ROCKSOLAR

40 kW High-Voltage Hybrid Off-Grid Solar System

43.2 kW Solar Array + 81.92 kWh LiFePO4 Energy Storage

Item	Specification
Inverters	2 x Isuna U20K-POH 20 kW high-voltage split-phase hybrid/off-grid inverters
Total AC Output	40,000 W nominal aggregate, 120/240 VAC split-phase
Solar Array	72 x 600 W Philadelphia Solar modules = 43,200 W
Battery Storage	2 x GSL-R40K HV LiFePO4 systems = 81.92 kWh nominal total
PV Configuration	TWELVE strings of SIX panels in series (6S x 12 strings)
PV Allocation	Inverter 1: Strings 1-6 | Inverter 2: Strings 7-12
Battery Allocation	Battery 1 -> Inverter 1 | Battery 2 -> Inverter 2 (unless manufacturer-approved alternate topology)

CRITICAL PV WIRING	The 72 supplied 600 W modules are configured as twelve independent 6-panel series strings. Each inverter receives six equal strings. Do not increase string length, combine additional strings, or move strings between inverters without a new electrical review.

BATTERY / PARALLEL HOLD POINT	Each GSL-R40K is intended to serve one U20K-POH power block. Do not cross-connect HV battery buses, bridge one battery across both independent battery ports, or parallel the two R40K clusters unless Isuna and GSL provide an approved topology for the exact hardware and firmware.

ROCKSOLAR USA
6585 Arville Ave, STE A
Las Vegas, NV 89118, USA
+1 (702) 983-5966

ROCKSOLAR CANADA
115 Randall Drive, Unit 9
Waterloo, ON N2V 1C5, Canada
+1 (800) 858-4318

Customer Service & Technical Support: support@rocksolar.io

Revision 1.0 - August 2026 | System-level operating and commissioning guide

Contents

1. Introduction and Intended Use

Thank you for choosing the ROCKSOLAR 40 kW High-Voltage Hybrid Off-Grid Solar System. This system combines two Isuna U20K-POH 20 kW split-phase high-voltage inverters, a 72-panel 43.2 kW Philadelphia Solar array, and two GSL-R40K 40.96 kWh high-voltage LiFePO4 battery systems for 81.92 kWh nominal storage. It is intended for large off-grid or hybrid homes, farms, ranches, workshops, agricultural facilities, remote estates, cottages, and commercial properties requiring substantial 120/240 VAC split-phase power.

The installation is organized as two balanced 20 kW power blocks. Each inverter is assigned 36 solar modules (21.6 kW) and one GSL-R40K battery system. When a common AC output is required, the two inverters must be configured using the current Isuna manufacturer-approved parallel architecture.

QUALIFIED INSTALLATION REQUIRED

This manual is a system-level operating and commissioning guide. Parallel-inverter configuration, high-voltage battery wiring, PV protection, grounding, rapid shutdown, grid/generator integration, AC distribution, permitting, and commissioning must be completed by qualified personnel under applicable NEC/CEC requirements and the authority having jurisdiction.

2. System Overview and Primary Components

Item	Specification
Inverters	2 x Isuna U20K-POH, 20 kW each, 40 kW aggregate nominal output when configured in an approved parallel system
Solar modules	72 x Philadelphia Solar PS-MNB144(HCBF)-600W design-basis modules
Solar array	43.2 kW DC nominal total; 21.6 kW assigned to each inverter
Battery storage	2 x GSL-R40K HV LiFePO4 systems, 40.96 kWh each; 81.92 kWh nominal total
PV stringing	12 independent strings x 6 modules in series
MPPT allocation	Each inverter: 2 strings to MPPT 1; 2 strings to MPPT 2; 1 string to MPPT 3; 1 string to MPPT 4
Battery allocation	One R40K cluster assigned to each inverter unless an alternate topology is explicitly approved by Isuna and GSL
Balance of system	Project-specific PV disconnect/OCPD, RSD equipment, grounding, HV battery protection, AC breakers/disconnects, generator equipment, racking, labels, communications, and parallel hardware

