



Growatt New Energy Technology Co., Ltd
best solar solution

Growatt SPF 6000ES PLUS

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01 Product Overview



Product Overview



The high-frequency 1.5 generation machine is a new product developed on the basis of the first generation machine, while maintaining the original function, the performance and parameters of the whole machine have been partially upgraded and optimized according to market feedback problems and needs, and the main differences are as follows.

1. The overall structure uses a large chassis, and the appearance layout has been greatly adjusted;
2. The wiring method of the terminal block is optimized and more user-friendly;
3. The PV part has been changed from a single input to two inputs, and the power and open circuit voltage have been increased;
4. The communication board uses an integrated design to optimize the wiring and facilitate machine maintenance;
The air duct was optimized, the blowing mode was changed to the exhaust mode, and the dust filter was added;
6. The main boost of the machine is changed from the pulse width modulation chip to the DSP direct control, which increases the reliability;
7. Add generator interface and built-in ATS;
8. The main circuit AC/AC uses LC resonant circuit, which is highly efficient, low noise, and can effectively protect the switch.

Product Appearance



Front

There is currently only one look available

The main frame and upper cover of the structural parts of the Growatt version and the Shangke version are slightly different, and the hardware is common.



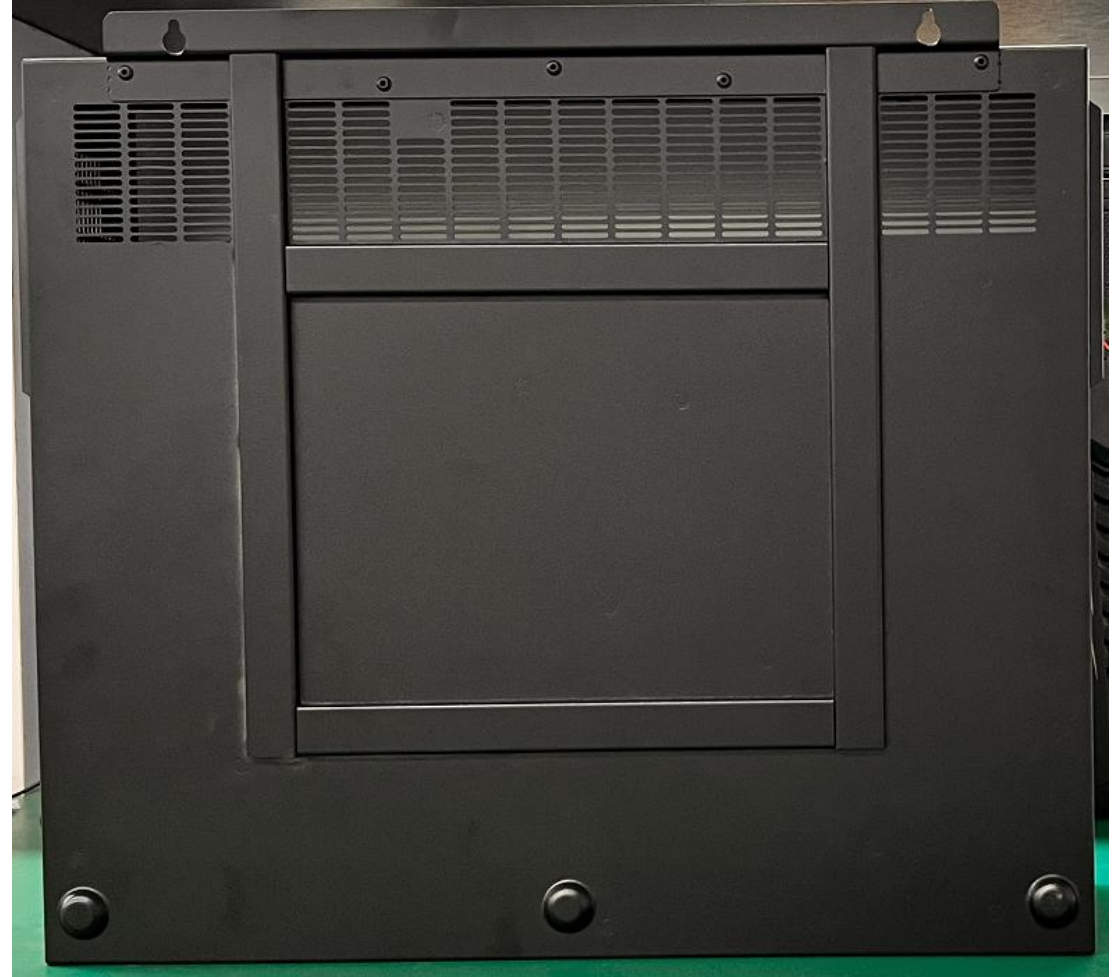
Vertical Appearance

Product Appearance



Side

A new detachable dust cover has been added to the air inlet of the case, and due to the large size of the case, there are additional stiffeners on the back.

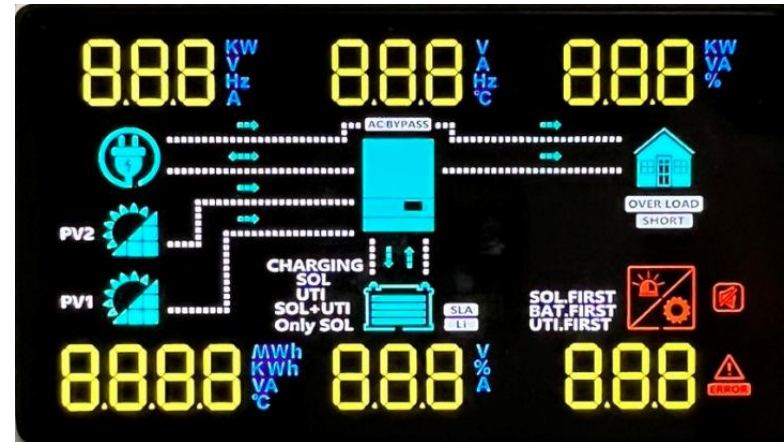
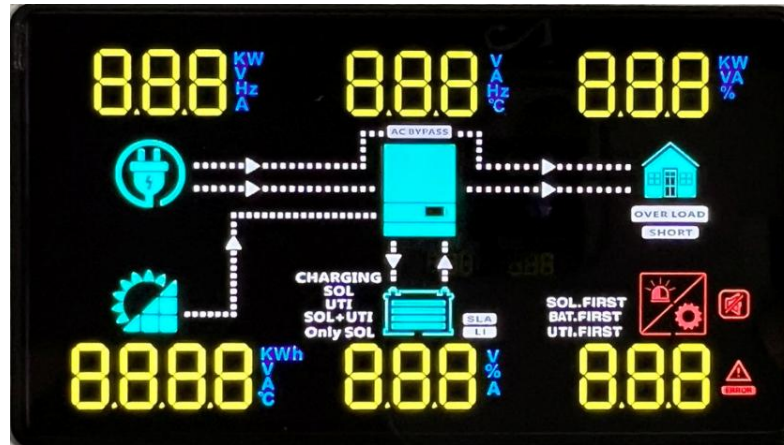


Vertical Appearance

Product Appearance

5KES

Operator Panel



6KES

SPF 6000 ES uses the new display and SPF 5000 ES display is not universal, and it can be used in emergency situations, but it will be less PV display.

The key operation is the same as that of SPF 5000 ES.



