

ROCKSOLAR

6 kW Off-Grid Solar System with 10 kWh Energy Storage

USER MANUAL

Product	ROCKSOLAR 6 kW Split-Phase Off-Grid Solar System
System SKU	SYS-6KW-2xGSL5-SPE6-10x440PHIL-2
Inverter	Growatt SPE 6000US
Solar Array	10 x 440 W bifacial panels - 4,400 W total
Battery	2 x Growatt ALP 5.0L-E2 US - 10 kWh nominal storage
AC Output	120/240 Vac split-phase, 60 Hz

IMPORTANT SOLAR ARRAY WIRING

The 10 supplied 440 W modules must be arranged as **two independent series strings of five panels each**. Connect String 1 to MPPT 1 and String 2 to MPPT 2. Do not place all 10 panels in one series string.

For off-grid residential, cottage, cabin and backup-power applications

Installation and commissioning must be performed by a qualified solar/electrical professional.

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1. Introduction

Thank you for choosing the **ROCKSOLAR 6 kW Off-Grid Solar System with 10 kWh/15kWh Energy Storage**. This system combines a Growatt SPE 6000US split-phase inverter, ten 440 W bifacial solar modules, and two Growatt ALP 5.0L-E2 US LiFePO4 battery modules or one GSL 14.34kWh battery module into an integrated off-grid power system for homes, cottages, cabins, and backup applications.

During daylight, available solar energy can supply loads and charge the battery. Stored energy can supply loads when solar production is insufficient. The inverter also supports utility or compatible generator input when the system is configured for auxiliary charging or backup operation.

QUALIFIED INSTALLATION REQUIRED

This manual is a system-level operating guide. Electrical installation, grounding, overcurrent protection, PV string wiring, battery wiring, commissioning, and code compliance must be completed by qualified personnel in accordance with applicable Canadian electrical requirements, local rules, and the current manufacturer manuals.

2. What's Included

Component	Quantity
Growatt SPE 6000US off-grid storage inverter	1
440 W bifacial monocrystalline solar panel	10
Growatt ALP 5.0L-E2 US 5 kWh battery module	2
10 AWG 20 ft PV cable set	2 sets
10 ft 2 AWG battery cable set	1 set
Wi-Fi module	1
300 V / 20 A DC circuit breaker	2
Circuit breaker box	1
Solar mounting rack	Optional
Component user manuals	Included

The ROCKSOLAR product page may also offer an alternate GSL battery option. This manual is written for the **two Growatt ALP 5.0L-E2 US modules** that provide 10 kWh nominal storage. If your kit contains another battery model, follow that battery manufacturer's instructions for installation, communication, settings, and service.

3. Main System Specifications

3.1 Growatt SPE 6000US inverter

Specification	Rating / Description
Rated AC output	6,000 W / 6,000 VA
AC output	120/240 Vac split-phase, 60 Hz
AC connection	L1 / L2 / N / PE
Maximum output current	25 A
PV input	2 independent MPPT trackers
Maximum recommended PV power	9,000 W total
Maximum power per MPPT	4,500 W per MPPT
Maximum DC voltage	550 Vdc
PV startup voltage	120 Vdc
MPPT operating range	60-480 Vdc
Maximum input current	27 A per MPPT
Maximum PV short-circuit current	34 A per MPPT
Lithium battery voltage range	46-60 Vdc
Maximum battery charge/discharge current	140 A / 140 A
Battery communication	CAN / RS485
Peak efficiency	96.5%
Enclosure protection	IP20
Operating temperature	-10°C to +50°C
Monitoring	LCD/LED; Wi-Fi supported

3.2 Solar array

Parameter	Per 440 W module	Five-panel string
Rated power	440 W	2,200 W
V _{mpp}	32.98 V	~164.9 V
V _{oc}	38.63 V	~193.2 V
I _{mpp}	13.36 A	~13.36 A
I _{sc}	14.30 A	~14.30 A