3. Main System Specifications

3.1 Isuna U20K-POH / current 20 kW Isuna HV split-phase platform

Item	Specification
Rated AC output	20,000 W per inverter; 40,000 W aggregate nominal when configured in the approved parallel system
AC output	120/240 VAC split-phase; 50/60 Hz
Rated output current	83.5 A per inverter at the 240 V split-phase rating
Overload capability	110% long-term; 160% for 10 s; 200% for 100 ms under manufacturer-specified conditions
Dedicated generator input	48 kW / 200 A published input rating per inverter
Off-grid switching time	<8 ms
Maximum PV input	30,000 W per inverter
PV startup / MPPT range	95 V startup; 80-500 VDC MPPT range

Item	Specification
MPPT trackers / strings	4 MPPTs; up to 2 / 2 / 2 / 2 strings on the 20 kW model
MPPT current limits	36 A max input current and 44 A max short-circuit current per MPPT
Battery range	80-480 VDC
Battery ports / current	2 independent HV battery ports; 50 A + 50 A published charge/discharge current
Efficiency	97.7% max; 97.3% CEC; 98% PV-to-battery; 96.8% max charging/discharging
Enclosure / warranty	IP66 / NEMA 4X; current Isuna page lists 10-year warranty
Communication	Wi-Fi / LAN / 4G / Bluetooth; battery communication interfaces per approved installation

3.2 Philadelphia Solar 600 W module - design basis

The system design basis is the Philadelphia Solar PS-MNB144(HCBF)-600W bifacial N-type module. The values below are used for string calculations. Verify the actual module nameplate and the most current manufacturer datasheet before commissioning.

Item	Specification
Module rated power	600 W
Module Vmp	44.95 V at STC
Module Voc	53.11 V at STC
Module Imp	13.35 A at STC
Module Isc	14.12 A at STC
Voc temperature coefficient	-0.25%/deg C
Maximum series fuse	30 A
Maximum system voltage	1500 VDC module rating
Six-panel string power	3,600 W
Six-panel string Vmp	Approx. 269.7 V at STC
Six-panel string Voc	Approx. 318.7 V at STC
Six-panel string operating current	Approx. 13.35 A

3.3 GSL-R40K high-voltage battery - each power block

Item	Specification
Chemistry	LiFePO4 / LFP
Nominal energy	40.96 kWh each; 81.92 kWh total for two systems
Cell configuration	128S1P
Nominal voltage	409.6 V
Working voltage range	358.4-460.8 V
Nominal working current	100 A
Peak charge/discharge current	150 A for 5 s at 25 deg C
Communication	CAN / RS485
Installation	Floor-standing
Enclosure rating	IP20
Published temperature range	Charge: 0 to 55 deg C; Discharge: -20 to 55 deg C

BATTERY COMPATIBILITY HOLD POINT

The GSL-R40K working range falls within the Isuna 80-480 V battery window. Voltage compatibility does not confirm BMS protocol, battery-port topology, pre-charge behavior, current limits, or protection. Confirm the exact Isuna-GSL protocol and approved connection for each inverter before energization.

4. Safety Information

DANGER - MULTIPLE HIGH-ENERGY SOURCES	This system contains twelve PV strings, two high-voltage battery systems operating up to approximately 460.8 V each, two 20 kW inverters, 120/240 VAC output, and potentially grid and generator AC sources. Switching off one inverter does not de-energize the complete system.

- Installation, commissioning, service, and electrical modifications must be performed by qualified personnel.
- Use appropriately rated PPE, insulated tools, meters, lockout/tagout procedures, and disconnecting means.
- Verify polarity before connecting any PV or battery conductor. Never assume a circuit is de-energized because a display is off.
- Do not open, puncture, short, reverse-connect, or bypass either GSL battery BMS.
- Do not connect or disconnect PV connectors under load unless the connector system and procedure specifically permit it.
- Do not exceed Isuna MPPT voltage/current limits or the Philadelphia Solar module maximum series-fuse rating.
- Do not cross-connect the two HV battery clusters or inverter battery ports without an approved manufacturer topology.
- Keep unauthorized persons away from inverters, batteries, disconnects, combiner/protection equipment, and load panels.
- Install the GSL-R40K systems indoors or in another suitable protected environment consistent with their IP20 rating.

Fire and emergency conditions

If there is fire, heavy smoke, arcing, flooding, damaged high-voltage battery equipment, or exposed conductors, keep people away from the equipment and contact emergency services. Inform responders that the site contains two high-voltage lithium iron phosphate energy-storage systems. Do not touch damaged or submerged battery equipment.

