

Off-grid microgrid battery specification sheet - Turnkey C&I Energy Storage

Solution Brief: Deploying Off-grid microgrid battery specification sheet

TURNKEY C&I ENERGY STORAGE SOLUTION BRIEF: DEPLOYING OFF-GRID
MICROGRID BATTERY SPECIFICATION SHEET

EXECUTIVE SUMMARY

This document serves as the definitive technical overview and commercial datasheet for the advanced off-grid microgrid battery specification sheet. Designed as a core component of next-generation distributed energy systems, this platform represents a paradigm shift in ensuring energy resilience, reducing dependency on diesel generation, and enabling high-renewable-penetration microgrids for commercial and industrial (C&I) applications. The system architecture is engineered around Tier-1 Lithium Iron Phosphate (LFP) cells, offering an optimal balance of safety, cycle life, and energy density, specifically tailored for demanding off-grid and weak-grid environments.



SYSTEM ARCHITECTURE & SAFETY

The off-grid microgrid battery specification sheet is built upon a modular, scalable architecture designed for seamless integration with photovoltaic (PV) arrays, wind turbines, and diesel generator backup systems. At its heart lies a high-performance, bi-directional Power Conversion System (PCS) that manages the AC/DC interface, ensuring grid-forming or grid-following capabilities with a seamless transfer time of less than 20ms. The system is governed by an intelligent Energy Management System (EMS) that executes sophisticated control algorithms for peak shaving, load shifting, and frequency regulation, optimizing the economic and operational performance of the entire microgrid.

Safety is paramount in the system's design, incorporating a multi-layered protection strategy that exceeds international standards. This includes a

four-level battery management system (BMS) for cell-level monitoring, active equalization, and thermal runaway prevention. The reinforced outdoor housing provides IP55/NEMA 3R environmental protection, ensuring reliable operation in extreme climates from -30°C to $+50^{\circ}\text{C}$. The system is certified against stringent safety standards, including UL 9540 and IEC 62619, confirming its suitability for near-community and sensitive industrial sites.

KEY FEATURES

- Feature 1: True Off-Grid & Weak-Grid Operation: The integrated PCS provides robust grid-forming capabilities, supporting black-start functionality and stable power supply for critical loads, even when completely isolated from the main utility grid. This ensures uninterrupted power for essential infrastructure.
- Feature 2: Scalable & Modular Configuration: The system's modular design allows for effortless capacity expansion. Multiple cabinets can be paralleled to scale from 372 kWh to several MWh, accommodating growing energy needs without significant re-engineering.
- Feature 3: Intelligent Energy Management: The proprietary EMS leverages machine learning to predict load profiles and solar generation, optimizing battery charge/discharge cycles to maximize renewable energy utilization and minimize operational costs. It offers remote monitoring and control via a secure cloud platform.
- Feature 4: High-Efficiency Cooling & Longevity: The advanced liquid cooling

system maintains cell temperatures within a $\pm 2^{\circ}\text{C}$ range, significantly enhancing cell uniformity, cycle life (achieving over 6000 cycles at 80% DoD), and overall system efficiency, which boasts a peak round-trip efficiency of over 92%.

COMPLIANCE & STANDARDS

The off-grid microgrid battery specification sheet is manufactured under strict quality management systems and fully complies with key international regulations to ensure global deployment and insurability. The system holds full certification for UL 9540 (Energy Storage Systems and Equipment) and its constituent components, UL 1973 (Batteries), and UL 9540A (Thermal Runaway Fire Propagation). Furthermore, the entire system meets the safety requirements of IEC 62619 (Secondary cells and batteries for industrial applications) and is CE and RoHS compliant. All manufacturing facilities are certified to ISO 9001 and ISO 14001 standards.