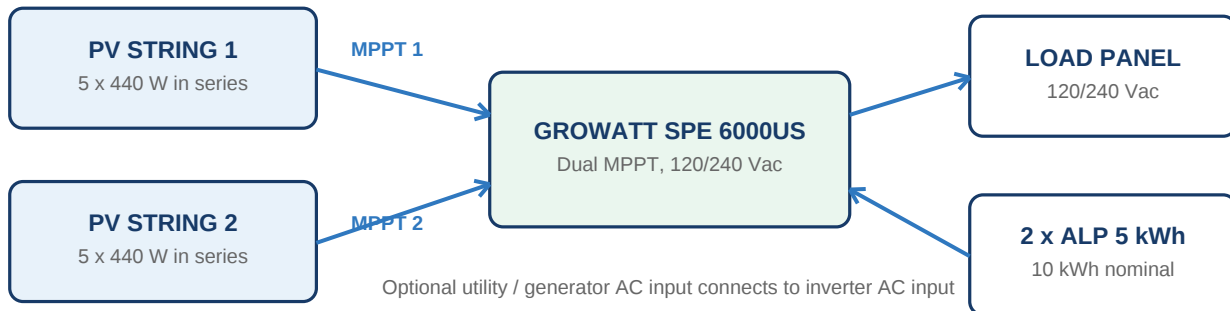
The complete array is 4,400 W: two equal five-panel series strings, each rated approximately 2,200 W at STC. One string is connected to each MPPT tracker.

3.3 Battery bank

Specification	Two-module battery bank
Chemistry	Cobalt-free LiFePO4 (LFP)
Nominal system voltage	51.2 V
Nominal energy	10.0 kWh
Usable energy	Approx. 9.2 kWh
Module count	2 x ALP 5.0L-E2 US
Module capacity	100 Ah each
System communication	CAN
Protection rating	IP66 / NEMA Type 4X
Operating temperature	-10°C to +50°C
Warranty	10 years (manufacturer datasheet)

4. System Operating Principle

The system uses two independent PV strings feeding the inverter's two MPPT trackers. The inverter manages solar production, battery charging/discharging, split-phase AC output, and optional utility/generator input according to the programmed operating priorities.



SOLAR INPUT CONFIGURATION

Each five-panel series string should remain independent and feed its own MPPT input. This keeps each MPPT operating within its designed current range and allows the inverter to track each string separately.

5. Safety Instructions

DANGER - HIGH DC AND AC VOLTAGE

Solar modules produce DC voltage whenever exposed to light, even when the inverter is switched off. The battery bank can deliver very high fault current. The inverter also contains AC circuits capable of causing serious injury or death.

- Use insulated tools and appropriate personal protective equipment.
- Verify polarity before making any DC connection.
- Install correctly rated disconnects, breakers, grounding, and bonding.
- Keep battery terminals protected from accidental short circuit.
- Do not open, modify, or puncture battery modules.
- Do not exceed the inverter PV voltage/current limits.
- Do not work on energized circuits unless specifically required by an approved procedure.
- Keep children and unauthorized persons away from electrical equipment.

BATTERY SAFETY

Never reverse battery polarity, short battery terminals, expose batteries to fire, or use a damaged/deformed battery. A damaged or submerged lithium battery must not be touched; isolate the area and contact qualified service personnel.

6. Installation Location

6.1 Inverter

- Install indoors in a dry, accessible, well-ventilated service area.
- Mount on a solid, non-combustible surface.
- Maintain the manufacturer-required clearances and do not block fan openings.
- Protect the inverter from water, condensation, corrosive vapours, direct heat, and combustible materials.
- The SPE 6000US is rated IP20 and is not intended for direct outdoor exposure.

6.2 Battery

- Install in a clean location protected from prolonged direct sunlight and excessive heat.
- Growatt ALP modules may be wall-mounted or floor-installed using approved hardware/base.
- Each ALP 5.0L-E2 US module weighs approximately 46 kg / 101 lb; use safe lifting methods.
- Do not install damaged batteries.
- Maintain access for service, inspection, and emergency isolation.

7. Solar Panel Installation

- Select an unshaded location with suitable solar exposure.
- Use racking designed for the roof or ground structure and local wind/snow loads.
- Keep modules mechanically secure and allow rear ventilation.
- Route PV cables away from sharp edges, standing water, and abrasion points.
- Keep connectors off the roof surface where practical and ensure compatible connectors are fully seated.
- Do not walk on modules or modify the frames.

The supplied Philadelphia Solar 440 W bifacial module is approximately 1721 x 1133 x 30 mm and weighs about 20.5 kg. The module datasheet lists a maximum static load of 5400 Pa on both front and rear surfaces; the complete mounting design still must comply with local structural requirements.

