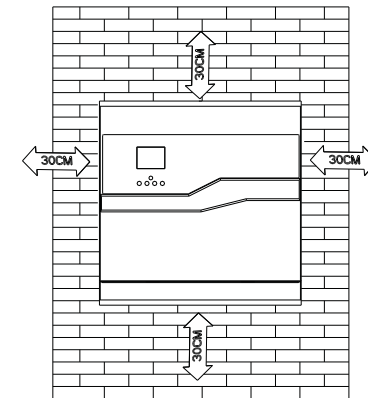


Chart 5.2

K Do not install the machine near television antenna or any other antennas and antenna cables.

L Don't install the machine in the living area.

M Be sure that the machine is out of the children's reach.

5.2 Installation Instructions

Note: Before installation, Please confirm whether it is the first install system or have already installed system after installed the inverter, If it is the first install system, Please according to the installation manual of inverter, Installing the inverter first, If not, Please installation as the following steps.

5.2.1 Installation Layout(wired sensors)

There're two types of sensors for use with Growatt SP. The first one is wired sensors. Before installing you should know something that as below:

- 1, Firstly, Max line length is 15m for wired sensors so you need to consider the length between storage machine with combiner box for the sensor should be installed in the main line.
- 2, Taking the battery fixing space into account, about the dimensions please reference user manual
- 3, The Inflammable and explosive dangerous goods must not be placed around battery in case of cause serious danger.
- 4, To consider the load-bearing before fixing, more details please reference user manual.

5, A three pin socket is needed for connecting storage machine auxiliary power supply (AC), and the distance is less than 1m between the socket with storage machine.

The installation layout of energy storage machine at home as following :

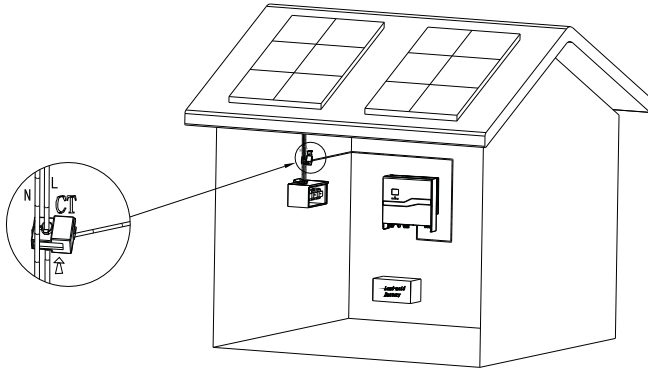


Chart 5.3

5.2.2 Installation Layout (wireless sensors)

Users also can choose wireless sensor, SP-CT, provided by Growatt, more info please read its manual attached. In this case, there isn't limitation of the 15m but the 2,3,4,5, items of 5.2.1 also has to be satisfied. SP-CT for use with Growatt SP installation diagram is as following figure:

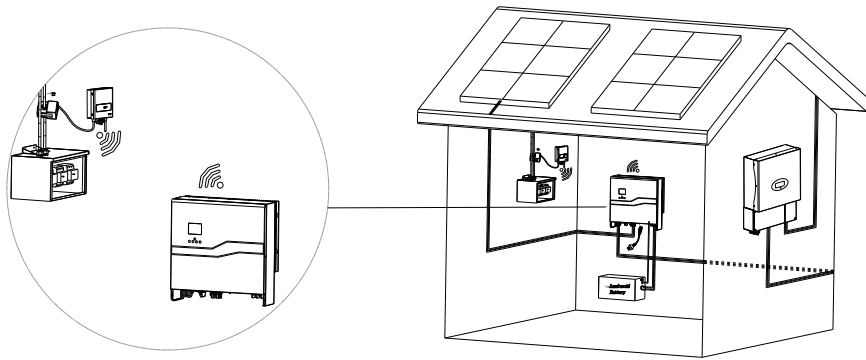
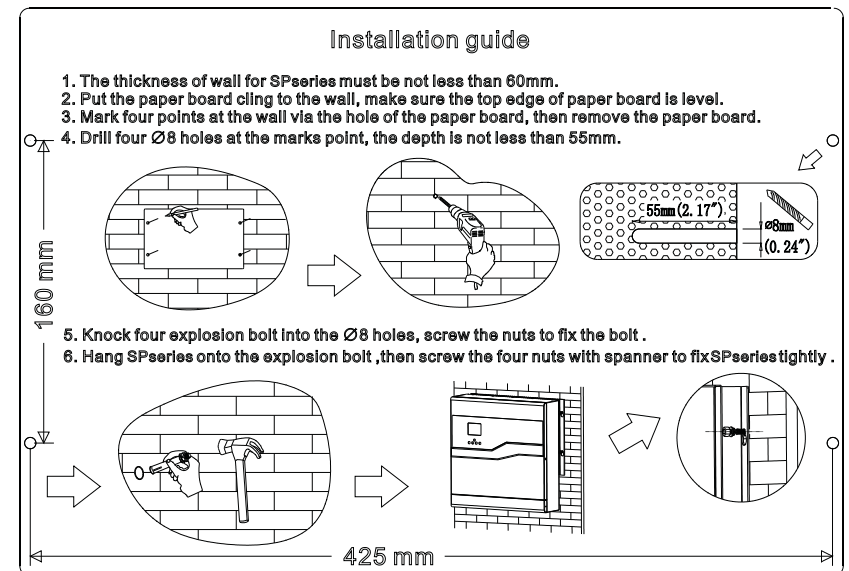


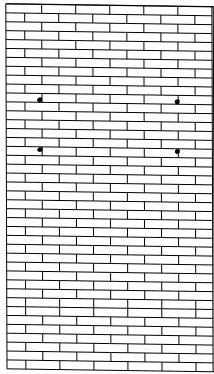
Chart 5.4

5.2.3 Installation of energy storage machine

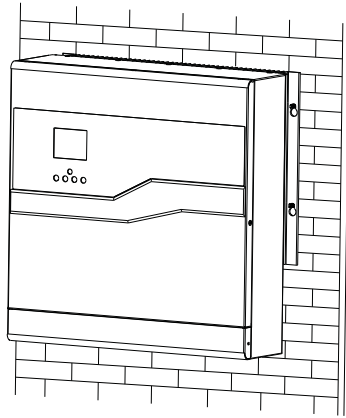
1. Project the machine's probably size on the wall; the thickness of wall for SP must be not less than 60mm.
2. Make sure the drill position, use paper board (installation guide), put the paper board cling to the wall, make sure the top edge of paper board is level (As the chart 5.5a below)
3. Mark four points at the wall via the hole of the paper board, then remove the paper board.
4. Drill four $\Phi 8$ holes at the mark point, the depth is not less than 55mm.
5. Knock four explosion bolt into $\Phi 8$ holes (As the chart 5.5b below)
6. Hang the energy storage machine on the four setscrews (As the chart 5.4c below)
7. Lock the nut of setscrew (As the chart 5.5d below)
8. The whole installation has finished



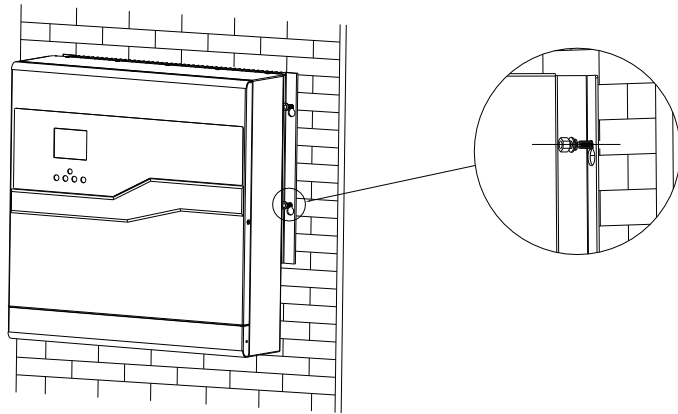
a)



b)



c)



d)

Chart 5.5

5.3 Storage System Connection Mode

5.3.1 Difference between Traditional Photovoltaic System and Storage System

Growatt SP series storage plus can be connected to single-phase grid-connected inverter to build a storage-function system. SP3000-S is compatible with dual MPPT string inverter as it has two MPPT built-in.

The traditional single-phase inverter system is shown as below:

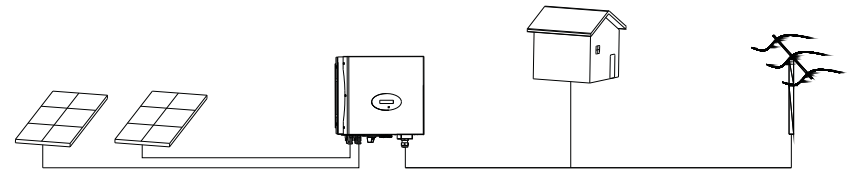


Chart 5.6

Traditional single-phase inverter system consists of PV panels, PV inverter, load and power grid. The inverter supplies the power generated by solar panels to household load. Extra electricity will be fed to the grid when generated power is more than family load needs; otherwise load will get power from grid for supplement.