5. Dual-Inverter System Architecture and Energy Flow

21.6 kW PV - Block 1 36 x 600 W 6 strings x 6S	**GSL-R40K Battery 1** 40.96 kWh 409.6 V nominal	**ISUNA U20K-POH #1** 20 kW split-phase 4 MPPTs | 2 battery ports
21.6 kW PV - Block 2 36 x 600 W 6 strings x 6S	**GSL-R40K Battery 2** 40.96 kWh 409.6 V nominal	**ISUNA U20K-POH #2** 20 kW split-phase 4 MPPTs | 2 battery ports
Optional Grid Input per approved parallel-system design	**Generator Source** dedicated GEN input(s) per Isuna parallel instructions	**Parallel 120/240 V Load System** 40 kW aggregate nominal output

The intended design uses two balanced power blocks. Solar power can supply loads and charge the assigned R40K battery. Each battery can supply its assigned inverter when PV is insufficient. The two inverters may supply a common 120/240 V load system only when configured using Isuna parallel-system hardware, communications, settings, protection, and commissioning procedures.

GENERATOR INPUT RATING	The 48 kW / 200 A generator-input rating is a port/interface rating per inverter. It does not mean that 48 kW per inverter is always available for battery charging or load pass-through. Generator topology in a two-inverter parallel system must follow the current Isuna parallel-system documentation.

6. Site Planning and Equipment Location

- Mount both Isuna inverters on solid surfaces with manufacturer-required clearances, ventilation, and service access. Preserve the intended IP66 / NEMA 4X enclosure protection at all entries.
- Install both GSL-R40K systems floor-standing in dry, protected locations consistent with the IP20 rating and temperature limits.
- Provide working space around HV battery disconnects, PV protection equipment, AC distribution, parallel equipment, and communication hardware.
- Keep equipment away from combustible storage, corrosive vapors, standing water, impact hazards, and uncontrolled heat sources.
- Plan PV and HV cable routes to minimize mechanical damage, unnecessary voltage drop, and connector exposure.
- Clearly label Inverter 1, Inverter 2, Battery 1, Battery 2, PV Strings 1-12, all AC sources, and emergency isolation points.

7. Solar Array Installation

The array consists of 72 matching 600 W Philadelphia Solar modules for 43.2 kW nominal DC power. Install the modules on an approved roof- or ground-mount structure designed for local wind, snow, corrosion, roof structure, clamp zones, and service access.

- Use matching modules within every string and keep string orientations as consistent as practical.
- Avoid shading differences within a string; place different orientations on separate MPPT trackers where practical.
- Inspect glass, frames, junction boxes, leads, and connectors for shipping or installation damage before wiring.
- Support PV conductors and keep connectors away from standing water, sharp edges, and high-heat surfaces.
- Do not mix incompatible PV connector brands or connector families.
- Where bifacial rear-side gain is desired, maintain suitable rear clearance and avoid blocking the active rear surface.

8. PV Wiring - Twelve 6-Panel Series Strings

REQUIRED CONFIGURATION	72 panels = 12 independent strings x 6 panels in series. Inverter 1 receives Strings 1-6. Inverter 2 receives Strings 7-12. Each inverter uses a 2 / 2 / 1 / 1 string allocation across MPPTs 1-4.

Inverter / MPPT	PV string(s)	Panel assignment	PV power
Inverter 1 - MPPT 1	Strings 1 + 2	Panels 1-12	7.2 kW
Inverter 1 - MPPT 2	Strings 3 + 4	Panels 13-24	7.2 kW
Inverter 1 - MPPT 3	String 5	Panels 25-30	3.6 kW
Inverter 1 - MPPT 4	String 6	Panels 31-36	3.6 kW
Inverter 2 - MPPT 1	Strings 7 + 8	Panels 37-48	7.2 kW
Inverter 2 - MPPT 2	Strings 9 + 10	Panels 49-60	7.2 kW
Inverter 2 - MPPT 3	String 11	Panels 61-66	3.6 kW
Inverter 2 - MPPT 4	String 12	Panels 67-72	3.6 kW

8.1 Series-string connection method

Create twelve equal six-module series strings. The two unused end leads of each completed string become that string positive and negative conductors. Label every string before routing it to the inverter area. With all PV disconnects open, measure and record polarity and open-circuit voltage of each string using a properly rated DC meter.

