

3.5 kW Off-Grid Solar Panel Kit with 2600W solar Panels (120V/30AMP)



1. Safety Information

Safety Information

This solar power system includes a 48V battery system and a 3.5kW off-grid inverter with an integrated MPPT charge controller. The system generates electrical energy whenever the solar panels are exposed to sunlight. Improper installation or handling may result in electric shock, fire, or equipment damage. Always follow the safety instructions below before installing or operating the system.

General Safety

- Installation should be performed by a qualified technician or licensed electrician familiar with solar power systems.
- Follow all local electrical codes and regulations during installation.
- Do not modify system components or wiring unless specified in this manual.
- Use only approved cables, connectors, and protection devices rated for the system voltage and current.
- Ensure all electrical connections are tight and properly insulated before operating the system.

Electrical Safety

- Solar panels generate electricity whenever exposed to sunlight. Always disconnect or cover the panels before performing wiring or maintenance.
- Always connect the battery bank to the inverter first, before connecting the solar panels.
- Use properly rated DC cables, fuses, and circuit breakers suitable for a 48V system and a 3.5kW inverter.
- Never touch exposed terminals or wires while the system is energized.
- Install proper grounding and surge protection according to local electrical codes.

Battery Safety

- The system requires a 48V battery bank compatible with the inverter.
- Batteries can deliver high current and may produce explosive gases, so they must be installed in a well-ventilated location.
- Never short-circuit battery terminals.
- Always verify correct polarity (+ / -) before connecting batteries to the inverter.
- Keep batteries away from sparks, flames, or excessive heat sources.

Inverter Safety

- The 3.5kW inverter produces high AC voltage at the output. Treat the AC output the same as household electricity.
- Do not operate the inverter without proper grounding.
- Install the inverter in a dry, clean, and well-ventilated location.
- Keep sufficient space around the inverter to allow proper airflow and cooling.

Maintenance Safety

- Disconnect solar panels and batteries before servicing the system.
- Inspect cables, connectors, and mounting hardware regularly for signs of damage or overheating.
- Clean solar panels periodically to maintain optimal system performance.
- If abnormal operation occurs, turn off the inverter and inspect the system before restarting.

2. System Components

| Component | Description |
|---------------------------------|--|
| Solar Panels | 6 x 440W monocrystalline panels |
| Inverter | Growatt Off-Grid Storage Inverter SPF 3500TL LVM-US Integrated MPPT controller |
| Mc4 Cable | Set of Cables for Solar Panel to Inverter Connection |
| Battery Bank (May not included) | 48V battery system |

3. Battery Wiring (Not Include in this KIT)

| Configuration | Example |
|------------------|---|
| 48V Battery Bank | <p>1) https://wdjba7nfulb45jd8-68988567843.shopifypreview.com/products/growatt-axe-5-0l-c1-5kw-battery?_pos=1&_psq=5kwh&_ss=e&_v=1.0&variant=48780601065763</p> <p>2) https://wdjba7nfulb45jd8-68988567843.shopifypreview.com/products/gsl-51-2v-100ah-lithium-battery-system?_pos=2&_psq=5kwh&_ss=e&_v=1.0&variant=52463722266915</p> <p>3) https://wdjba7nfulb45jd8-68988567843.shopifypreview.com/products/growatt-apx-5-0p-b1-us-5-0kwh-battery-module?_pos=3&_psq=5kwh&_ss=e&_v=1.0&variant=53550004535587</p> <p>4) https://wdjba7nfulb45jd8-68988567843.shopifypreview.com/products/dakota-48v-74ah-lifepo4-battery?_pos=1&_psq=da&_ss=e&_v=1.0</p> |

4. Technical Specifications

https://wdjba7nfurb45jd8-68988567843.shopifypreview.com/products/growatt-3-5kw-off-grid-storage-inverter?_pos=1&_sid=f4bc2ced0&_ss=r