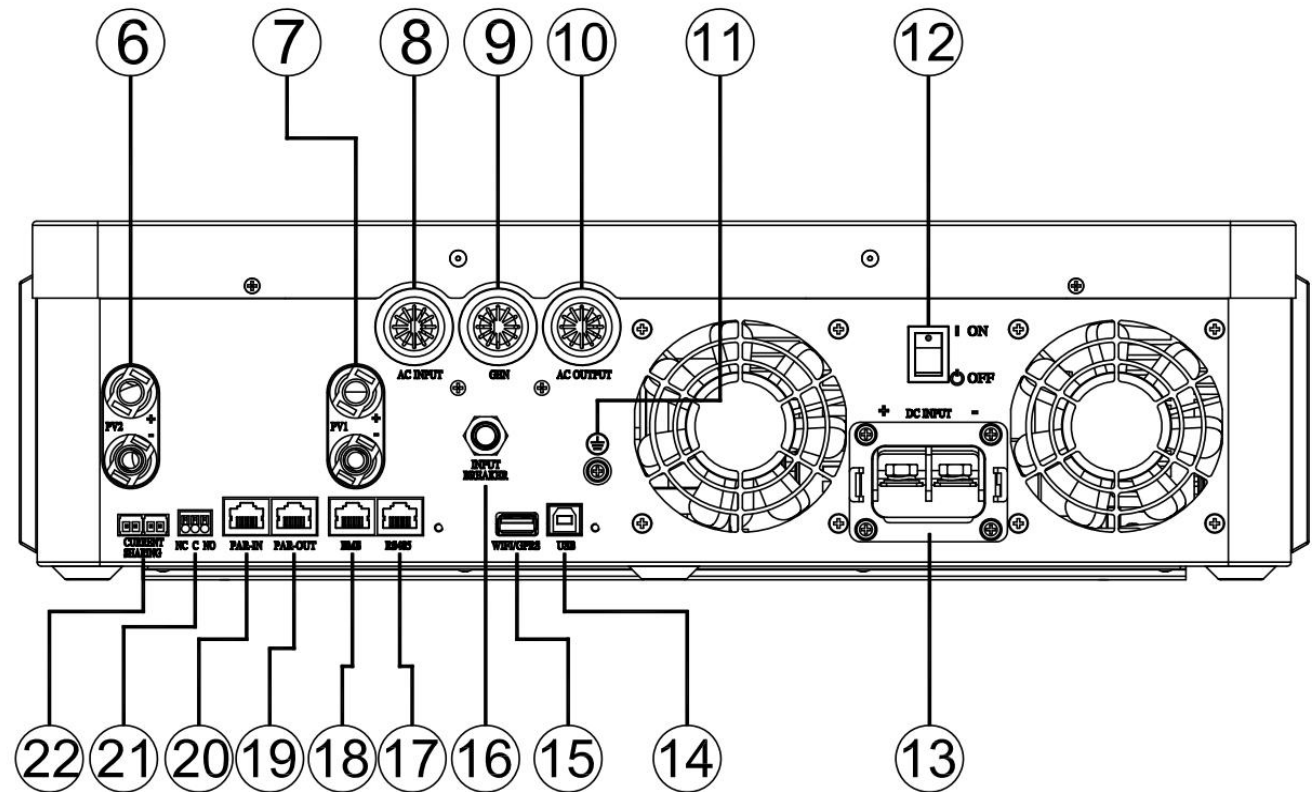
Left (green light): Solid light - Utility bypass; Flash-inverter mode;
 Middle (green light): Solid light - Fully Charged; Flash - Battery Charging;
 Right (red light): Solid light - Fault Mode; Flash - Warning Mode;
 Key:
 Left: Back Key;
 Second: Page UP (Turn the page three times to see the software version);
 Third: Page Down
 Right: Confirm Key

Product Appearance



Wiring Panel

- 6. PV2 Input, Positive up and Negative down,
- 7. PV1 Input, Positive up and Negative down,
- 8. AC Input
- 9. Generator Input
- 10. AC Output
- 12. Power on Switch
- 13. Battery Input, Left Positive and Right Negative,
- 14. USB Communication
- 15. WiFi/GPRS Interface
- 16.AC Input Insurance
- 17.RS485 Communication
- 18.BMS Communication
- 19.Parallel Communication Input
- 20.Parallel Communication Output
- 21.Dry Contact
- 22.Current Sharing Port (Parallel Use)



03 Parameters



Basic Parameters



Note

The machine parameters are basically the same as those of SPF 5000 ES, only the power and PV parameters are slightly different.

Model	5K ES	6K ES
Rated Power	5000W	6000W
Battery Voltage	48VDC	48VDC
Parallel Function	up to 6	Up to 6
Monitoring Method	WiFi / GPRS	WiFi / GPRS
Inverter Voltage	208-240V can be set	208-240V can be set
Inverse Maximum Conversion Efficiency	93%	94%
Conversion Time	10-20ms	10-20ms
PV Maximum Open Circuit Voltage	450V	500V
Maximum PV Power	6000W	4000W*2
PV Operating Voltage Range	120-430V	120-450V
Maximum Charging Voltage	60V	60V
PV Maximum Charge Current	100A	100A
AC Maximum Charge Current	80A	80A
Maximum Total Charge Current	100A	100A
Communication Interface	USB/CAN/RS485	USB/CAN/RS485
Size	470*320*135mm	460*395*132
Net Weight	12kg	13.5kg