8. Electrical Connections

The installation should be organized around equipment grounding/bonding, battery DC, split-phase AC output, optional AC input, and the two PV circuits. Use the current manufacturer manual for exact terminal locations, torque values, conductor requirements, and commissioning steps.

- 1 Establish equipment grounding and bonding.
- 2 Install and connect the battery bank and battery overcurrent/disconnect equipment.
- 3 Connect the 120/240 Vac load panel to L1/L2/N/PE as designed.
- 4 Connect utility or generator input if used.
- 5 Wire and verify the two five-panel PV strings with PV disconnects/breakers open.
- 6 Perform polarity and voltage checks before closing any disconnect.

9. Battery Connection

The two ALP battery modules are used as a 51.2 V nominal battery bank with 10 kWh nominal energy. The battery modules are paralleled according to the Growatt ALP battery system instructions and connected to the inverter through properly rated battery conductors and protection.

IMPORTANT - BATTERY WIRING

The two 5 kWh batteries are connected as a compatible **parallel battery bank**, not in series. Do not create a 102.4 V battery bank. The SPE 6000US lithium battery input range is 46-60 Vdc.

Before connecting the battery bank:

- Turn the inverter OFF.
- Turn PV disconnects OFF.
- Turn AC input and AC output breakers OFF.
- Verify battery polarity with a suitable meter.
- Confirm both battery modules are the same compatible model and are prepared for parallel operation.
- Use the approved Growatt communication and parallel connection method.

10. Battery Communication

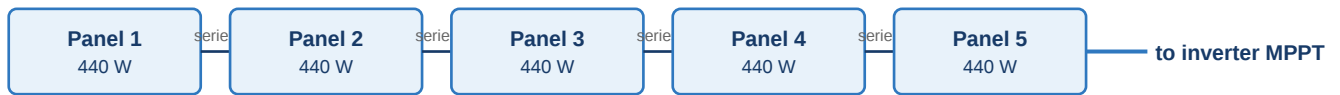
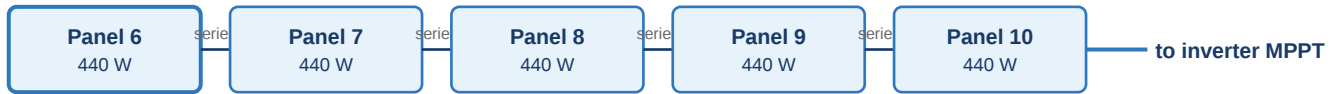
The ALP system communicates with the inverter by CAN. Correct BMS communication allows the inverter and battery to coordinate charge/discharge current, state of charge, voltage limits, temperature protection, and fault conditions.

- Use the specified communication port and cable.
- Follow the ALP manual for master/parallel module addressing and communication wiring.
- Do not substitute pinouts or generic network cables unless the manufacturer explicitly permits them.
- Commission the inverter with the correct lithium battery protocol/settings.

11. Solar Panel Connection - Two 5-Panel Series Strings

REQUIRED PV CONFIGURATION

The 10 supplied 440 W solar modules must be wired as **two independent strings of five panels in series**. String 1 connects to MPPT 1. String 2 connects to MPPT 2. This is a 5S + 5S dual-MPPT configuration.

STRING 1 - FIVE PANELS IN SERIES -> MPPT 1**STRING 2 - FIVE PANELS IN SERIES -> MPPT 2**

Do not connect all 10 modules in one series string. Do not mix unequal string lengths.

Keep the two 5-panel strings independent and connect one string to each MPPT input.

11.1 Series wiring procedure

With both PV breakers/disconnects open and the modules safely accessible:

- 1 For String 1, connect Panel 1 positive (+) to Panel 2 negative (-), then continue panel-to-panel until five modules are in series.
- 2 The two unused end leads become String 1 positive (+) and String 1 negative (-).
- 3 Repeat the same procedure with Panels 6-10 to create String 2.
- 4 Label both strings clearly.
- 5 Measure and verify polarity of each string before connecting it to the inverter.
- 6 Measure open-circuit voltage of each string and compare the two strings; similar irradiance and temperature should produce similar voltages.
- 7 Route String 1 through its designated 300 V / 20 A DC breaker/disconnect to MPPT 1.
- 8 Route String 2 through its designated 300 V / 20 A DC breaker/disconnect to MPPT 2.
- 9 Confirm connectors and terminals are secure before energizing the PV circuits.