Panel assignments

Item	Specification
String 1	Panels 1-6 -> Inverter 1 MPPT 1
String 2	Panels 7-12 -> Inverter 1 MPPT 1
String 3	Panels 13-18 -> Inverter 1 MPPT 2
String 4	Panels 19-24 -> Inverter 1 MPPT 2
String 5	Panels 25-30 -> Inverter 1 MPPT 3
String 6	Panels 31-36 -> Inverter 1 MPPT 4
String 7	Panels 37-42 -> Inverter 2 MPPT 1
String 8	Panels 43-48 -> Inverter 2 MPPT 1
String 9	Panels 49-54 -> Inverter 2 MPPT 2
String 10	Panels 55-60 -> Inverter 2 MPPT 2
String 11	Panels 61-66 -> Inverter 2 MPPT 3
String 12	Panels 67-72 -> Inverter 2 MPPT 4

8.2 MPPT electrical check

Each six-panel string is approximately 269.7 V at maximum power and 318.7 V open circuit at STC. Two equal strings paralleled on one MPPT remain at the same voltage while current adds to approximately 26.7 A operating current and 28.24 A short-circuit current. These values are below the current Isuna 20 kW platform limits of 36 A operating current and 44 A short-circuit current per MPPT.

COLD-WEATHER VOC CHECK	Solar-module Voc rises as temperature falls. The design-basis module lists a -0.25%/deg C Voc coefficient. The installer must calculate the actual site minimum-temperature Voc using the current module datasheet and verify every six-panel string remains below the inverter PV voltage limit before energization.

9. PV Protection, Grounding and Rapid Shutdown

Each PV string should have an independently identifiable circuit from the array to its assigned inverter input. Final string OCPD/disconnect ratings, conductor ampacity, grounding/bonding, surge protection, combiner architecture, and rapid-shutdown equipment must be selected by the qualified installer under applicable code and the current component manuals.

- The Philadelphia Solar design-basis module lists a 30 A maximum series fuse rating. Do not exceed the module maximum series-fuse rating.
- Provide project-specific PV disconnecting means and overcurrent protection where required by code and system architecture.
- Provide equipment grounding/bonding and surge protection appropriate to the installation.
- Use listed rapid-shutdown equipment where required. The Isuna platform provides PV quick-shutdown control capability, but site-specific RSD hardware and wiring must follow the approved design.
- Label all twelve PV strings, disconnects, inverter inputs, and shutdown points so service personnel can isolate the correct source.

10. GSL-R40K Battery Installation and Communication

The system uses two independent GSL-R40K battery systems. Battery 1 is assigned to Inverter 1 and Battery 2 to Inverter 2. Each battery system is 409.6 V nominal and operates across a published 358.4-460.8 V range.

HIGH-VOLTAGE BATTERY	Each R40K can operate above 400 VDC and can deliver dangerous fault current. Use manufacturer-approved HV disconnects, protection, pre-charge/contactors, cable assemblies, grounding, and service procedures. Do not service energized HV conductors.

- Keep both batteries OFF and isolated while making power and communication connections.
- Verify polarity and measured voltage with appropriately rated equipment before connection.
- Use the GSL manufacturer-approved BMS, control unit, interconnects, grounding, and HV protection arrangement.
- Configure CAN or RS485 communication using the exact protocol and pinout approved for the Isuna/GSL combination.
- Do not connect Battery 1 to Inverter 2 or Battery 2 to Inverter 1 unless the complete topology is redesigned and manufacturer-approved.
- Do not bridge one R40K across both independent battery ports on an inverter unless Isuna and GSL explicitly approve that arrangement.
- Do not operate with BMS communication bypassed when the approved battery profile requires closed-loop communication.

COMMISSIONING HOLD POINT	Before first energization, confirm for each power block: (1) Isuna-GSL BMS protocol compatibility, (2) which inverter battery port is used, (3) whether the second battery port remains unused or may be used only for approved future expansion, (4) battery current limits, and (5) required HV pre-charge and shutdown sequence.

11. Dual-Inverter Parallel Configuration

The two U20K-POH units must not be treated as unrelated standalone inverters feeding the same AC panel. When 40 kW aggregate output is required, the units must be installed as a manufacturer-approved parallel system using the current Isuna parallel power, communication, synchronization, protection, configuration, and commissioning instructions.

PARALLEL SYSTEM REQUIRED	Never connect two inverter outputs together unless the exact Isuna parallel procedure, hardware, firmware requirements, communications, phase configuration, and AC protection have been satisfied. Incorrect paralleling can damage equipment and create dangerous backfeed or circulating current.