Inverter

9.0 Specifications

Table 1 Line Mode Specifications

| INVERTER MODEL | SPF 3000TL LVM-US | SPF 3500TL LVM-US | SPF 3500 US | SPF 5000 US |
|---|--|----------------------|---|-------------|
| Input Voltage Waveform | Sinusoidal (utility or generator) | | | |
| Nominal Input Voltage | 120Vac | | 230Vac | |
| Low Loss Voltage | 95Vac ± 7V (UPS); 65Vac ± 7V (Appliances) | | 170Vac ± 7V (UPS); 90Vac ± 7V (Appliances) | |
| Low Loss Return Voltage | 100Vac ± 7V (UPS); 70Vac ± 7V (Appliances) | | 180Vac ± 7V (UPS); 100Vac ± 7V (Appliances) | |
| High Loss Voltage | 140Vac ± 7V | | 280Vac ± 7V | |
| High Loss Return Voltage | 135Vac ± 7V | | 270Vac ± 7V | |
| Max AC Input Voltage | 150Vac | | 300Vac | |
| Nominal Input Frequency | 50Hz / 60Hz (Auto detection) | | | |
| Low Loss Frequency | 40 ± 1Hz | | | |
| Low Loss Return Frequency | 42 ± 1Hz | | | |
| High Loss Frequency | 65 ± 1Hz | | | |
| High Loss Return Frequency | 63 ± 1Hz | | | |
| Output Short Circuit Protection | Circuit Breaker | | | |
| Efficiency (Line Mode) | >95% (Rated R load, battery full charged) | | | |
| Transfer Time | 10ms typical, 20ms Max@ Single <30ms @ Parallel | | | |
| Output power derating: When AC input voltage drops to 170V, the output power will be derated. | | | | |

Table 2 Inverter Mode Specifications

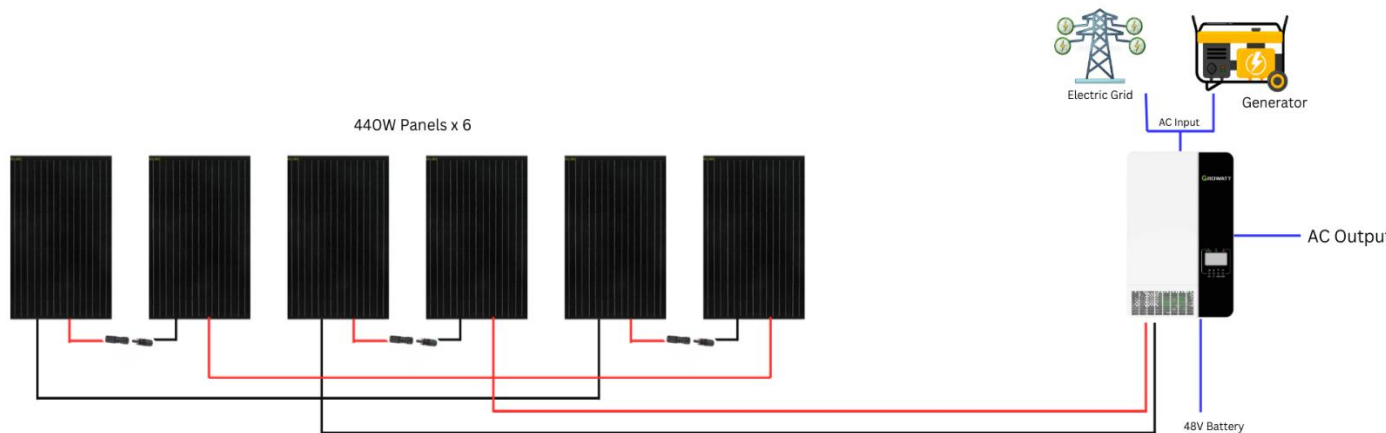
| INVERTER MODEL | SPF 3000TL LVM-US | SPF 3500TL LVM-US | SPF 3500 US | SPF 5000 US |
|---|--|----------------------|-----------------|-------------|
| Rated Output Power | 3KVA/3KW | 3.5KVA/3.5KW | | 5KVA/5KW |
| Output Voltage Waveform | Pure Sine Wave | | | |
| Output Voltage Regulation | 120Vac \pm 5% | | 230Vac \pm 5% | |
| Output Frequency | 50Hz / 60Hz (Auto detection) | | | |
| Nominal Output Current | 25A | 29.2A | 15.2A | 21.7A |
| Max. Output Fault Current/ Duration | 80A/ 300 μ s | | | |
| Max. Output Over current Protection | 76A | 76A | 58A | 65A |
| Peak Efficiency | 90% | | 93% | |
| Overload Protection | 5s@ \geq 150% load; 10s@110%~150% load | | | |
| Surge Capacity | 2* rated power for 5 seconds | | | |
| Nominal DC Input Voltage | 48Vdc | | | |
| Cold Start Voltage(Lead-Acid Mode) | 46.0Vdc | | | |
| Cold Start SOC(Li Mode) | Default 30%, Low DC Cut-off SOC +10% | | | |
| Low DC Warning Voltage (Lead-Acid Mode) | 44.0Vdc @ load < 20% 42.8Vdc @ 20% \leq load < 50% 40.4Vdc @ load \geq 50% | | | |
| Low DC Warning Return Voltage (Lead-Acid Mode) | 46.0Vdc @ load < 20% 44.8Vdc @ 20% \leq load < 50% 42.4Vdc @ load \geq 50% | | | |
| Low DC Cut-off Voltage (Lead-Acid Mode) | 42.0Vdc @ load < 20% 40.8Vdc @ 20% \leq load < 50% 38.4Vdc @ load \geq 50% | | | |
| Low DC Cut-off Voltage (Li Mode) | 42.0Vdc | | | |
| Low DC Warning SOC (Li Mode) | Low DC Cut-off SOC +5% | | | |
| Low DC Warning Return SOC (Li Mode) | Low DC Cut-off SOC +10% | | | |
| Low DC Cut-off SOC(Li Mode) | Default 20%, 5%~50% settable | | | |
| High DC Recovery Voltage | 56.4Vdc(C.V. charging voltage) | | | |
| High DC Cut-off Voltage | 60.8Vdc | | | |
| No Load Power Consumption | <60W | | | |