04 Fault Codes and Troubleshooting

Fault Codes and Troubleshooting



Fault Codes

High frequency machine all-in-one					
error code	description	warning code	description	warning code	description
01	Fan lock (abnormal)	01	Fan lock (abnormal) during inverter operation	36	Overvoltage of lithium battery overall
02	Over-temperature	02	Over-temperature	37	Lithium battery overall under-voltage
03	Battery voltage high	03	attery overcharge	38	Discharge overcurrent
04	Battery low voltage	04	Battery low voltage	39	Charging overcurrent
05	Output short circuit	07	Overload	40	Discharge over temperature
06	Output voltage high	10	Output power derating	41	Charging overtemperature
07	Overload	12	Battery voltage too low, PV stops charging	42	Mosfet over temperature
08	BUS voltage high	13	PV voltage too high, PV stops charging	43	Battery over temperature
09	BUS soft start failure	14	Overload, PV stops charging	44	Battery temperature too low
51	Overcurrent or surge	15	Input mains different at parallel	45	System shutdown
52	BUS voltage low	16	Input phase sequence error during parallel	51	Overcurrent or surge
53	Inverter soft start failure	17	Output out of phase at parallel	63	Battery voltage inconsistent
55	Output DC component too high	18	Overcurrent		
56	Battery not connected or disconnected	19	Battery disconnected		
57	Current sensor failure	20	BMS communication error		
58	Low output voltage	21	Insufficient PV power		
60	Negative power fault	22	No battery prohibits paralleling		
61	PV input overvoltage	25	Parallel inverter power difference		
62	Internal communication error	33	BMS communication lost		
80	CAN communication failure	34	Lithium battery single cell overvoltage		
81	Host loss	35	Lithium battery single cell undervoltage		



06 Client FAQ

Client FAQ



Settings for Different Batteries

Why protocol unmatched lithium batteries need to be manually parameterised:

The use of protocols not matched lithium-ion, because the machine can not communicate with the battery to obtain battery parameters and other information, charging and discharging voltage and current is not controllable, it is easy to cause battery protection or machine damage, so the use of lithium-ion in the absence of communication must be in accordance with the specifications of the battery and the parameters of the machine charging parameter settings, due to lithium-ion specifications, the machine can not be sure of the default setting parameters, it is recommended that you consult with the battery manufacturer, the manufacturers reply to the parameter settings according to the manufacturer.

Note: Off-grid models do not respond to battery discharge current requests.

Off-Grid Battery Related Settings									
Charging-related settings should follow the setting logic: Voltage setting: 21 items < 12 items < 13 items < 20 items < 19 items Current setting: 11 items < 02 items									Remarks
Battery type/mode		21 items low voltage cut-off point	12 items switching point into utility	13 items switching point out of utility	20 items float charging voltage	19 items average charging voltage	11 items utility maximum charging current	02 items total charging current	
AGM (default) Lead-acid mode	Default value	42V	46V	54V	54V	56.4V	Machine preset	Machine preset	
	Setting range	Not settable	44~51.2V Customize	48~58V Customize	Not settable	Not settable	Less than 02 items	Machine preset	
Flooded 水电池模式	Default value	43.6V	48V	56V	56V	58.4V	Machine preset	Machine preset	
	Setting range	Not settable	44~51.2V	48~58V	Not settable	Not settable	Less than 02 items	Machine preset	
Li 锂电模式	Default value	SOC 20%	SOC 40%	SOC 80%	Battery Preset	Battery Preset	Machine preset	Battery Preset	It is recommended to access only DC input when matching in lithium mode, and then access other input sources after matching is completed and communication is normal to avoid battery protection or damage to the machine.
	Setting range	SOC 5%~50%	SOC 6%~50% Customize	SOC 51%~100% Customize	Not settable	Not settable	Less than 02 items	Not settable	
USE 自定义模式 适用铅酸	Default value	42V	46V	54V	54V	56.4V	Machine preset	Machine preset	
	Setting range	40~48V	44~51.2V Customize	48~58V Customize	48~58.4V	48~58.4V	Less than 02 items	Recommended less than 1/5C	
US2 自定义模式2 适用锂电	Default value	45.5V/46V	48V	52V	54V	54V	Machine preset	Machine preset	Applies only to lithium batteries that are not communicating or are not matched. Some lithium batteries do not communicate with the machine battery output will be switched off. Be sure to pay attention to the voltage and current in the charge setting.
	Setting range	40~48V	44~51.2V Customize	48~58V Customize	48~58.4V	48~58.4V	Less than 02 items	Recommended less than 1/5C	
Remarks		When the low voltage cut-off point is reached *If only battery power is available - system shuts down *If there is a PV with battery - system shuts down output and PV charges battery. *If there is a PV with mains power and battery - system turns to bypass with load and charges the battery at the same time.	Items 12 and 13 need to be set only if item 01 is in SBU or SOL mode.		Items 19 and 20 can be set only in USE or US2 mode (it is recommended that the two settings are the same in US2 mode).		For safety reasons, no communication lithium battery charging current settings are recommended to be set within 0.2C, the maximum do not exceed 0.25C, it is recommended to consult the battery manufacturer to set the parameters of the manufacturer's response.		