PV Storage System with the storage plus is shown as below:

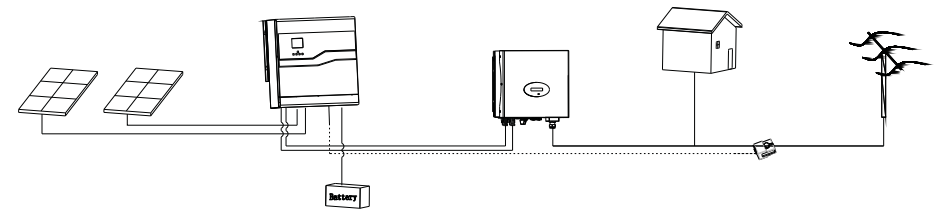


Chart 5.7

Compared with the traditional photovoltaic system, a storage-control device SP, battery (battery voltage should be between 46V to 58V, both lead-acid and lithium battery is ok) and a sensor for information collection have been added into the Storage System (Notice: Sensor must be installed close to the grid side).

5.3.2 Storage System installation with single-MPPT

As for connection with two MPPT inverter, you can refer to chart 5.6 for installation. When installing the storage system with single MPPT inverter, you can install one SPXXX only as well. Installation diagram as below:

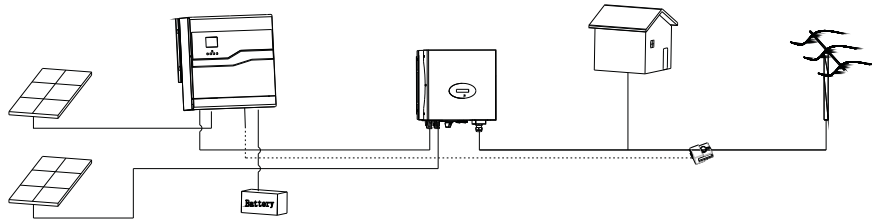


Chart 5.8

Notice: During the installations above, please pay attention to the installation position of the sensor.

5.3.3 Installation steps of Upgrading existing PV system

Steps to add the storage system into the original installed PV inverter system are shown as follow:

Step 1: If inverter is equipped with a DC switch, please turn the DC switch to Off and ensure that the DC switch on the Storage Plus stays at Off status at the same time. Then unplug the terminal connected to the inverter from PV panels, and connect it to the Input terminal of Storage Plus.

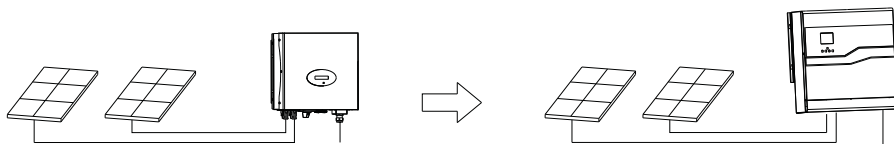


Chart 5.9

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

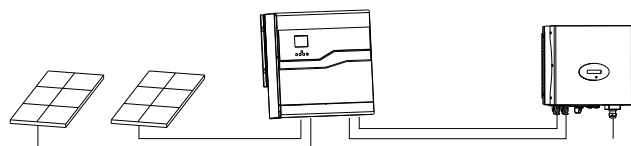


Chart 5.10

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

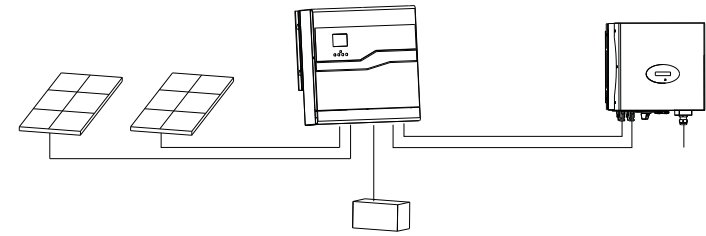


Chart 5.11

Step 4: Buckle the sensor to the residential user inlet wires, at the same time plug the AC PLUG on the Storage Plus to electricity, and finally the entire system is ready to work smoothly.

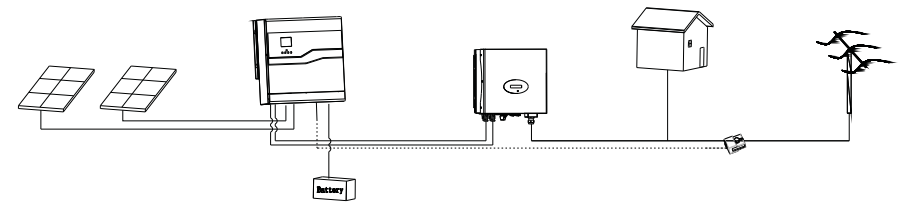


Chart 5.12

5.4 System Electrical Connection

Caution: when install the SP system, please make sure all of the power are off.

5.4. 1 Storage Plus PV and inverter Connection

1. Insure correct polarity before connecting the PV input. Reverse positive or negative polarities may cause unrecoverable damage. Insure that the short-current of PV string should not exceed the max input current of the Storage Plus.
2. The diagrams below show the PV connection way. Attention, the connectors (male and female connectors) are in paired. The connectors for PV arrays and inverters are H4 or MC4 standard.
3. When connect to inverter, please see the follow chart, pay attention to the terminal between SP and PV inverter, please pay attention to tracker number, and do not make mistake, for example, PV input A and OUTPUT to INV are a one-to-one correspondence:

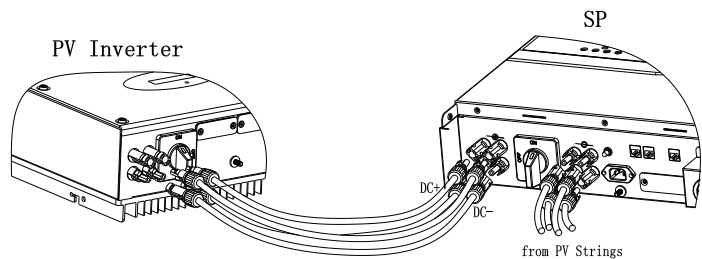


Chart 5.13

4. The maximum input current value as the table shows below:

Type	Max PV input current	Max output current to inverter (power from PV though SP)
Growatt SP1000-S	15A/15A	15A/15A
Growatt SP2000-S		
Growatt SP3000-S		

Remark: We suggest you use the cable $\geq 4\text{mm}^2/12\text{ AWG}$ to connect.

5.4.2 Connection of Temperature sensor for Lead-acid battery

Please confirm the battery type before connection. For the installation of Lead-acid battery, you need to use the temperature sensor, while lithium battery can connect direct to BMS.

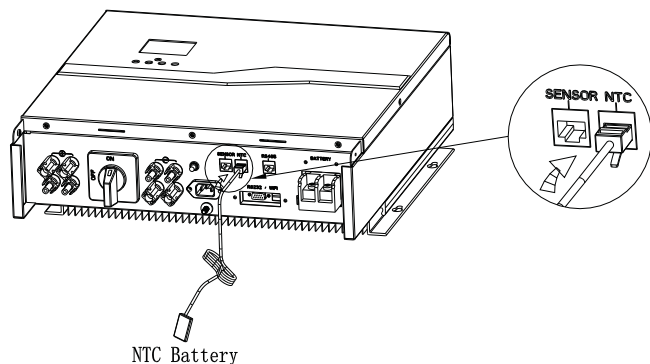


Chart 5.14

As pictured above, plug battery temperature sensor into the RJ45 male plug marked with NTC. The other terminal will stick to the battery cabinet (not to battery body).

Remark: Temperature detection wire (1.5m in length) specifications: UL1332 26 AWG TS 200°C 300V.

5.4.3 Cable CT installation diagram

There is a current transformer in sp monitoring the power consumption situation of residential users. plug current transformer into the RJ45 male plug marked with SENSOR, The other side of current transformer should be installed at the distribution box.

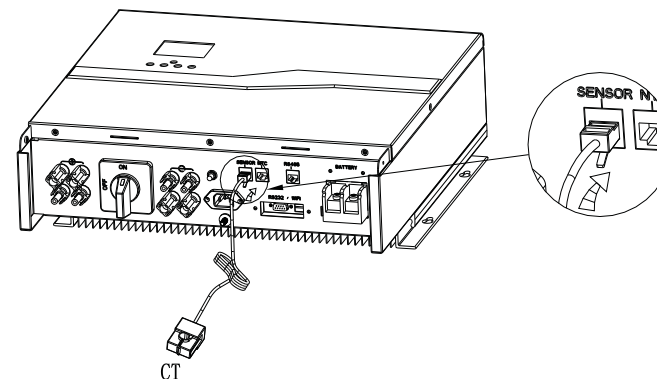


Chart 5.15

Remark: CT wire (5m in length) specification: RJ45, standard LAN line (one end with 8P modular plug, the other connected with transformer). But if the length is not enough, customer can add cable, so the length can be increased to 15m max, the operation is as follow chart:

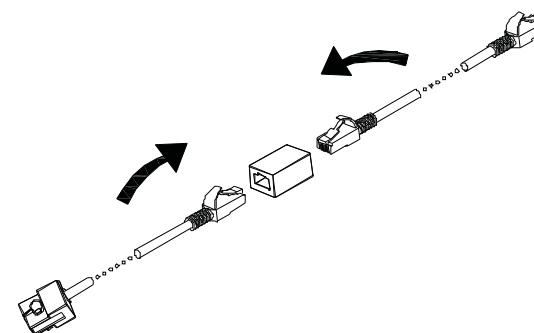


Chart 5.16

During the actual operation, please pay attention to the installation of current transformer as the diagram shows below:

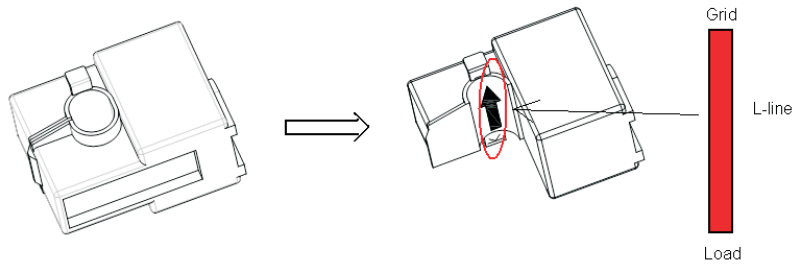


Chart 5.17

As illustrated above, open the current transformer and you can see an arrow labeled on it indicating the direction of current. Put the live wire among the under-detection wires onto the current transformer. After latching the current transformer, the installation has been finished.

