# Off-Grid Package Overview

**Design of the Frankensolar Off-Grid packages**

Each package consists of three package segments.

- The **inverter** as the core of the system
- The **battery** system with different sizes and chemistries
- The **solar PV** system with different sizes

Each system is carefully designed to work together with selected other packages that the electrical parameters of each system part are compatible to each other. This is important since system voltages and battery sizing requirements affect the safe and reliable operation of each system.

As an example, a very large solar PV array with a system on small 24V battery voltage would not work well from a technical as well as from a financial consideration.

**Base Packages – Inverters:**

| | Tiny Home and Cottage – Very Basic | Tiny Home and Cottage – Small | Tiny Home and Cottage – Medium | Cottage – Large | Cottage – Extra Large |
|---|---|---|---|---|---|
| SKU | 5700134 | 5700135 | 5700136 | 5700137 | 5700138 |
| | | | | | |
| AC power | 3.4kW cont. 4.0kW 30min | 3.4kW cont. 4.0kW 30min | 3.8kW cont. 4.4kW 30min | 6.8kW cont. 8.5kW 30min | 13.6kW cont. 17kW 30min |
| AC power peak | 7.0kW 5sec | 7.0kW 5sec | 7.0kW 5sec | 12kW 30sec | 24kW 30sec |
| AC voltage | 120/240 Vac | 120/240 Vac | 120/240 Vac | 120/240 Vac | 120/240 Vac |
| Transfer Relay | 30A each phase | 30A each phase | 30A each phase | 60A each phase | 60A each phase |
| | | | | | |
| DC voltage | 24V | 24V | 48V | 48V | 48V |

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**Packages – 24V Battery:**

| | Battery Kit 1<br>24V, FLA,<br>5.4kWh | Battery Kit 2<br>24V, FLA,<br>5.0kWh | Battery Kit 3<br>24V, AGM,<br>5.3kWh | Battery Kit 4<br>24V, AGM,<br>9.0kWh | Battery Kit 5<br>24V, AGM,<br>18kWh |
|---|---|---|---|---|---|
| SKU | 5700139 | 5700140 | 5700141 | 5700142 | 5700143 |
| | | | | | |
| Battery Chemistry | Flooded Lead Acid | Flooded Lead Acid | Absorbent Glass Mat | Absorbent Glass Mat | Absorbent Glass Mat |
| Maintenance | Required | Required | Free | Free | Free |
| Battery Voltage | 24V<br>4x6V | 24V<br>2x12V | 24V<br>4x6V | 24V<br>4x6V | 24V<br>4x6V |
| Capacity Ah | 225Ah C20 | 210Ah C20 | 220Ah C20 | 375Ah C20 | 750Ah C20 |
| Capacity nominal kWh | 5.4kWh | 5.0kWh | 5.3kWh | 9.0kWh | 18kWh |
| Capacity usable kWh | ~3kWh | ~3kWh | ~3kWh | ~5.4kWh | ~10.8kWh |
| Typical Depth of Discharge | ~30% daily | ~30% daily | ~30% daily | ~30% daily | ~30% daily |
| Cycle Life | 1200cyc at DOD50% | 2000cyc at DOD50% | 1700cyc at DOD50% | 1700cyc at DOD50% | 1700cyc at DOD50% |
| Max Depth of Discharge | 80%<br>not regularly! | 80%<br>not regularly! | 80%<br>not regularly! | 80%<br>not regularly! | 80%<br>not regularly! |
| Battery Manufacturer | Trojan Battery | Discover Energy | Trojan Battery | Trojan Battery | Trojan Battery |
| Battery Model | T-105 | 12VRE3000-TF | SAGM06-220 | SAGM06-375 | SAGM06-375 |
| Temp. range Standby | -40C – 30C | -40C – 30C | -40C – 30C | -40C – 30C | -40C – 30C |
| Required SOC for -30deg C | min 80% | min 80% | min 80% | min 80% | min 80% |
| Temp. range Usable | -10C -30C | -10C -30C | -10C -30C | -10C -30C | -10C -30C |