- Label the units Inverter 1 and Inverter 2 and keep PV/battery assignments consistent throughout commissioning.
- Install all required parallel communications and power interconnections before energizing a shared load bus.
- Confirm both inverter firmware versions and parallel settings are compatible.
- Verify L1, L2, neutral, grounding/bonding, output breaker sizing, and current-sharing behavior.
- Confirm each inverter receives correct battery/BMS status from its assigned R40K system.
- Do not operate a partially commissioned parallel system except under a manufacturer-approved service procedure.

12. AC Output, Grid and Generator Connections

Each U20K-POH provides 120/240 VAC split-phase output and separate grid and dedicated generator AC inputs. Final AC conductors, breaker ratings, neutral/ground bonding, transfer functions, grid interconnection, and generator topology must follow the current Isuna parallel-system documentation and applicable electrical code.

- Use a properly rated split-phase load distribution system and balance large 120 V loads across L1 and L2 where practical.
- Account for motor, pump, compressor, HVAC, welder, EV charging, electric heating, and other high-demand loads during system design.
- Do not backfeed utility wiring or a generator receptacle through an unapproved connection.
- Confirm generator voltage, frequency, neutral/ground configuration, waveform quality, breaker/disconnect rating, and capacity.
- The 48 kW / 200 A dedicated generator-port rating is per inverter input interface; actual pass-through and charging behavior is controlled by inverter, battery, generator, and parallel-system limits.
- Generator feeds in a two-inverter system must use the manufacturer-approved topology; do not simply split or parallel generator conductors between inverter ports without an approved design.

Motor-starting and overload capability

The current Isuna 20 kW platform lists 110% long-term overload, 160% for 10 seconds, and 200% for 100 milliseconds under specified conditions. For one 20 kW inverter, 160% corresponds to approximately 32 kW for 10 seconds. This can help start pumps, compressors, and HVAC equipment, but it is not a substitute for an actual motor-starting study.

13. Initial Commissioning and Startup

Commissioning must be performed by the installer after all mechanical, PV, battery, AC, grounding, communication, parallel-system, and protection checks are complete.

Pre-start checklist

- Both inverters and both battery systems are securely installed with required clearances.
- Parallel-inverter power and communications are complete and verified.
- Grounding and bonding are complete.
- All AC and DC conductors are correctly sized, protected, torqued, and labeled.
- Each of the twelve PV strings contains exactly six matching 600 W modules in series.
- PV Strings 1-6 are assigned to Inverter 1 and Strings 7-12 to Inverter 2.
- Each inverter uses the intended MPPT allocation of 2 / 2 / 1 / 1 strings across MPPTs 1-4.
- Polarity and open-circuit voltage have been measured and recorded for all twelve strings.
- Cold-weather PV Voc calculation is documented and remains within inverter limits.
- Battery 1 and Battery 2 polarity, HV protection, pre-charge procedure, BMS communication, and operating limits are confirmed.
- Isuna-GSL protocol has been validated for the exact hardware/firmware.
- AC output, optional grid input, and generator input wiring have been verified.
- Rapid shutdown and emergency disconnect functions have been tested where required.

Typical startup sequence

Follow the current Isuna and GSL manuals for the exact parallel-system startup sequence. A typical controlled sequence is: initialize both battery/BMS systems and validate communications -> initialize/configure both inverters and parallel communications -> verify current sharing and battery settings -> enable any permitted grid or generator source -> enable PV circuits -> energize AC loads gradually. Do not use this generic sequence if the shipped manufacturer manuals specify a different order.

14. Normal Operation and Energy Priorities

Item	Specification
Sunny daytime	PV from both 21.6 kW arrays supplies loads and may charge the two R40K systems with surplus energy, subject to inverter and battery limits.
Cloudy / high load	Available PV and battery power may work together; configured generator or grid support may be used.
Night operation	The two battery systems support loads through their assigned inverters until configured reserve or low-SOC thresholds are reached.
Low battery	A configured generator or grid source may support loads and/or recharge storage according to approved settings.
High load	The inverters share common-system demand only through the approved parallel configuration.
PV imbalance	A missing or weak string can reduce one inverter block; compare Inverter 1 vs Inverter 2 PV production during troubleshooting.

Load management

A 40 kW system can support substantial loads, but simultaneous demand and battery current remain important. Electric resistance heating, large water heaters, ranges, dryers, EV charging, large pumps, compressors, and workshop equipment can consume available capacity quickly. Staggering major loads generally improves runtime and operating margin.