Notice: The direction (from K to L) of the arrow on the current transformer is corresponding to the direction of the current in live wire from load to the grid. Sensor needs to be placed in the power distribution cabinet.

5.4.4 Wireless sensor installation program

It's more flexible for users to use SP-CT provided by Growatt. More details about installation method please read SP-CT manual. In this case, sensor listed of 5.4.3 is not need to be satisfied any more.

After completing installation, the indicator light can be used to denote its work status. (eg. Communication status) Generally speaking, the distance between SP-CT with SP should be less 30m.

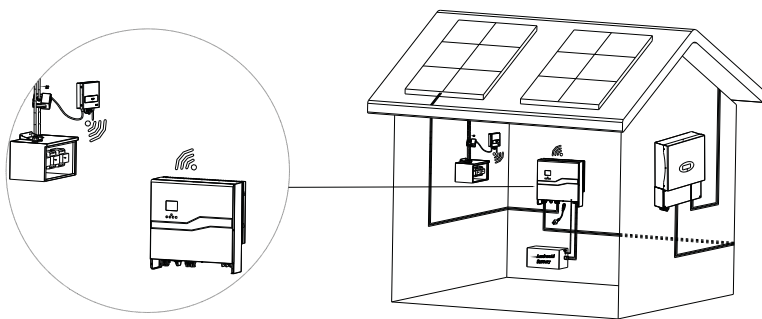


Chart 5.18

5.4.5 Battery Power Connection

1. Make sure storage machine is match with battery type.
2. Insure the polarity is correct before connecting to battery input.
3. Open the cover plate at the terminal before connection.
4. Battery connection area located on the right side above the bottom plate as the diagram below:

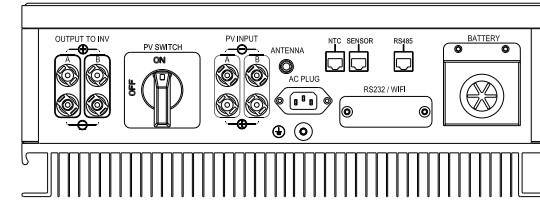


Chart 5.19

Electrical connection of battery is shown as below:

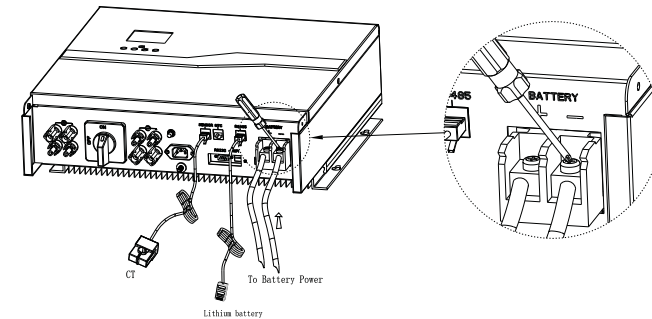


Chart 5.20

According to the battery power, you should use Cable 2*AWG8 or AWG6 (PVC type cable) to connect. And the length of this cable not more than 1.5m.

Note: When we connect lead-acid battery to SP, we should add a bat fuse between SP and lead-acid battery. Also we suggest the max current of bat fuse is 100A (fuse's voltage must above 60V), the follow chart is how to add a bat fuse:

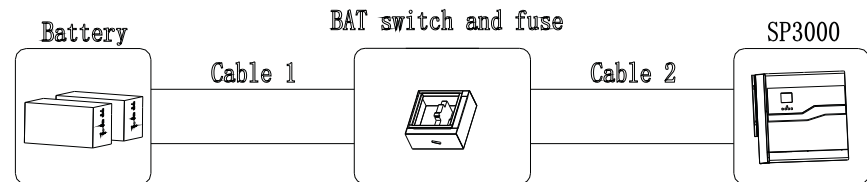


Chart 5.21

Cable 1 length add cable 2 length should not more than 1.5m.

5.4.6 Connection with BMS system of Lithium Battery

When connect to lithium battery with a BMS system, please connect the battery BMS system to the RS485 of the Storage Plus via LAN line. Installation steps are as follow:

1. Firstly please confirm the distance between battery and Storage Plus, and purchase a LAN line in spare length, both ends of LAN cable are RJ45 terminals.
2. Insure the battery is in a dormant state before connection between Storage Plus and lithium battery.
3. Severally plug one RJ45 modular plug of the LAN line (RJ45 Standard LAN) to the Storage Plus.

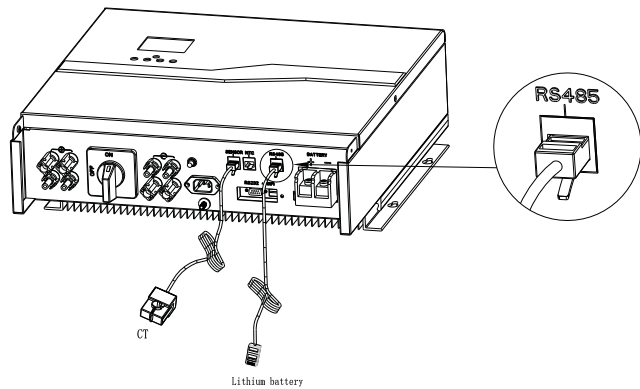


Chart 5.22

5.4.7 Connection to Lead-acid Battery

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

1. Make sure storage machine is match with lead-acid battery.
 2. Output voltage of lead-acid battery is 48V.
 3. Total Capacity of lead-acid battery is like specification shown.
 4. The installation cabinet of lead-acid is under ventilation condition.
- Installation of lead-acid battery is shown as follow:

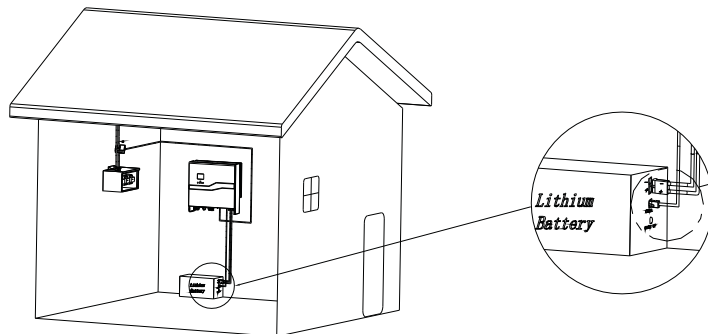


Chart 5.23

Step 1. Connect to the positive pole and negative pole of lead-acid battery cabinet using 2*AWG8 wires.

Step 2. Paste the NTC conductor used to detect ambient temperature of lead-acid battery onto the top of lead-acid battery cabinet.

After accomplishing the two steps above, the connection of lead-acid battery is completed.

Growatt recommends to use charging/discharging current at 0.2C for battery usage. There're two methods to setup this parameter by shineplusbus and its buttons

- Note:
1. Refer to user manual of shineplusbus to setup shineplusbus.
 2. Refer to chapter 6.3.4 to setup how to configure Max. charging/discharging current.

5.4.8 Recommendatory connection: Connection Between SP and Lithium Battery

For example: install with Darfon lithium battery. As to the detailed operation of Lithium battery you can refer to user manual of lithium battery in the packing box.

Connection between SP and Darfon battery as follow:

1. Firstly insure the 'status' LED indicator of lithium battery is in the extinguished status.
2. Prepare to connect with cable and LAN of the Battery, the sectional area of the cable should be more than 8mm², you are advised to use the connector within the battery packing box to connect the battery and we require the RJ45 modular plug LAN line.
3. Connection of terminals is shown as below:

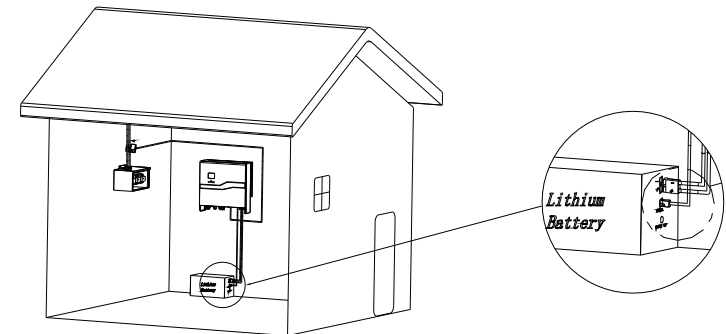


Chart 5.24

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.