# Off-Grid Package Overview

**Packages – 48V Battery:**

| | Battery Kit 6<br>48V, FLA,<br>5.4kWh | Battery Kit 7<br>48V, FLA,<br>5.0kWh | Battery Kit 8<br>48V, AGM,<br>5.3kWh | Battery Kit 9<br>48V, AGM,<br>9.0kWh | Battery Kit 10<br>48V, AGM,<br>18kWh |
|---|---|---|---|---|---|
| SKU | 5700144 | 5700145 | 5700146 | 5700147 | 5700148 |
| | | | | | |
| Battery Chemistry | Flooded Lead Acid | Flooded Lead Acid | Absorbent Glass Mat | Absorbent Glass Mat | Absorbent Glass Mat |
| Maintenance | Required | Required | Free | Free | Free |
| Battery Voltage | 48V<br>8x6V | 48V<br>4x12V | 48V<br>8x6V | 48V<br>8x6V | 48V<br>8x6V |
| Capacity Ah | 225Ah C20 | 210Ah C20 | 220Ah C20 | 375Ah C20 | 750Ah C20 |
| Capacity nominal kWh | 10.8kWh | 10.0kWh | 10.6kWh | 18kWh | 36kWh |
| Capacity usable kWh | ~6kWh | ~6kWh | ~6kWh | ~10.8kWh | ~21kWh |
| Typical Depth of Discharge | ~30% daily | ~30% daily | ~30% daily | ~30% daily | ~30% daily |
| Cycle Life | 1200cyc at DOD50% | 2000cyc at DOD50% | 1700cyc at DOD50% | 1700cyc at DOD50% | 1700cyc at DOD50% |
| Max Depth of Discharge | 80%<br>not regularly! | 80%<br>not regularly! | 80%<br>not regularly! | 80%<br>not regularly! | 80%<br>not regularly! |
| Battery Manufacturer | Trojan Battery | Discover Energy | Trojan Battery | Trojan Battery | Trojan Battery |
| Battery Model | T-105 | 12VRE3000-TF | SAGM06-220 | SAGM06-375 | SAGM06-375 |
| Temp. range Standby | -40C – 30C | -40C – 30C | -40C – 30C | -40C – 30C | -40C – 30C |
| Required SOC for -30deg C | min 80% | min 80% | min 80% | min 80% | min 80% |
| Temp. range Usable | -10C -30C | -10C -30C | -10C -30C | -10C -30C | -10C -30C |

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**Packages – 48V Battery, Lithium**

| | Battery Kit 11 48V, FLA, 5.4kWh | Battery Kit 12 48V, FLA, 5.0kWh | Battery Kit 13 48V, AGM, 5.3kWh | Battery Module US3000C | |
|---|---|---|---|---|---|
| SKU | 5700149 | 5700150 | 5700151 | | |
| | | | | | |
| Battery Chemistry | LFP, LiFePO4 | LFP, LiFePO4 | LFP, LiFePO4 | LFP, LiFePO4 | |
| Maintenance | Free | Free | Free | Free | |
| Battery Voltage | 48V | 48V | 48V | 48V | |
| Capacity Ah | 148Ah | 222Ah | 296Ah | 74Ah each | |
| Capacity nominal kWh | 7.1kWh | 10.6kWh | 14.2kWh | 3.55kWh | |
| Capacity usable kWh | ~6.7kWh | ~10.1kWh | ~13.5kWh | ~3.37kWh | |
| Typical Depth of Discharge | ~60% daily | ~60% daily | ~60% daily | ~60% daily | |
| Cycle Life | 6000cyc | 6000cyc | 6000cyc | 6000cyc | |
| Warranty | 10 years | 10 years | 10 years | 10 years | |
| Max Depth of Discharge | 95% | 95% | 95% | 95% | |
| Battery Manufacturer | Pylontech | Pylontech | Pylontech | Pylontech | |
| Battery Model | US3000C (2 modules) | US3000C (4 modules) | US3000C (4 modules) | US3000C | |
| Temp. range Standby | -20C – 30C | -20C – 30C | -20C – 30C | -20C – 30C | |
| Temp. range Usable | 0C -30C | 0C -30C | 0C -30C | 0C -30C | |
| Certification | c**CSA**us | c**CSA**us | c**CSA**us | c**CSA**us | |