Panels

| ELECTRICAL CHARACTERISTICS | | | | |
|--|--------|--------|--------|--------|
| POWER AT STC | 425 W | 430 W | 435 W | 440 W |
| Short Circuit Current - I _{sc} (A) | 14.05 | 14.13 | 14.22 | 14.30 |
| Maximum Power Current - I _{mpp} (A) | 13.23 | 13.28 | 13.32 | 13.36 |
| Open Circuit Voltage - Voc (V) | 38.29 | 38.42 | 38.50 | 38.63 |
| Maximum Power Voltage - V _{mpp} (V) | 32.23 | 32.49 | 32.76 | 32.98 |
| Module Efficiency - η (%) | 21.80% | 22.05% | 22.31% | 22.57% |
| Bifaciality Ratio (%) | 80% ±5 | | | |
| Power tolerance (%) | 0~+3% | | | |

| MATERIAL CHARACTERISTICS | |
|--------------------------|---|
| Characteristics | Value |
| Cells per Module | 108 (54x 2) |
| Cell Type | N Type Mono-Crystalline |
| Front Surface | 3.2mm Tempered AR Coated Glass |
| Back Cover | Transparent Backsheet |
| Frame | Anodized Aluminum (Black/Silver) |
| Junction Box | IP 68 With original MC4 |
| Cable Length | 1200mm Cable length could be customized |
| Fire Classification | Type 1 |

5. Solar Panel Wiring Diagram



Step 1 – Connect the Solar Panels

1. Position the **six 440W solar panels** at the mounting location.
2. Connect the **positive (+) cable of Panel 1 to the negative (-) cable of Panel 2** to form the first series string.
3. Connect the **positive (+) cable of Panel 3 to the negative (-) cable of Panel 4** to form the second series string.
4. Connect the **positive (+) cable of Panel 5 to the negative (-) cable of Panel 6** to form the third series string.
5. The remaining **positive (+) and negative (-) cables from each string** will be used as the solar output to the inverter.

This configuration creates **three strings of two panels in series**, providing the correct voltage for the inverter MPPT input.

Step 2 – Connect the Battery Bank (Recommended First Connection)

1. Prepare a **48V battery bank** compatible with the inverter.
2. Connect the **battery positive (+) cable to the inverter BAT+ terminal**.
3. Connect the **battery negative (-) cable to the inverter BAT- terminal**.
4. Ensure the **battery polarity is correct** before tightening the connections.

⚠ Important: Always connect the battery to the inverter before connecting the solar panels.

Step 3 – Connect the Solar Panels to the Inverter

1. Combine the solar output cables from the panel strings.
2. Connect the positive (+) solar cable to the inverter PV+ input.
3. Connect the negative (–) solar cable to the inverter PV– input.
4. Verify that all connectors are secure and properly connected.

Step 4 – Optional AC Input Connection (Grid or Generator)

1. If required, connect the AC input from the electric grid or generator to the inverter AC INPUT terminals.
2. This connection allows the inverter to charge the batteries or supply power when solar energy is insufficient.