Note: Battery presets in the table refer to the settings that the battery sends to the machine and cannot be changed. Machine preset refers to the preset default parameters of different models, which can be changed.

Client FAQ



Stand-alone normal, parallel fault

Why the stand-alone test is normal and the parallel machine reports a fault?

Common faults are parallel machine report 16, 17, 80, parallel machine noise after switching on, parallel machine charging is not normal, output uneven current, Negative power failure, etc.

Excluding abnormal machine processes or software bugs, most of the faults are related to the user or installer did not read the user manual carefully, resulting in setup or wiring errors.

Precautions for single-phase parallel machines:

1. Be sure to confirm that the wiring is correct, the wiring is shown in the attached diagram in the user manual schedule.
2. Make sure all circuit breakers in the load side line are disconnected.
3. There is no need to set the master and slave of single-phase parallel machine, the system automatically assigns the master and slave according to the order of switching on the machine, the first one to switch on the machine is the master and the rest are the slaves. After the master is switched off, the master is automatically transferred to the slave of the same phase.

Precautions for three-phase parallel machine:

1. Be sure to confirm whether the wiring is correct, the wiring method is shown in the attached figure.
2. Make sure that all circuit breakers in the load side line are disconnected.
3. The three-phase parallel machine setup needs to define the master and slave machines, see the attached table for the specific setup method. Setting and machine wiring should be one-to-one correspondence (such as three-phase parallel machine will be single-phase in the two machines set to different phases)
4. Try to cut in all three phases at the same time when connecting to the mains for three-phase parallel machines.
5. Confirm that the whole system is in normal operation before loading.
6. The power supply system has a switching time, and the power supply may be interrupted for critical equipment with high power supply requirements.
7. Three-phase parallel AC input cannot be used with single-phase input. [Report parallel input abnormality](#)

Other Precautions

1. In the parallel system, PV access to the machine must be connected to an independent PV string, and it is prohibited for multiple PV ports to share the same set of strings. [Shared strings lead to common ground interference noise and damage to the machine.](#)
2. All inverter battery inputs in the parallel system must share the same set of batteries, and it is prohibited to supply power separately. [Individual power supply charging abnormality](#)
3. 23 settings need to be changed after the parallel machine is switched on, the switch must be turned off before setting, after the switch is turned off, the machine will shut down if it does not enter the setup menu within 20 seconds, such as entering the setup menu after a one-minute delay to shut down the machine. [Some customers feedback can not find the parallel machine setup options](#)
4. 23 settings need to be changed after the parallel machine is switched on and off before the switch can be set, the machine will shut down if it does not enter the setup menu within 20 seconds after the switch is turned off, and the machine will shut down if it is delayed by one minute after it enters the setup menu.
5. Parallel AC output N line must be connected in parallel. [Report the output phase sequence error](#)
6. The same phase of the machine must be connected between the parallel flow line. [Report negative power failure](#)
7. Parallel communication line can not be missed or not locked. [Report parallel communication failure or loss of host](#)