15. Monitoring and User Controls

The Isuna platform supports Wi-Fi, LAN, 4G, and Bluetooth monitoring options. Battery communication uses the approved CAN/RS485 integration. Monitoring should allow the installer or owner to compare the two inverter blocks, battery states, PV production, loads, source status, operating modes, and faults, depending on the configured platform.

- Confirm both inverters appear online and are reporting consistent parallel status.
- Compare PV production between Inverter 1 and Inverter 2 and compare individual MPPTs to identify shading, a tripped disconnect, or string problems.
- Review both battery states of charge and alarms before adding large discretionary loads.
- Investigate repeated fault codes rather than repeatedly resetting equipment.
- Restrict firmware, protection, battery, and parallel-setting changes to qualified personnel.
- Keep network credentials and installer-level access secure.

16. Controlled Shutdown and Emergency Shutdown

Controlled shutdown

Use the exact Isuna/GSL parallel-system shutdown sequence for the installed equipment. A typical controlled shutdown is: reduce/disconnect major AC loads -> disable grid/generator input if used -> open all PV disconnects -> stop/switch off both inverters in the required order -> isolate both high-voltage battery systems using the approved battery procedures.

ENERGY MAY REMAIN PRESENT	Switching off one or both inverter displays does not make the PV arrays or battery conductors safe. PV strings remain energized in daylight and both high-voltage batteries retain stored energy. Verify de-energization before service.

Emergency shutdown

If there is fire, smoke, arcing, severe overheating, flooding, damaged battery equipment, or exposed conductors, do not approach or touch the equipment. Evacuate the immediate area as needed and contact emergency services. If safe from accessible disconnect locations, isolate AC sources and loads, PV circuits, and both battery systems according to the approved emergency procedure.

17. Routine Maintenance

Item	Specification
Monthly	Review both inverter/battery statuses, alarms, state of charge, and production trends. Check ventilation and visible equipment condition.
Every 3-6 months	Inspect accessible PV wiring, twelve PV circuits, connectors, disconnects, conduit, both battery enclosures, inverter areas, and mounting hardware for damage, corrosion, moisture, or overheating.
Seasonally	Manage snow, vegetation, shading, and debris using safe methods that do not damage modules or wiring.
Annually	Have a qualified technician inspect electrical terminations, parallel communications, breaker/disconnect condition, grounding/bonding, both battery systems, fault history, and overall performance.

Solar-module cleaning

Use clean water and non-abrasive materials when cleaning is necessary. Do not walk on modules or use metal scrapers, harsh chemicals, or methods that can damage glass, frames, seals, or cables.

Battery maintenance

Follow the GSL R40K manufacturer instructions for inspection, storage, temperature control, shutdown, and long-term non-use. Keep both battery areas clean, dry, protected, and within their published environmental limits.

18. Troubleshooting

Condition	Possible cause	Recommended action
One inverter offline	Battery/DC supply, parallel communications, AC status, or fault condition	Check the affected inverter block, BMS status, parallel communication, breaker status, and fault code. Do not continue in an unapproved parallel state.
No solar charging	PV disconnects open, low irradiance, input fault	Confirm daylight and all assigned PV circuits. Qualified personnel should test the affected strings separately.
Inverter 1 PV low	Strings 1-6, breakers, connectors, or MPPT issue	Compare all four MPPT readings on Inverter 1; inspect affected strings and measured Voc.
Inverter 2 PV low	Strings 7-12, breakers, connectors, or MPPT issue	Compare all four MPPT readings on Inverter 2; inspect affected strings and measured Voc.
Battery 1 or 2 alarm	BMS, temperature, communication, current/voltage limit	Read the specific GSL/Isuna alarm. Check approved communication, temperature, SOC, protection, and limits.
Uneven power sharing	Parallel settings, communication, battery/PV imbalance	Verify parallel synchronization, settings, load sharing, PV assignment, and both battery conditions.
Generator not accepted	Voltage/frequency/neutral/ground or configuration issue	Check generator quality, wiring, breaker status, settings, and approved two-inverter generator topology.
Repeated fault code	Persistent system or component fault	Record the exact code and operating conditions; contact ROCKSOLAR support or a qualified installer. Do not repeatedly reset a persistent fault.