A Plyontech US3000C Battery system can be scaled to a maximum of 96 battery modules, 340kWh nominal. Systems with up to 16 batteries can just be connected in one stack with the included battery and communication cable jumpers. Please contact our application engineer for assistance.

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**Packages – Solar PV:**

| | Solar Kit 1<br>For 24V,<br>1 kWdc | Solar Kit 1<br>For 24V,<br>2 kWdc | Solar Kit 3<br>For 48V,<br>3 kWdc | Solar Kit 4<br>For 48V,<br>4 kWdc | Solar Kit 5<br>For 48V,<br>8 kWdc |
|---|---|---|---|---|---|
| SKU | 5700153 | 5700154 | 5700155 | 5700156 | 5700157 |
| | | | | | |
| Panel Model | Qcells Q.Peak DUO BLK-L-G6+ | Qcells Q.Peak DUO BLK-L-G6+ | Qcells Q.Peak DUO BLK-L-G6+ | Qcells Q.Peak DUO BLK-L-G6+ | Qcells Q.Peak DUO L-G8.3 |
| Power class[1] | min. 335W | min. 335W | min. 335W | min. 335W | min. 425W |
| Panel Type | 60cell equiv.<br>120 half cells | 60cell equiv.<br>120 half cells | 60cell equiv.<br>120 half cells | 60cell equiv.<br>120 half cells | 72cell equiv.<br>144 half cells |
| Silicon | Crystalline Si | Crystalline Si | Crystalline Si | Crystalline Si | Crystalline Si |
| String Design | 1x 3 in series | 2x 3 in series | 3x 3 in series | 4x 3 in series | 2x 10 series |
| String max Voc | 150V<br>@-40C | 150V<br>@-40C | 150V<br>@-40C | 150V<br>@-40C | 600V<br>@-40C |
| | | | | | |
| MPPT Charger | Schneider MPPT150-60 | Schneider MPPT150-60 | Schneider MPPT150-60 | Schneider MPPT150-60 | Schneider MPPT600-100 |
| Power Output | ~1500W<br>@25V | ~1500W<br>@25V | ~3000W<br>@50V | ~1500W<br>@50V | ~5000W<br>@50V |
| Output current | 60A | 60A | 60A | 60A | 100A |
| DC breaker size | 80A | 80A | 80A | 80A | 125A |
| DC:DC ratio[2] | 0.67:1 | 1.34:1 | 0.67:1 | 1.34:1 | 1.7:1 |
| | | | | | |
| Average Yield Summer[3] | ~2kWh/day usable | ~4kWh/day usable | ~6kWh/day usable | ~8kWh/day usable | ~17kWh/day usable |
| Average Yield Winter[3] | ~1kWh/day usable | ~2kWh/day usable | ~3kWh/day usable | ~4kWh/day usable | ~8kWh/day usable |

[1] Solar panel wattage 335W or larger, depending on module availability.

[2] For off-grid systems it is recommended to oversize the solar array regarding the output power of the MPPT charge controller. DC:DC ratios of 1.3:1 to 2.0:1 are ideal. Ratios below 1.0:1 have a larger MPPT than required and offer future possibilities of system expansions.

[3] This is a rule of thumb. For specific yields in your specific geographical location and with your system orientation, please read and follow our Frankensolar TechTip "Off-Grid Solar Sizing" using publicly available NRCAN solar radiation data.

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