11.2 Expected electrical values

Using the supplied 440 W module datasheet at STC, each five-panel string is approximately **164.9 V at maximum power (V_{mp})** and **193.2 V open circuit (V_{oc})**, with approximately **13.36 A operating current**. These values are within the SPE 6000US MPPT range of 60-480 Vdc and below the 27 A per-MPPT input current limit.

Solar-module voltage rises in cold weather. The panel datasheet lists a V_{oc} temperature coefficient of -0.30%/°C. The installer must calculate the maximum cold-weather string V_{oc} for the actual site and verify it remains below the inverter's 550 Vdc maximum input voltage.

DO NOT RECONFIGURE WITHOUT ENGINEERING REVIEW

Do not connect all 10 supplied modules in one series string. Do not use unequal string lengths. Do not combine the two strings onto a single MPPT input unless a qualified designer has verified the design against the current inverter manual and electrical code.

12. AC Output Connection

The SPE 6000US provides **120/240 Vac split-phase output** with L1, L2, neutral, and protective earth. A qualified electrician should connect the inverter output to an appropriately configured load panel with correctly sized conductors, neutral/ground treatment, and overcurrent protection.

- Total continuous output is 6,000 W / 6,000 VA.
- Maximum output current is 25 A at 240 V split-phase rating.
- Balance 120 V loads across L1 and L2 where practical.
- Large motors, pumps, compressors, and air conditioners can have high starting current and must be evaluated for surge compatibility.

13. Split-Phase 120/240 V Operation

Unlike the smaller 120 V-only systems, the SPE 6000US directly supplies split-phase 120/240 V output. Typical 120 V loads connect from L1-to-neutral or L2-to-neutral. Typical 240 V loads connect from L1-to-L2. The exact branch-circuit design must comply with applicable electrical codes and the equipment served.

14. Initial Startup

Initial commissioning should be performed by the installer after all mechanical and electrical inspections are complete.

Pre-start checklist

- Inverter and batteries are securely mounted.
- Grounding and bonding are complete.
- Battery polarity is correct.
- PV String 1 and String 2 polarity are correct.
- Each PV string contains exactly five supplied modules in series.
- String 1 is connected to MPPT 1 and String 2 to MPPT 2.
- Measured PV Voc is within limits.
- AC input/output wiring is correct.
- Battery CAN communication is connected and configured.
- All covers, glands, and enclosures are secure.

A typical commissioning sequence is battery system -> inverter -> AC source (if used) -> PV inputs -> AC loads. Always follow the current Growatt SPE and ALP manuals for the final switch-on sequence and settings.

15. Normal Operation

The system can be configured to prioritize solar, battery, utility, and/or generator power. A common off-grid strategy is solar supplying loads first, excess solar charging the battery, and the battery serving loads when solar is insufficient. Utility or generator charging may be enabled as a backup according to the installation design.

16. Battery Indicators

Indicator	Meaning
RUN - Green	Battery operating / status indication
ALM - Red	Alarm, fault, or protection condition
SOC LEDs	Approximate state-of-charge indication in increments

If the ALM indicator remains illuminated, review the battery/inverter monitoring information. Do not repeatedly reset a persistent fault without determining the cause.

17. Wi-Fi Monitoring

The kit includes a Wi-Fi monitoring module. Once configured, remote monitoring may provide solar production, battery state of charge, load information, system mode, charging/discharging status, and fault/warning information. Follow the Wi-Fi module and Growatt monitoring instructions supplied with the kit.

18. System Shutdown

- 1 Turn off or disconnect major AC loads.
- 2 Open/disable AC utility or generator input if present.
- 3 Open both PV DC breakers/disconnects.
- 4 Turn off the inverter according to the Growatt procedure.
- 5 Shut down/isolate the battery bank according to the ALP procedure.

ENERGY MAY REMAIN PRESENT

Turning off the inverter display does not make PV wiring or battery conductors safe. Solar modules can remain energized in daylight, and batteries retain stored energy.

19. Emergency Shutdown

If there is smoke, fire, flooding, physical damage, exposed conductors, or another hazardous condition, keep people away from the equipment and contact emergency services or a qualified technician.

- Do not touch a damaged, swollen, burned, or submerged lithium battery.
- If safe to do so from an accessible disconnect location, isolate AC output, PV, AC input, and battery sources.
- For a battery fire or thermal event, evacuate the area and inform responders that a lithium iron phosphate energy-storage system is involved.