19. Understanding Available Energy

The two GSL-R40K systems provide 81.92 kWh nominal stored energy. Actual AC energy available to loads will be lower after reserve SOC, conversion losses, battery limits, temperature effects, and other system losses. Solar production can extend runtime while the array is generating.

Illustrative load	Theoretical nominal-energy runtime
5 kW average load	Approx. 16.4 hours theoretical before reserve/losses
10 kW average load	Approx. 8.2 hours theoretical before reserve/losses
20 kW average load	Approx. 4.1 hours theoretical before reserve/losses
30 kW average load	Approx. 2.7 hours theoretical before reserve/losses
40 kW average load	Approx. 2.0 hours theoretical before reserve/losses

These are simple energy examples, not guaranteed runtimes. High instantaneous power may also be limited by approved battery-port current, inverter settings, BMS limits, and system operating conditions.

Solar production

The 43.2 kW array is rated at STC nameplate conditions. Daily production depends on location, season, module orientation, shading, snow/soiling, temperature, clipping, and system losses. Actual output should be estimated using a site-specific solar resource model.

20. Expansion and System Changes

Any change to PV string length, number of strings, battery systems, inverter count, generator capacity, or AC distribution requires an engineering review before installation.

- Do not add panels to any six-panel string without recalculating cold-weather Voc and verifying the MPPT operating window.
- Do not add a third string to an MPPT; the 20 kW Isuna platform lists up to two strings per MPPT.
- Do not cross-connect batteries or use the second independent battery port without manufacturer approval for the proposed expansion.
- Additional inverter capacity requires approved Isuna parallel hardware, communications, protection, conductor sizing, and commissioning.
- Permits and inspections may be required for system modifications.

21. Technical Support and Commissioning Checklist

ROCKSOLAR USA	ROCKSOLAR CANADA
6585 Arville Ave, STE A Las Vegas, NV 89118, USA Phone: +1 (702) 983-5966 Toll-free: +1 (800) 858-4318	115 Randall Drive, Unit 9 Waterloo, ON N2V 1C5, Canada Phone: +1 (800) 858-4318
Customer Service & Technical Support: support@rocksolar.io	

When requesting support, provide the order number, both inverter model/serial numbers, both battery serial numbers, fault codes, photos of the installation, monitoring screenshots, and measured PV string voltages when safely available.

Commissioning checklist

Commissioning item	Initial / Date
Both inverter mountings complete and labelled	
Parallel inverter communications and approved hardware verified	
Grounding and bonding verified	
AC conductors and breakers verified	
Battery 1 wiring/protection/BMS verified	
Battery 2 wiring/protection/BMS verified	
Approved Isuna-GSL protocol confirmed for both power blocks	
Strings 1-6 = exactly 6 panels each -> Inverter 1	
Strings 7-12 = exactly 6 panels each -> Inverter 2	
All twelve string polarities and Voc values recorded	
MPPT allocation 2/2/1/1 verified on both inverters	
PV protection / RSD / shutdown labeling verified	
Battery profiles and current limits confirmed on both inverters	
Generator/grid settings confirmed if used	
Both inverters synchronized and load sharing verified	
Monitoring paired and operating	
Customer startup/shutdown orientation completed	

22. Important Notice and Source Basis

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

MODEL / REVISION NOTE	This manual uses the ROCKSOLAR product designation U20K-POH. Isuna's current 2026 web page identifies the 20 kW U.S. platform as U20K-PH-US and publishes updated efficiency, switching-time, overload, and protection data. Confirm the exact nameplate model and shipped manual before commissioning.

Primary technical references used for this manual

- Isuna: Split Hybrid Inverter HV 5-20 kW product page (current 2026 specifications for the 20 kW U.S. platform).
- Sinexcel / Isuna: Split Phase High Voltage Off-Grid 5-20 kW datasheet supplied by ROCKSOLAR.
- GSL Energy: 20-60 kWh Rack High-Voltage Energy Storage Battery product page; GSL-R40K 40.96 kWh / 409.6 V data.
- Philadelphia Solar: PS-MNB144(HCBF)-595W-600W Nexus module datasheet, updated April 2024.
- ROCKSOLAR: current USA/Canada contact information and technical-support email.

FINAL INSTALLER RESPONSIBILITY	Before energization, verify actual component model numbers, nameplate ratings, firmware/BMS protocol, PV array measurements, cold-weather voltage calculations, protection ratings, grounding/bonding, rapid-shutdown provisions, and AC service configuration.