Note:

Darfon is one of qualified lithium battery manufacturer of Growatt. Customer must connect lithium battery which was qualified by Growatt, otherwise it will bring danger. All the lithium battery which was qualified by Growatt has a battery fuse inside the battery box.

5.4.9 Storage Plus AC power supply connection

Preparations before connection:

- A Make sure the AC plug input have Type B RCD(Residual current detection or monitoring).
- B Measure the grid voltage and frequency and make sure it within its acceptable range.
- C Connect the AC cable with safety regulation to the AC PLUG section. The cable must be inserted in the overvoltage category 2 places, namely the home row insert.

We suggest the cable $\geq 3 \times 0.75\text{mm}^2$ to connect.

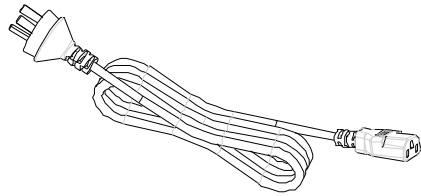


Chart 5.25

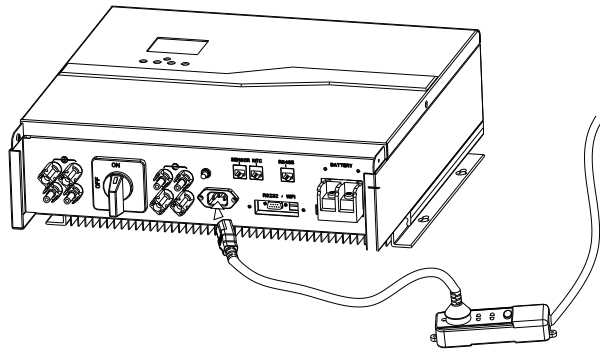


Chart 5.26

5.4.10 Storage Plus grounding

SP must be grounded by cable, the grounding point is showed as follow, and the minimum grounding cable wire diameter is 10.0mm^2

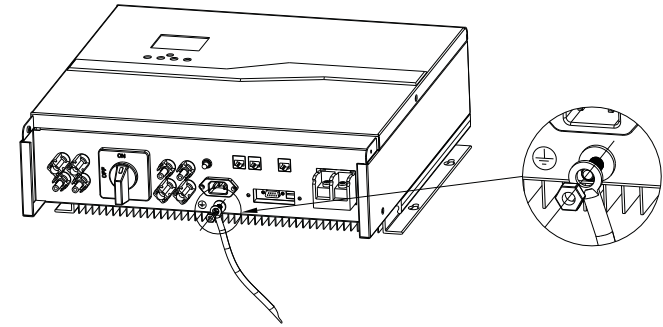


Chart 5.27

5.5. Grounding

PV Array Grounding

Grounding conductor of PV panel brackets must be firmly connected to earth at PV array side and inverter side and SP side. The sectional area of grounding conductor should be equal to the sectional area of DC grounding conductor. The minimum wire diameter is 10.0mm^2 .

DC Grounding

Select the DC Grounding mode according to the local standard and use the PV grounding terminal box and DC Grounding wires of the same specification.

Grounding Device

If the positive pole or the negative pole of PV array need to be grounded in the PV system, the inverter output should be insulated by Isolation Transformer. Isolation transformer must conform to IEC62109-1,-2 standard.

Connection as below:

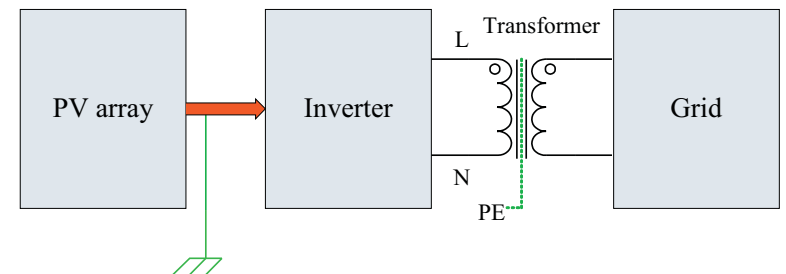


Chart 5.28

6 Commissioning

6.1 Commissioning of Energy storage machine

1) After all installation according to the fifth chapter description, and then power on SPXXX by alternating current (AC 230V)

2) At that time, SP power on, LCD will display information as follows:

- Storage plus \rightleftharpoons operating \rightleftharpoons status information.
- LCD will display warning or fault status because all of the power is off except AC.
- Please check all the information on the LCD, through pushing button you'll see various parameters

3) Make sure some electrical appliance is still consuming power. Check the P_Grid value on SP LCD, this value should show in "--" (minus), for example, "P_Grid: --200 w". The value should be more than 100 watts.

4) Turn on battery switch and inverter switch, so battery can give power to SP. Read battery voltage and Vdo from LCD, these data must meet with the datasheet. Wait for about more than 1 minute. SP's LCD status should change to "discharging"

5) After wait for 5 minutes, read the discharging power and consuming power (P_Grid which means PV power to grid or Grid power to local load), consuming power will be less than 100W.

6) Turn on PV, if there is PV power and PV power is more than consuming power, SP will stop discharging to operating, then turn to charging several minutes.

7) In normal contra variant mode, LCD would scroll display the state information and display the current state. The green LED light would turn on constantly in the same time, and consuming power will be less than 100W all the time.

8) Finish commissioning.

6.2 Operation modes

6.2.1 Normal charge mode

When daytime with abundant sunlight, energy storage machine can work in normal charge mode.

When

- PV voltage is more than 150V, and
- PV input power through storage machine more than 200W, and
- The energy storage machine detected the generator has countercurrent power (more than 80W above 1 minute) flow to the grid. The machine would transform the redundant energy exist in PV panel into electric and store into the battery, the green LED light will be lightened at the moment

When

- PV voltage is less than 130V, or
- Battery is full (SOC=100%) or battery temperature is above the range, or
- Current charging power add PV power to grid are less than 50W for 5 minutes. The energy storage machine will quit the normal charge mode automatically and turn into operating status.

When PV voltage is more than 150V, while energy storage machine fail to detect the generator has countercurrent power flow to the grid, the energy storage machine won't start charge, and in the operating status.

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

6.2.2 Normal discharge mode

When the solar energy is shortage at night, though battery capacity is completely over plus, then the energy storage machine can work in normal discharge mode..

When

- PV input voltage is less than 100V
- Battery capacity is ready, for example if lead-acid battery, voltage of lead-acid battery must be over 50V. if lithium battery, SOC should be more than 5%.
- The energy storage machine detected the generator has downstream power flow (100W) from grid to load. The energy storage machine will extract energy from the energy storage battery side, and provide it to inverter as the photovoltaic panel's mode, meanwhile the inverter transform the DC current into AC current and feed it to load, the green LED light will be lightened at the moment.

When PV voltage is less than 100V, the energy storage machine fail to detect the inverter exist downstream power flow from grid to load, then the energy storage machine will be operating state, and won't provide any power.

When

- PV voltage is more than 120V
- Battery capacity is low, for example if lead-acid battery voltage is lower than 48V (this voltage can be change by shineplusbus) or lithium battery capacity is zero.
- The energy storage machine detected the inverter has downstream power flow from grid to load less than 50W more than 1 minute.
- Maybe PV inverter is in standby status for more than 6 minutes.

The energy storage machine will transform discharge state to operating state.

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

6.2.3 Forced discharge together with PV string power (FDT) mode

This is addition function, it is not work default, how to setup it and how to judgment? Please turn to CD and read the file "How to setup SP Forced Discharge Together with PV string power".

NOTICE: FDT: forced discharge together with PV string power

6.2.4 AC charging (ACC) mode

This is addition function, it is disabled by default.

When start to work in ACC mode, you need to enable this function that maximum charging power is 1000W from utility gird. The upper limit SOC is 80% for battery by default in ACC mode.

6.2.5 Fault mode

The energy storage machine's intelligent control system could monitoring and adjustment system's status continuously, when energy storage machine monitoring anything unexpected happen, such as system fault or machine fault ,the LCD will display the fault information, in fault mode, the LED light will be lighten.

NOTICE:

- a) The detail's fault information please refer to 9.1
- b) Some fault information is in order to remind users that might have some faults occurred in inverter side.

6.2.6 Shutdown mode

Under normally circumstances, the energy storage machine will be operating state all the time, If need energy storage machine to stop working, you must disconnect the machine's providing, then the energy storage machine will turn into shutdown mode automatically.

The following is the shutdown procedure:

First: shutdown the PV side and turn off battery switch.

Second: Pull the AC PLUG from the AC grid. Then you can see the both LED and LCD of SP are off.

NOTICE:

After all the actions are done, you still have to wait for more than 2 minutes.