⚠ This step is optional and depends on customer requirements.

Step 5 – Connect the AC Output (Load)

1. Connect the inverter AC OUTPUT terminals to the main load distribution panel or electrical loads.
2. Ensure the connected load does not exceed the inverter's rated capacity.

Step 6 – System Startup

1. Turn on the battery connection first.
2. Turn on the inverter power switch.
3. The inverter will begin operating and solar panels will start charging the battery when sunlight is available.

5. Installation Overview

This solar kit includes six 440W solar panels, a Growatt 3.5kW single-phase off-grid inverter, and a 48V battery bank. The solar panels generate DC electricity, which is sent to the inverter to charge the battery and power connected loads.

The installation process involves mounting the solar panels, wiring the panels to the inverter, connecting the 48V battery bank or connecting the AC output to the electrical loads. An optional AC input from the utility grid or a generator can also be connected for backup power or battery charging.

For safe installation, always connect the battery to the inverter first, then connect the solar panels, and finally connect the AC loads. Ensure all wiring connections are secure before starting the system.

6. Panel Installation

Install the solar panels in a location that receives maximum direct sunlight throughout the day. In the Northern Hemisphere, panels should be mounted facing south for best performance.

The recommended tilt angle is between 25° and 40°, depending on location. Ensure the panels are mounted on a secure and stable structure such as a roof or ground mount.

Avoid installing panels where they may be shaded by trees, buildings, or other objects, as shading can significantly reduce power generation.

Ensure all panels are securely mounted and cables are properly routed and protected from damage.

7. Inverter Installation

Mount the 24V 3000W inverter close to the battery bank to reduce cable length and power loss. Install the inverter on a solid vertical surface in a dry and well-ventilated area.

Ensure there is sufficient space around the inverter for airflow to prevent overheating. Avoid installing the inverter in areas exposed to moisture, direct sunlight, or excessive heat.

Secure the inverter firmly and ensure all DC and AC connections are properly tightened before operation.

8. Maintenance

Regular maintenance helps ensure optimal system performance and longevity.

Clean the solar panels periodically to remove dust, dirt, snow, or debris that may reduce energy production. Inspect all cables, connectors, and mounting hardware every 6–12 months to ensure they remain secure and free from damage.

If any loose connections, corrosion, or damaged components are found, repair or replace them promptly.

9. Trouble shooting

| | | | |
|----|--|----------------------------|-----------------|
| 01 | Fan is locked when inverter is on | Beep 3 times every second | 01 [△] |
| 02 | Over temperature | Beep once every second | 02 [△] |
| 03 | Battery is over-charged | Beep once every second | 03 [△] |
| 04 | Low battery | Beep once every second | 04 [△] |
| 07 | Overload | Beep once every 0.5 second | 07 [△] |
| 10 | Output power derating | Beep twice every 3 seconds | 10 [△] |
| 12 | Solar charger stops due to low battery | Beep once every second | 12 [△] |
| 13 | Solar charger stops due to high PV voltage | Beep once every second | 13 [△] |
| 14 | Solar charger stops due to overload | Beep once every second | 14 [△] |
| 15 | Parallel input utility grid different | Beep once every second | 15 [△] |
| 16 | Parallel input phase error | Beep once every second | 16 [△] |
| 17 | Parallel output phase loss | Beep once every second | 17 [△] |
| 18 | Buck over current | Beep once every second | 18 [△] |
| 19 | Battery disconnect | No beep | 19 [△] |
| 20 | BMS communication error | Beep once every second | 20 [△] |
| 21 | PV power insufficient | Beep once every second | 21 [△] |
| 22 | Parallel forbidden without battery | Beep once every second | 22 [△] |
| 25 | Parallel inverters' capacity different | Beep once every second | 25 [△] |
| 26 | PV insulation test failed | Beep once every second | 26 [△] |
| 33 | BMS communication loss | Beep once every second | 33 [△] |
| 34 | Cell over voltage | Beep once every second | 34 [△] |
| 35 | Cell under voltage | Beep once every second | 35 [△] |
| 36 | Total over voltage | Beep once every second | 36 [△] |
| 37 | Total under voltage | Beep once every second | 37 [△] |
| 38 | Discharge over voltage | Beep once every second | 38 [△] |
| 39 | Charge over voltage | Beep once every second | 39 [△] |
| 40 | Discharge over temperature | Beep once every second | 40 [△] |
| 41 | Charge over temperature | Beep once every second | 41 [△] |
| 42 | Mosfet over temperature | Beep once every second | 42 [△] |
| 43 | Battery over temperature | Beep once every second | 43 [△] |
| 44 | Battery under temperature | Beep once every second | 44 [△] |
| 45 | System shut down | Beep once every second | 45 [△] |
| 63 | Battery voltage consistent failed | Beep once every second | 63 [△] |