20. Routine Maintenance

Interval	Recommended check
Monthly	Review inverter/battery status, alarms, and production trends.
Every 3-6 months	Inspect visible PV cables, connectors, disconnects, battery enclosure, and inverter ventilation for damage, corrosion, moisture, or overheating.
Annually	Have a qualified technician inspect electrical terminations, breakers/disconnects, grounding, fault history, battery condition, and system performance.

21. Solar Panel Cleaning

Clean modules when accumulated dirt, leaves, pollen, or other debris materially reduces production. Use clean water and soft, non-abrasive materials. Avoid metal scrapers, abrasive chemicals, and walking on modules. Follow safe roof-access procedures. Snow accumulation can substantially reduce winter production.

22. Battery Storage

For extended non-use, follow the Growatt ALP storage instructions. Store batteries in a dry, clean, ventilated environment protected from direct sun and rain. Maintain the manufacturer-required state of charge and periodic recharge schedule; do not leave batteries deeply discharged for extended periods.

23. Troubleshooting

Condition	Possible cause	Recommended action
Inverter does not start	Battery isolated/depleted	Check battery switches, breakers, SOC, and BMS status.
No PV charging	PV breakers open	Check both PV breakers/disconnects.
One MPPT shows no PV	String fault or open connection	Check the affected five-panel string, polarity, connectors, and measured Voc.
Different MPPT production	Shade, soiling, orientation, or string issue	Compare irradiance/conditions; inspect the lower-producing string.
Battery not charging	BMS communication/settings	Check CAN connection and battery protocol.

Condition	Possible cause	Recommended action
Battery alarm	Protection/fault condition	Read monitoring fault information and consult ALP manual.
Inverter overload	Load exceeds available capacity	Disconnect nonessential loads; assess motor/compressor surge.
No 240 V load operation	AC wiring/breaker/load issue	Have qualified electrician check L1/L2 circuit.
Wi-Fi offline	Network/module issue	Verify module power, network credentials, and monitoring setup.

24. Understanding Available Energy

Two ALP 5.0L-E2 US modules provide **10.0 kWh nominal energy** and approximately **9.2 kWh usable energy** according to the battery datasheet. Actual AC energy available to loads will be lower after inverter losses and can vary with battery state of charge, temperature, protection limits, and simultaneous solar production.

As a simple illustration, a constant 1,000 W load would theoretically use 9.2 kWh in about 9.2 hours before accounting for inverter losses, changing loads, reserve settings, and battery limits. This is an energy example, not a guaranteed runtime.

25. System Expansion

The system can be expanded only after a qualified design review. The SPE 6000US manufacturer datasheet lists support for multiple parallel inverters, and the ALP battery platform supports multiple battery modules. Expansion may require additional overcurrent protection, conductors, communication wiring, bus equipment, settings, and code review.

- Do not add PV modules without recalculating voltage, current, MPPT loading, and cold-weather Voc.
- Do not exceed 4,500 W recommended PV power on either MPPT for the SPE 6000US.
- Do not mix incompatible battery models or chemistries in the same battery bank.
- Use the current Growatt parallel-system instructions before adding inverter units.

26. Technical Support

ROCKSOLAR Canada

Customer Service: Mon-Sat, 9:00 a.m.-6:00 p.m. EST

Phone: +1 800-858-4318

Email: support@rocksolar.io

Address: 115 Randall Drive, Unit 9, Waterloo, Ontario N2V 1C5, Canada

When requesting support, provide the order number, inverter model/serial number, battery serial numbers, fault code, photos of the inverter display and installation, battery SOC, and measured PV string voltages when safely available.

27. Important Notice & Technical References

This ROCKSOLAR manual is a system-level guide and does not replace the current installation, operation, and service manuals for the individual components. Where any discrepancy exists, the current manufacturer manual and requirements of the authority having jurisdiction take precedence.

Primary technical references used for this manual:

- ROCKSOLAR Canada product page: 6 KW Split phase 120/240Vac Off-Grid Solar System.
- Growatt SPE 6000-12000US Datasheet, 2024-10.
- Growatt ALP LV-US Modular Battery Datasheet, 2024-10.
- Growatt ALP 5.0L-E2 US Battery System User Manual, 2025-10.
- Philadelphia Solar PS-MNB108(HCBF) 425-440 W bifacial module datasheet, updated 2024-10-30.