6.3 Display and button

6.3.1 LCD display area

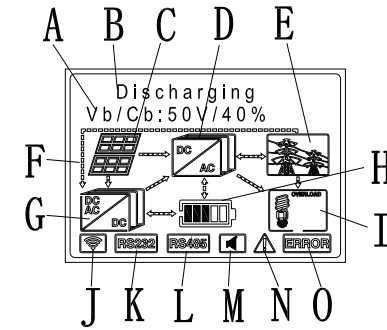


Chart 6.1

location	Description
A	Show detailed info for system
B	Indicator info for system
C	PV input
D	Inverter
E	Power grid
F	Power flow direction
G	SPXXX
H	Battery SOC
I	Load
J	SP-CT mode
K	Rs232 indicator
L	Rs485 indicator for lithium battery
M	Buzzer
N	Alarm indicator
O	Fault indicator

6.3.2 Each status light indication schematic

Normal status, we have eight states one day:

State one: before dawn, the energy stored in the battery is ran out, then the amount of home use load energy needed by the power grid to supply, the whole light operate indication schematic as follow (for example):

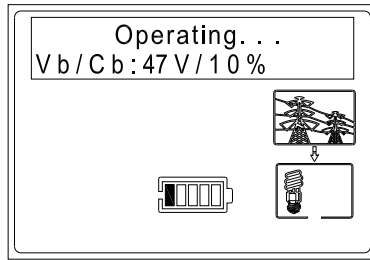


Chart 6.2

State two, in the morning and the sun rises, the PV panel's energy increase gradually, the photovoltaic panel start to supply energy to users through the inverter, lead to get power from grid less and less(or when the battery is full in the daytime, while solar energy is insufficient), the whole light operate indication schematic as follow:

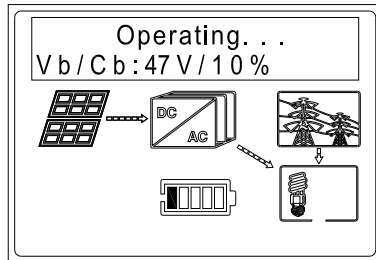


Chart 6.3

State three: with the sunlight become stronger and stronger, the PV panel's energy increase gradually, the power of the photovoltaic panel create not only satisfy the home use load, but also feed the power to grid, The SP start at the moment, and charge to the battery, decrease the countercurrent, the whole light operate indication schematic as follow:

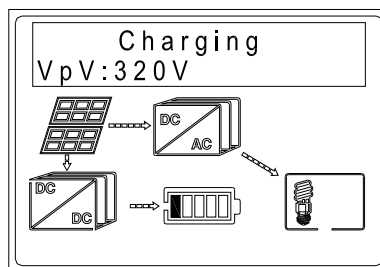


Chart 6.4

State four: with the sunlight become more stronger and stronger, the PV panel's energy increase gradually, the power of the photovoltaic panel creates not only satisfy the home use load and SP, but also feed the redundant power to grid, the whole light operate indication schematic as follow:

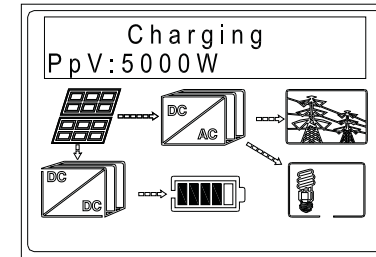


Chart 6.5

State five: increased with time, battery of SP will be fully, at that time, the power of the photovoltaic panel creates not only satisfy the home use load, but also feed the redundant power to grid, the whole light operate indication schematic as follow:

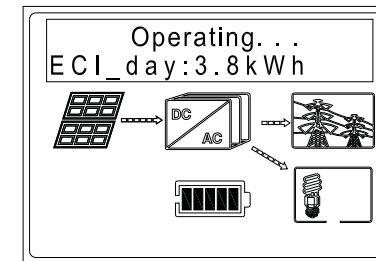


Chart 6.6

State six: The same situation as state two, with time goes by, the sun goes down to the hill slowly, the power of the photovoltaic panel creates can't satisfy the home use load ever, then the power grid would supplement the lack of the part. the whole light operate indication schematic as follow:

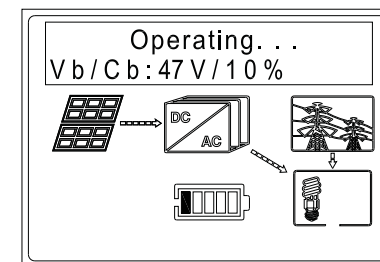


Chart 6.7

State seven: when the sun goes down to hill completely, the photovoltaic panel doesn't create power anymore, the SP has detected the condition of the load, and then restart discharge mode to satisfy home use's load, the whole LED light operate indication schematic as follow:

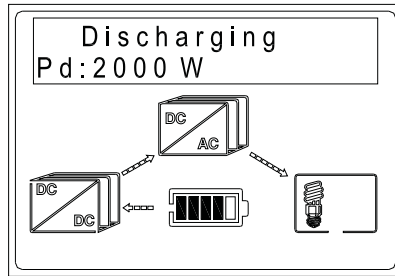


Chart 6.8

State eight: At night, when the household electricity increase, exceed the power of the SP create, in order to satisfy the home use's load, the power grid will replenish the energy of the SP's output insufficient, the whole light operate indication schematic as follow:

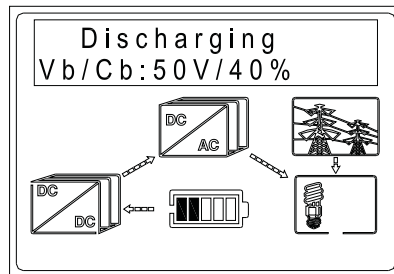


Chart 6.9

Another status, PV power generated can satisfied require of local load exactly:

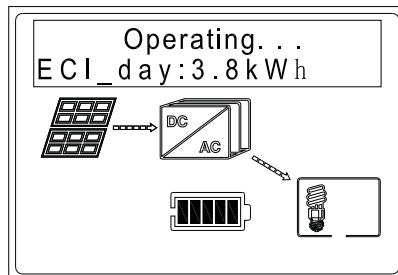


Chart 6.10

In this case, storage machine work in operating mode
In FDT mode the power flows figure is as following:

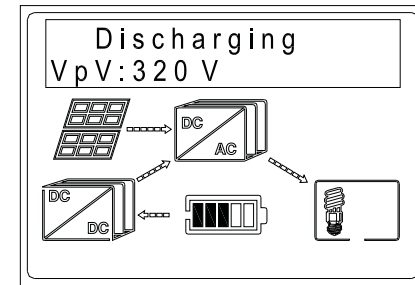


Chart 6.11

In the FDT mode, battery and PV panel common output power to load, the power flows figure is as above

In AC charging mode the power flows figure is as following:

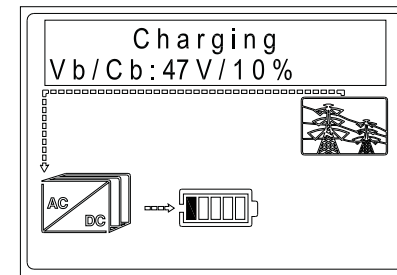


Chart 6.12

In AC charging mode, power from grid to charging battery

6.3.3 LED and button instruction

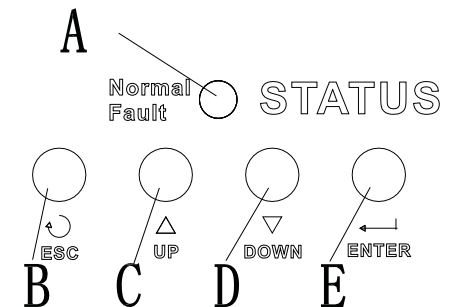


Chart 6.13

location	description
A	Status LED
B	ESC button(cancel control)
C	Up button
D	Down button
E	Enter button

Status LED is to show status of SP, it have two color, one is green and the other is red. Please turn to 3.1 and read the detail of LED

ESC button: used to cancel the last step
 UP button: page up control once.
 DOWN button: page down control once.
 Enter: determine or enter.

6.3.4 LCD display column

LCD display column is used to show the current state, basic information and fault information. Also include se the language, COM address and time. On default condition will take turns to display the information

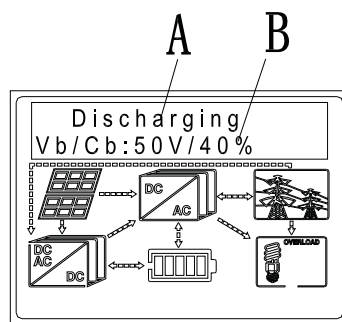


Chart 6.14

The A line's concluding information as follow:

1. Operating state: The machine is in operating state, not conduct charge-discharge operation, but system is all ready.
2. Charging state: The machine is in PV charge the battery's state.
3. Discharging state: The machine is in battery discharge to inverter's state.
4. Warning state: The machine has warning information, but doesn't affect the normal operation of the machine. If there is warning information, LCD will alternate display the current state and warning information (state and warning every 5 seconds).
5. Fault state :The machine has fault information, the machine will be in stopped operational protection state.
6. Programming state: The machine is in burn program's state.