TECHNICAL SPECIFICATIONS

General Parameters

Nominal Energy: e.g., 372 kWh (Configurable in 372 kWh blocks)

Usable Energy: > 95% of Nominal (optimized for 90% DoD daily operation)

Cell Chemistry: Tier-1 Prismatic LFP (LiFePO₄)

System Configuration: Scalable containerized / cabinet architecture

Electrical Parameters (AC Side)

Nominal AC Power: 200 kW (standard) / Peak 300 kW (for 10s)

Output Voltage: 400 Vac (3P+N+PE) / 480 Vac (3P+PE) selectable

Frequency: 50/60 Hz (grid-forming / grid-following modes)

AC Connection: 3-wire / 4-wire (switchable)

Battery & Performance Parameters

Cell Model: High-performance LFP with >10000 cycle life at 25°C (80% EOL)

Nominal Voltage (DC): 1228 V

Operating Voltage (DC): 1000V - 1350V

Charge / Discharge Rate: Up to 1C (standard), 2C (peak for 10s)

Round-Trip Efficiency: > 92% (at nominal operating point)

Depth of Discharge (DoD): Up to 95% daily, 100% emergency

Environmental & Cooling

Cooling Method: Smart Liquid Cooling (with redundancy)

Operating Temperature Range: -30°C to +55°C (Derating above 50°C)

Storage Temperature Range: -40°C to +70°C

Ingress Protection (Chassis): IP55 / NEMA 3R

Altitude: Up to 4000m (Derating above 2000m)

Communication & Interfaces

Local Communication: Modbus TCP/IP, Modbus RTU (RS-485), CAN

Remote Communication: 4G/LTE, Ethernet (via cloud platform)

Protocol Support: IEC 61850, DNP3, SunSpec, DL/T 645

EMS Integration: Standard API for direct integration with site controllers

Dimensions & Weight

Cabinet Dimensions (W x D x H): 2500mm x 3000mm x 2896mm (for standard 372 kWh unit)

Weight: Approx. 4200 kg (depending on specific configuration)

Ground Clearance: 250mm for optimized forklift/pallet jack handling

Parameter	Specification
Nominal Energy	372 kWh per cabinet (configurable in blocks)
Nominal AC Power	200 kW (standard) / 300 kW (peak for 10s)
Cell Chemistry	Tier-1 Prismatic LFP (LiFePO4)
Round-Trip Efficiency	> 92%
Cooling Method	Smart Liquid Cooling

Cycle Life	> 6000 cycles at 80% DoD
Operating Temperature	-30°C to +55°C
Ingress Protection (Chassis)	IP55 / NEMA 3R
Communication Protocols	Modbus TCP/IP, Modbus RTU, CAN, IEC 61850, DNP3



INDUSTRIAL DEPLOYMENT & USE CASES

The off-grid microgrid battery specification sheet is the definitive choice for a wide range of C&I applications. Its robust design and advanced control capabilities make it ideal for: (1) Remote industrial mining camps requiring reliable and quiet power to replace diesel generators, drastically reducing fuel

costs and CO2 emissions. (2) Large-scale agricultural processing facilities where grid power is unreliable, ensuring uninterrupted operation for critical machinery and cold storage. (3) Island communities seeking to maximize renewable penetration (PV/Wind) to reduce the cost and environmental impact of imported fossil fuels. (4) Critical infrastructure such as data centers and communication towers requiring high-availability power for grid-independent operation. The system's turnkey design facilitates rapid on-site installation, significantly reducing engineering, procurement, and construction (EPC) time.

ROUND-TRIP RETENTION DYNAMICS & PERFORMANCE LEDGER

This platform's exceptional performance is validated by an extensive testing regime under a variety of simulated operating conditions. The liquid cooling system guarantees that the temperature variation between any two cells in a rack is maintained at $\leq 3^{\circ}\text{C}$, extending the calendar life to over 20 years. The EMS's advanced control logic ensures that the system operates in its most efficient sweet spot ($> 85\%$ SOC) during normal arbitrage operations, contributing to a guaranteed round-trip efficiency of $> 92\%$ over the system's lifetime. The performance ledger is rigorously tracked and logged, providing owners with verifiable data to ensure the system meets its expected return on investment (ROI) and energy savings targets.

GLOBAL WARRANTY ASSURANCE

This product is backed by a comprehensive and industry-leading warranty program, demonstrating our confidence in its long-term reliability. The standard warranty covers the complete battery system against material and manufacturing defects for a period of 10 years, with a guaranteed throughput energy performance (MWh) and capacity retention of > 80% for over 10 years or 6000 cycles, whichever comes first. Our global network of certified service partners ensures rapid local support, spare parts availability, and expert maintenance for the entire system lifecycle.