| Problem | LCD/LED/Buzzer | Explanation | What to do |
|--|---|---|--|
| Unit shuts down Automatically during startup process. | LCD/LEDs and buzzer will be active for 3 seconds and then complete off. | The battery voltage is too low . (<1.91V/Cell) | 1. Re-charge battery. 2. Replace battery. |
| No response after power on. | No indication. | 1.The battery voltage is far too low. (<1.4V/Cell) 2.Battery polarity is connected reversed. | 1. Check if batteries and the wiring are connected well. 2. Re-charge battery. 3. Replace battery. |
| Mains exist but the unit works in battery mode. | Input voltage is 0 on the LCD and green LED is flashing. | Input protector is tripped. | Check if AC breaker is tripped and AC wiring is connected well. |
| | Green LED is flashing. | Insufficient quality of AC power (Shore or Generator) | 1.Check if AC wires are too thin and/or too long. 2.Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS→Appliance) |
| | Green LED is flashing. | Set "Battery First" or "Solar First" as the priority of output source. | Change output source priority to Utility first. |
| When it's turned on, internal relay is switching on and off repeatedly. | LCD display and LEDs are flashing | Battery is disconnected. | Check if battery wires are connected well. |
| Buzzer beeps continuously and red LED is on. (Fault code) Buzzer beeps once every second, and red LED is flashing. (Warning code) | Fault code 01 | Fan fault, | 1.Check whether all fans are working properly. 2.Replace the fan. |
| | Fault code 02 | Internal temperature of component is over 100℃ . | 1. Check whether the air flow of the unit is blocked or whether the ambient temperature is too high. 2. Check whether the thermistor plug is loose. |
| | Fault code 03 | Battery is over-charged. | Restart the unit, if the error happens again, please return to repair center. |
| | | The battery voltage is too high. | Check if spec and quantity of batteries are meet requirements. |
| | Warning code 04 | The battery voltage/SOC is too low. | 1. Measure battery voltage in DC input. 2. Check battery SOC in LCD when use Li battery 3. Recharge the battery, |
| | Fault code 05 | Output short circuited. | Check if wiring is connected well and remove abnormal load. |
| | Fault code 06/58 | Output abnormal (Inverter voltage is higher than 280Vac or lower than 80Vac). | 1. Reduce the connected load. 2. Restart the unit, if the error happens again, please return to repair center. |
| | Fault code 07 | The inverter is overload 110% and time is up. | Reduce the connected load by switching off some equipment. |

| Fault Code | Fault Event | Icon on |
|-------------------|------------------------------|----------------|
| 01 | Fan is locked | 01- |
| 02 | Over temperature | 02- |
| 03 | Battery voltage is too high | 03- |
| 04 | Battery voltage is too low | 04- |
| 05 | Output short circuited | 05- |
| 06 | Output voltage is too high. | 06- |
| 07 | Overload time out | 07- |
| 08 | Bus voltage is too high | 08- |
| 09 | Bus soft start failed | 09- |
| 11 | The main relay failed | 11- |
| 51 | Over current or surge | 51- |
| 52 | Bus voltage is too low | 52- |
| 53 | Inverter soft start failed | 53- |
| 55 | Over DC voltage in AC output | 55- |
| 56 | Battery connection is open | 56- |
| 57 | Current sensor failed | 57- |
| 58 | Output voltage is too low | 58- |
| 60 | Negative power fault | 60- |
| 61 | PV voltage is too high | 61- |
| 62 | Internal communication error | 62- |
| 80 | CAN fault | 80- |
| 81 | Host loss | 81- |

10.Warranty

The solar panels included in this kit come with a 25-year performance warranty.

2-year warranty for the inverter.

Warranty coverage is subject to the manufacturer's terms and conditions. Improper installation, misuse, or unauthorized modifications may void the warranty.

Support team -

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