The B line's concluding information as follow:

In normal, it will turn on page automatically, when pushing the button "down", the order of the paging information as follow:

1. No pushing button control command(operating status show as follow):
 Vb/Cb: ?V/?V → Vpv: ? V → Ppv: ? W → Vac: ? V → P_Grid: ? W → Eg_day: ?. kWh → Eg_all: .. kWh → Eu_day: ? kWh → Eu_all: ? kWh → Vbus: ? V (every page stops 5s)

Note: Vb means the voltage of battery.
 Cb means the capacity of battery.
 Vpv is the voltage of PV array input.
 Ppv is the power of PV array input
 Vac is the voltage of grid.
 P_Grid means the power to grid, if the data is positive, it means there is power from PV inverter to grid, otherwise , if the data is negative, it means there is power from grid to local load.
 Pcharge means the charging power of SP.
 Eg_day means the grid energy calculated one day
 Eg_all means the grid energy calculated all the time.
 Eu_day means the user energy calculated one day
 Eu_all means the user energy calculated all the time
 Vbus means the bus voltage.

2. No pushing button control command(charging status show as follow):
 Vb/Cb: ?V/?V → Vpv: ? V → Ppv: ? W → Pc: ? W → Ec1_day: ? kWh → Ec2_day: ? kWh → Ec1_all: ? kWh → Ec2_all: ? kWh → P_Grid: ? W → Eg_day: ?. kWh → Eg_all: .. kWh → Eu_day: ? kWh → Eu_all: ? kWh → Vbus: ? V (every page stops 5s)

Note: Vb means the voltage of battery.
 Cb means the capacity of battery.
 Vpv is the voltage of PV array input.
 Ppv is the power of PV array input
 Pc is the charging power.
 Ec1_day is the charging energy of string1 one day
 Ec2_day is the charging energy of string2 one day
 Ec1_all is the charging energy of string1 all the time
 Ec2_all is the charging energy of string2 all the time
 P_Grid means the power to grid, if the data is positive, it means there is power from PV inverter to grid, otherwise , if the data is negative, it means there is power from grid to local load. Pcharge means the charging power of SP.
 Eg_day means the grid energy calculated one day
 Eg_all means the grid energy calculated all the time.
 Eu_day means the user energy calculated one day
 Eu_all means the user energy calculated all the time
 Vbus means the bus voltage.

3. No pushing button control command (discharging status show as follow):
 Vb/Cb: ?V/?V→ Vpv: ? V →Ppv: ? W→ Vdo: ? V→Pd: ? W →Ed1_day: ? kWh →
 Ed2_day: ? kWh→Ed1_all: ? kWh→ Ed2_all: ? kWh→ Vac: ? V→P_Grid: ? W→
 Eg_day: ? kWh→ Eg_all: ? kWh→Eu_day: ? kWh→ Eu_all: ? kWh→Vbus: ? V
 (every page stops 5s)

Note: Vb means the voltage of battery.

Cb means the capacity of battery.

Vpv is the voltage of PV array input.

Ppv is the power of PV array input

Vdo is discharging voltage of SP

Pd is the discharging power.

Ed1_day is the discharging energy of string1 one day

Ed2_day is the discharging energy of string2 one day

Ed1_all is the discharging energy of string1 all the time

Ed2_all is the discharging energy of string2 all the time

Vac is the voltage of grid.

P_Grid means the power to grid, if the data is positive, it means there is power from PV inverter to grid, otherwise, if the data is negative, it means there is power from grid to local load. Pcharge means the charging power of SP.

Eg_day means the grid energy calculated one day

Eg_all means the grid energy calculated all the time.

Eu_day means the user energy calculated one day

Eu_all means the user energy calculated all the time

Vbus means the bus voltage.

4. "Down" control command (if pushing "up" button, command will go back):

Vbus: ? V→SerNo: →Model→FW Version:→ COM Address: 20 / / : → Setting

Note: (push button, information before Vbus display is the same as operating or charging or discharging status)

SerNo means the serial number.

Model means the model of SP, Different model corresponding to different battery.

FW version is the software version of SP.

COM Address: SP COM address setting

20 / / is system time of SP.

Setting is the setting window of SP.

5. In Setting Window page, click "enter" button and then input 123 to setup the following items:

•CT mode: cable CT or SP-CT

•System time

•FDT : Vopen, Vmppenable, Time, period

•AC charging mode: enable, AC charging time period, SOC upper limit (default value is 80%)

•Battery type: Lead acid battery or Lithium-ion battery

•As for lead acid battery setup please refer to following:

100~120AH, Charging/discharging current is 24A

121~150AH, Charging/discharging current is 30A

151~200AH, Charging/discharging current is 36A

201~300AH, Charging/discharging current is 45A

>300AH, Charging/discharging current is 66A

•Language

•COM address

6. CT mode setup:

1) Enter the setup page as follow by buttons:

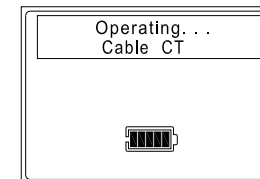
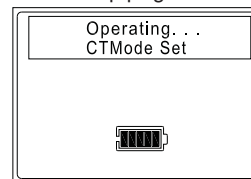


Chart 6.15

2) Press "Up" or "Down" to find "Cable CT", "SP-CT" and "Meter" as follow, and press "Enter" to complete the setup.

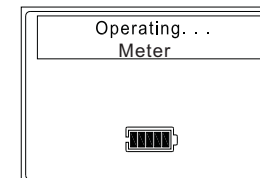
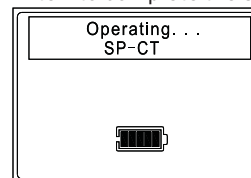


Chart 6.16

7. FDT Setup:

1) Enter FDT Setup page as below:

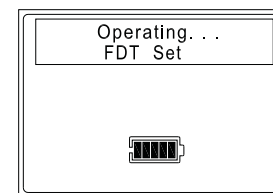
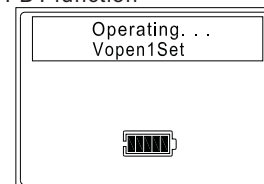


Chart 6.17

2) Setup the first MPPT Vopen. More information please refer to CD Disk "HOW to set FDT function"



e.g.:

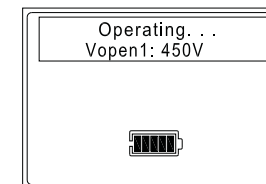
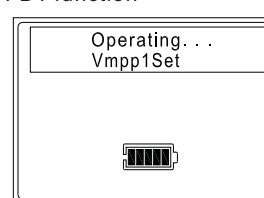


Chart 6.18

3) Setup the first MPPT Vmpp. More information please refer to CD Disk "HOW to set FDT function"



e.g.:

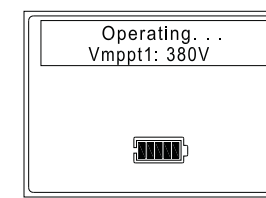


Chart 6.19

4) If you just connect one SPXXX for your inverter, you don't need to setup the second MPPT for Vopen & Vmpp. If you install two SPXXX, you need to setup the second MPPT for Vopen & Vmpp:

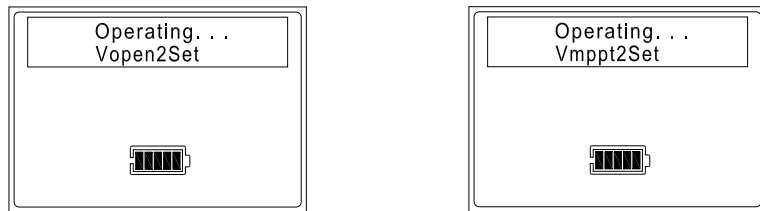


Chart 6.20

5) Setup FDT. Choose "EnableSet" is "Yes" to use this function

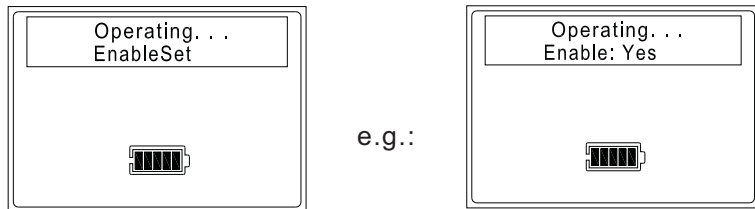


Chart 6.21

6) Setup FDT time period—starting time and ending time. 24hours by default:

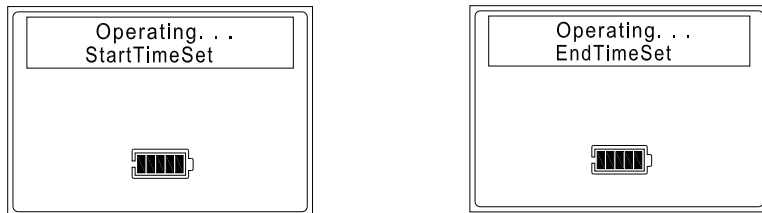


Chart 6.22

For example:

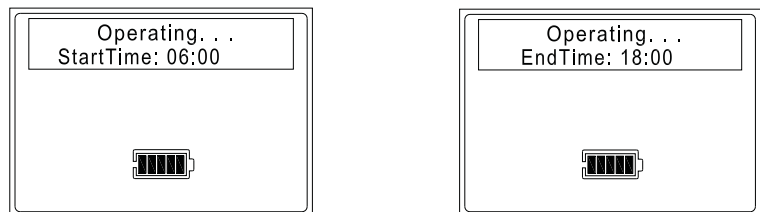


Chart 6.23

7) Enter Auto Setup page as below:

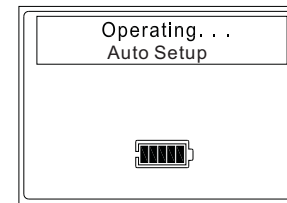
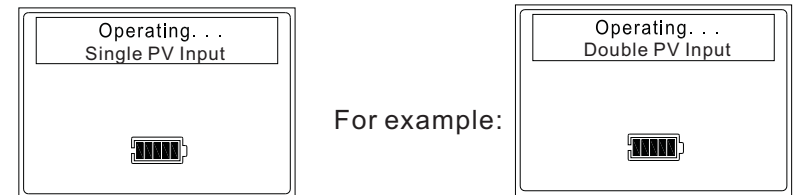


Chart 6.24

8) Press "Up" or "Down" to find "Single PV Input" and "Double PV Input" as follow, and press "Enter" to complete the setup.



Press "Enter" to complete the setup

8. AC charge setup

1) Enter ACCharge setup page as below:

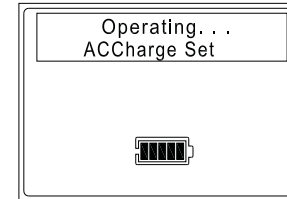


Chart 6.24

2) Setup AC charge: choose "EnableSet" as "Yes" to activate this function. If choose "No" means this function is not activated.

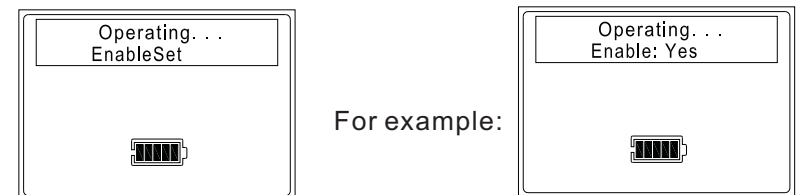


Chart 6.25

3) Setup starting time and ending time:



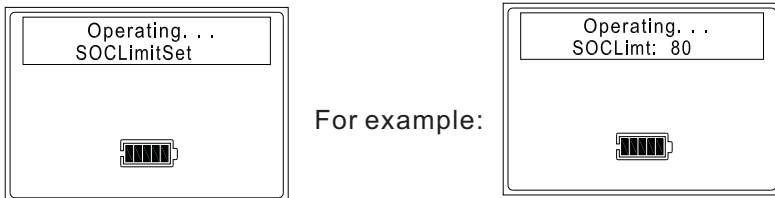
Chart 6.26

For example:



Chart 6.27

4) Setup battery SOC upper limit by AC charge, and the default value is 80%:



For example:

Chart 6.28

In chapter 6.7.8, It should show as below if you setup successfully:

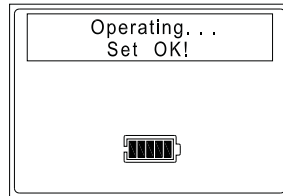


Chart 6.29

If the value is out of the allowed range, it shows as below:

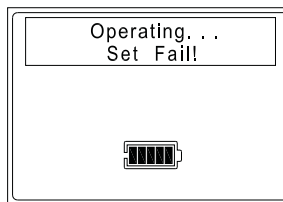


Chart 6.30

Accuracy of measurement

Display value and actual value may have deviations, can't be billing criteria. The Inverter measured value is used to control the parallel grid usage, not for accurate calibration.

6.4 Communication

6.4.1 Use the ShinePlusBus to set the storage machine

About ShinePlusBus software, when you needed, please download from official website. of Growatt or turn to CD, install software of ShinePlusBus is inside the CD.



Before use RS232 communication, you should make sure the follow PIN1 and PIN2 are OFF:

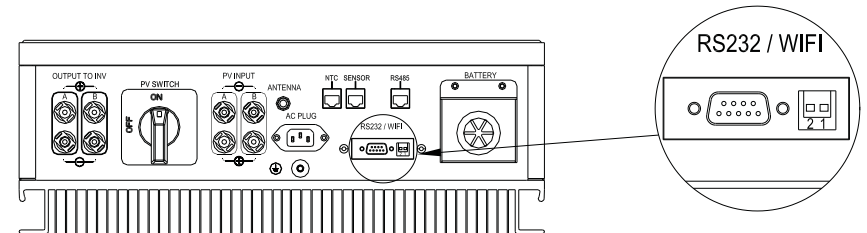


Chart 6.31

The wiring diagram is as follows:

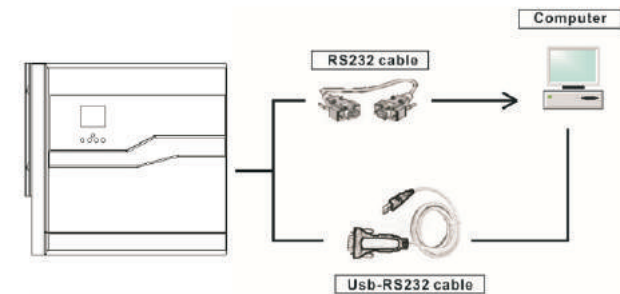


Chart 6.32

6.4.2 The SP's monitoring

The SP provide RS232 interface. Users can through the following communication solution to monitor the SP.

NOTE: this kind of monitoring, Can only be used by the monitor of Growatt's Shine server software provided by the company.

- Through RS232 interface connect to WIFI, use computer terminal for data monitoring.

Attention of the installation environment, maintenance and cleaning 8

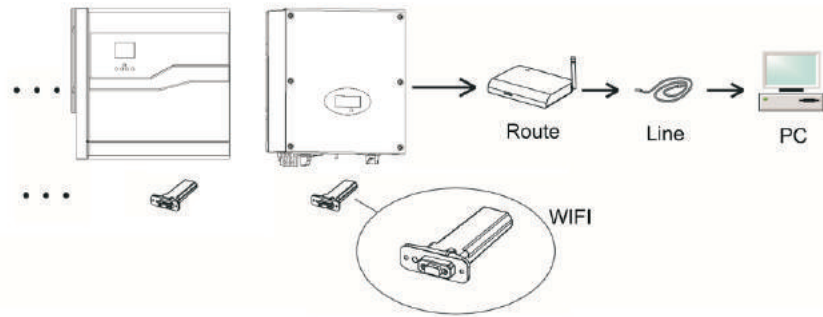


Chart 6.33

Before use WIFI communication, you should make sure the follow PIN1 or PIN2 is ON:

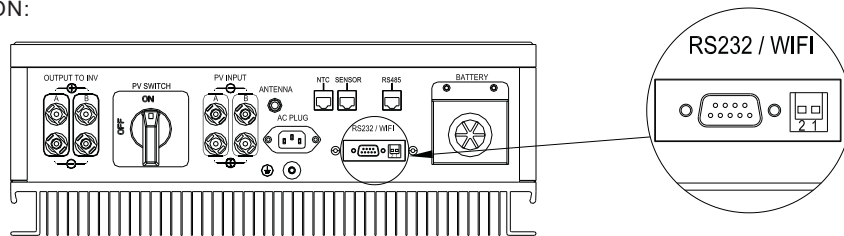


Chart 6.34

7 Start-up and shut down SP system

7.1 Start-up the SP system

Connect the AC circuit breaker

Insert AC PLUG, connect AC. the SP according the situation start-up model to judge and operate automatically.

7.2 Disconnect the SP system

1. Turn off all the circuit breaker and switch
2. Disconnect PV
3. Disconnect the inverter
4. Disconnect the battery
5. Pull up AC PLUG connection
6. Waiting until LED, LCD display have gone out, the SP is shut down completely

Heat dissipation performance is very important when Energy storage machine work under the environment of high temperature, better heat dissipation can reduce the possibility of energy storage machine stops working. Growatt SP series storage machine without fan so belongs to natural cooling, hot air from the top of the radiator, tie-in battery, use environment for IP20, please pay attention to the temperature of the installation environment, to ensure that the battery's safety and the normal work of the machine.

When use battery, please pay attention to the follow information:

Caution: Do not dispose of batteries in a fire. The batteries may explode.

Caution: Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

Caution: A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working on batteries:

- a) Remove watches, rings or other metal objects.
 - b) Use tools with insulated handles.
 - c) Wear rubber gloves and boots.
 - d) Do not lay tools or metal parts on top of batteries.
 - e) Disconnect charging source prior to connecting or disconnecting battery terminals.
 - f) Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).
- If the storage machine doesn't work for overheating too cold, solve it according to the following methods

- Confirm whether the radiator air duct installation is reasonable, choose the appropriate position before installation.
 - If is lead-acid batteries, confirming the NTC battery is in a good installation.
 - Confirm whether the battery temperature is too high, the battery temperature too high can also lead to energy storage machine fail to work normally, at this point, to ventilation, cooling or still handle to the battery, please.
 - If temperature is low, also can appear the battery low temperature protection, the battery will start with small load in low temperature output, when after temperature back to normal can work normally, please be patient at this time.
 - If the temperature is too low, it is possible the battery low temperature protection rather than the output, at this time, please pay attention to the working temperature range listed in the specifications of the book.
 - Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions.
 - When replacing batteries, replace with the same type and number of batteries or battery packs.
 - General instructions regarding removal and installation of batteries.
- Remark: all of above action should be operated by professional person, if you want to do these works, you must make sure all the power of storage system is off, for example: turn off all the DC switch, plug off the AC Cable and battery power etc.

9 Fault removal

Our products are carried out with strict tests before they take out, if the operation difficulties in the process of installation, please log on to www.ginverter.com website, view the Q&A program.

When energy storage machine fault happens, please inform our company, and to provide energy storage machine related information, we will have a professional after-sales service personnel to answer you.

What you need to provide the information about the SP including :

About the energy storage machine:

serial number

model

information about the LCD display

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?

What's the reason about this problem?

about The solar photovoltaic panels

The manufacturer name and model of solar photovoltaic panels

The output power of photovoltaic solar panels;

Solar photovoltaic panel output voltage;

Solar photovoltaic panels MPPT output voltage

The MPPT output current of photovoltaic solar panels;

The number of solar photovoltaic panels

about the battery

The manufacturer name and model of battery

capacity of battery

he total output voltage of the battery

the time you buy Battery and frequency you use it

9.1 System fault information list and troubleshooting suggestions

Error code	Possible cause	Troubleshooting suggestions
No Data Received	M3 modular can't receive data from SP-CT	1.Check the SP-CT status 2.Check the installation for SP-CT especially the distance between SP-CT and inverter 3.Restart SP-CT and try to pair with inverter again
Error: 101	Inner communication fault	1.Restar the machine; 2.Contact your installer;
PairingTimeOut	Inverter failed to pair with SP-CT	1. Check the SP-CT status 2. Check the installation for SP-CT especially the distance between SP-CT and inverter 3.Restart SP-CT and try to pair with inverter again
CT LN Reversed	CT L, N connection reversed	1.Check the L ,N line connection is correct
BMS COM Fault	Inverter failed to communicate with battery successfully	1.Check the wiring between lithium battery and inverter 2.Check the LED status of lithium.
BMS Error: xxx	Battery malfunction, fail to charge and discharge	1.Restart lithium battery 2.Contact your installer
Error:116, 117	Over current happens	1.Check the wiring between battery and inverter 2.Restart inverter 3.Contact your installer
Error: 118	Inner high voltage happens	1.Check the wiring between battery and SP 2.Restart inverter 3.Contact your installer
Error: 119	inner communication fault	1.Restart inverter 2.Contact your installer
Error: 120	Relay failed to operate	1.Restart inverter 2.Contact your installer

Error code	Possible cause	Troubleshooting suggestions
PV Voltage High	PV input voltage exceeds the acceptable range.	1.Check the PV array input voltage is within its allowed range.
PV Short-circuit	PV short-circuit happened	1.Check the PV array wiring
Battery reversed	Battery connectors reversed connection	1. Check the wiring for battery connector
PV Access Wrong	PV array terminals connect wrongly	1.Check the wiring for between PV array and inverter
PV Reversed	PV array terminal connection reversed	1. Check the wiring for PV array
L-N Reversed	L ,N line reversed for Inverter auxiliary power	1.Check the L, N line is connected right 2.Check the grounding is connected firmly
No AC Connection	Check the voltage from utility grid	1.Check the input power grid voltage is within allowed range
NTC Open		1.Restart inverter 2.Contact your installer
Battery Open	The wiring between battery and inverter is disconnected	1.Check the wiring connection between battery and inverter is correct 2.Restart the battery and SP
MPPT Trouble	Inverter MPPT malfunction	1.Check the inverter work status is normal
SS Timeout	Self-test procedure is timeout	1.Restart inverter 2.Contact your installer
Warning: 103	Inner malfunction for recording info	1. Restart inverter
Warning: 104	Firmware is mismatched	1.Update the firmware
BMS Error: xxx	Battery BMS malfunction	1. Restart inverter 2.Contact your installer
Warning: 108	The first MPPT channel may occur fault	1.Restart inverter 2.Contact your installer
Warning: 109	The second MPPT channel may occur fault	1.Restart inverter 2.Contact your installer

Error code	Possible cause	Troubleshooting suggestions
Bat voltage low	Battery voltage is too low	1. Check the battery wiring connection is correct
Bat T Outrange	Battery temperature is out of range	1. Check the battery temperature is within its range
CT Open	Current sensor connection is bad contact	1.Check the Current sensor is mounted firmly

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-SP3000-S.
Growatt-SP2000-S
Growatt-SP1000-S

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 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.

12.1 Growatt SP series energy storage machine product specification

Model	Growatt-SP1000-S	Growatt-SP2000-S	Growatt-SP3000-S
Specifications			
PV array input and output data:			
Input PV voltage range	100V~580VDC	100V~580VDC	100V~580VDC
Max input power	4000W	6000W	6000W
Max input current	15A/15A	15A/15A	15A/15A
Max charging and discharging power	1000W	2000W	3000W
Max charging power from grid	500W	1000W	1000W
Full load PV voltage range while charging	150V~450VDC	200V~450VDC	200V~450VDC
Output voltage range while discharging	150V~400VDC	150V~450VDC	150V~450VDC
Rated output voltage while discharging	300V	380V	380V
Max PV charging current	6.7A	6.7A	10A
Max discharging current to inverter	6.7A	6.7A	10A
Rated charging and discharging current	1.7A/per string	2.6A/per string	4A/per string
Number of MPP trackers /strings per MPP tracker	2/1	2/1	2/1
Output strings from SP2000 to inverter	2	2	2
Battery data			
Battery voltage range	46V~58VDC	46V~58VDC	46V~58VDC
Rating voltage	48V/51.2V/51.8V*1	48V/51.2V/51.8V*1	48V/51.2V/51.8V*1
Max charging voltage	57VDC/58VDC	57VDC/58VDC	57VDC/58VDC
Max charging current	≤23A	≤45A	≤66A
Max discharging current	≤23A	≤45A	≤66A

	Growatt-SP1000-S	Growatt-SP2000-S	Growatt-SP3000-S
Battery data			
Suitable battery types	Lead-acid battery /Lithium battery*2	Lead-acid battery /Lithium battery*2	Lead-acid battery /Lithium battery*2
Recommend battery capacity range	50~200Ah	90~400Ah	150~500Ah
The discharge depth control of battery	Lead battery 50% DOD Lithium battery 80% DOD		
Default Grid charge SOC	80%	80%	80%
Daily night electricity consumption	1~4kWh	2~9kWh	3~12kWh
Others:			
Maximum charging and discharging efficiency	94.0%	94.0%	94.5%
Input grid voltage range (single phase)	208Vac/230Vac/240Vac		
Input grid phase	50/60Hz	50/60Hz	50/60Hz
Operating temperature range:	0℃~+40℃	0℃~+40℃	0℃~+40℃
Altitude	2000m	2000m	2000m
Cooling concept	Natural convection	Natural convection	Natural convection
Environmental Protection Rating	IP 20 /(indoor used)	IP 20 /(indoor used)	IP 20 /(indoor used)
Noise emission (typical)	≤40dB	≤40dB	≤40dB
PV Over-voltage category	II	II	II
BAT Over-voltage category	II	II	II
Certificates and approvals:	CE	CE	CE
Over voltage protection	yes	yes	yes
Low voltage protection	yes	yes	yes
Over current protection	yes	yes	yes
Over load protection	yes	yes	yes
Output current short protection	yes	yes	yes
PV and battery reverse polarity protection	yes	yes	yes

	Growatt-SP1000-S	Growatt-SP2000-S	Growatt-SP3000-S
Others:			
PV array connector	MC4/H4(opt)	MC4/H4(opt)	MC4/H4(opt)
Battery connector	Screw terminal	Screw terminal	Screw terminal
Communication:	RS232/WIFI(opt)		
Display	LED+LCD	LED+LCD	LED+LCD
Dimensions(W/H/D)	445/450/162mm	445/450/162mm	445/450/162mm
Weight	16.7kg	16.7kg	16.7kg

Note:

*1 means: 48V for lead-acid battery rating voltage. 51.8V for ternary lithium battery rating voltage. 51.2V for LiFePO4 lithium battery rating voltage.

*2 means: if battery is lead-acid battery, customer can use four 12V batteries in series. But if customer chooses lithium battery, it must be supplied by Growatt.

12.2 DC input terminal parameter

MC 4 specification:

	2.5mm ² /14AWG	4mm ² /12AWG	6mm ² /10AWG	10mm ² /8AWG
Rated current (90℃environment)	32A	40A	44A	65A
Nominal system voltage	600V DC(UL) 600V DC(TUV)			
Contact resistance	0.25mΩ (model)			
Protection grade	IP 68			

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
Wi-Fi	COM interface	MR00.0004600
Bluetooth	COM interface	MR00.0002200
SP-CT	Countercurrent sampling device	MR00.0006700
Meter	Countercurrent sampling device	MR00.0007000

Growatt SP3000-S apply within the scope of the world, So the inverter have to satisfy different countries and regions of different safety standards.

Model	Certificate
Growatt-SP3000-S Growatt-SP2000-S Growatt-SP1000-S	CE,SAA,RCM,CEI0-21

Contact 14

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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