

Energy Storage Extreme Temperature Impact Test Results - Official Commercial

BESS Technical Overview & Datasheet

ENERGY STORAGE EXTREME TEMPERATURE IMPACT TEST RESULTS

OFFICIAL COMMERCIAL BESS TECHNICAL OVERVIEW & DATASHEET

EXECUTIVE SUMMARY

This document presents the comprehensive technical overview and verified performance datasheet for our advanced Battery Energy Storage System (BESS), with a specific focus on its validated resilience and operational stability under extreme temperature conditions. As a Tier-1 global energy storage vendor, we have subjected our modular LFP-based storage platform to a rigorous series of environmental stress tests, surpassing standard industry benchmarks. The results confirm unparalleled thermal management, sustained cycle life, and consistent power output across a temperature spectrum from -30°C to +60°C. This whitepaper serves as the definitive technical reference for project developers, EPCs, and asset owners seeking to deploy robust, reliable, and future-proof energy storage assets in diverse and challenging climatic zones.



SYSTEM ARCHITECTURE & SAFETY

The foundation of our extreme temperature performance is our proprietary, multi-layered system architecture. The platform integrates Tier-1 prismatic LFP cells within a rigid, weather-sealed IP65/NEMA 4X enclosure. Central to the system's thermal resilience is a dual-circuit, active liquid cooling and heating pipeline, which maintains optimal cell operating temperatures between 15°C and 35 °C. This precise thermal regulation is orchestrated by a distributed Battery Management System (BMS) and a cloud-connected Energy Management System (EMS), which dynamically balance thermal load and cell equalization. Safety is paramount, with a 5-level protection strategy encompassing cell-level fuses, module-level isolation, cluster-level high-voltage relays, and a UL 9540A-compliant fire suppression system. The architecture ensures that even under extreme ambient conditions, the internal thermal

runaway propagation path is effectively suppressed.

KEY FEATURES

- Thermal Stability Assurance: System maintains >95% of rated capacity and power output in continuous operation from -20°C to +55°C, with operability extending to -30°C for short periods. This eliminates the need for oversized inverters to compensate for temperature derating.
- Smart Liquid Cooling/Heating: An adaptive thermal management system with a high-efficiency chiller unit and PTC heaters ensures rapid temperature conditioning during startup and maintains tight tolerances during peak charge/discharge events, reducing cell temperature variance to <2°C across the entire rack.
- High-Density Modular Design: The containerized layout offers a compact footprint with up to 5 MWh per 40-foot container, while cabinet-level designs provide scalable blocks from 215 kWh to 3 MWh, enabling flexible project sizing without compromising thermal performance.
- Long Cycle Life Assurance: Verified through accelerated aging tests, our system demonstrates an industry-leading round-trip efficiency (RTE) of >94% and an estimated cycle life of >8,000 cycles to 80% State of Health (SOH) under extreme temperature cycling, ensuring long-term asset profitability.

COMPLIANCE & STANDARDS

Our BESS platform is fully certified to meet the most stringent international and regional standards, confirming its safety and reliability in all operating environments. The system successfully passed the following critical tests:

- UL 9540 & UL 9540A: Certified for system-level fire safety, with thermal runaway propagation tests conducted at extreme temperatures showing no fire spread between adjacent modules.
- IEC 62619 & IEC 63056: Verified for safety requirements of secondary cells and batteries, including rigorous testing for temperature cycling and overcharge protection.
- UN 38.3: Transport certification ensuring safe transit of the battery packs under varied climatic conditions.
- GB/T 36276: Compliance with Chinese standards for power storage batteries, including high and low-temperature performance verification.

TECHNICAL SPECIFICATIONS

The following specifications represent the nominal performance parameters validated under extreme temperature impact tests (from -30°C to +60°C). All data points have been verified through third-party testing facilities.

- Cell Chemistry: Tier-1 Lithium Iron Phosphate (LFP), prismatic format.

- Nominal Energy Capacity: 5.0 MWh (Containerized) / 215 kWh – 1.5 MWh (Cabinet Series).
- Depth of Discharge (DoD): Up to 95%.
- Round-Trip Efficiency (RTE): >94% (measured at +25°C, at nominal power).
- Max. Charge/Discharge Rate: 0.5C / 1.0C (Continuous).
- Operating Temperature Range: -30°C to +55°C (power derating above +45°C), storage: -40°C to +70°C.
- Thermal Management System: Active Liquid Cooling & Heating (Ethylene Glycol/Water mix).
- Cooling/Heating Power Consumption: <3% of total system capacity under full load.
- Internal Protection Rating: IP65 (Enclosure), IP67 (Cell/Module).
- Communications Protocol: Modbus TCP/IP, IEC 61850, optional CAN.
- Expected Cycle Life (at 25°C): >8,000 cycles @ 80% SOH.
- Expected Calendar Life: >20 years.
- Dimensions (40ft Container): 12,192 x 2,438 x 2,896 mm (L x W x H).
- Weight (Container): Approx. 40 tonnes (depending on configuration).

Parameter	Specification
Nominal Capacity (Container)	5.0 MWh
Nominal Capacity (Cabinet)	215 kWh – 1.5 MWh
Cooling Method	Active Liquid Cooling & Heating

Cell Chemistry	Tier-1 LFP (Prismatic)
Round-Trip Efficiency (RTE)	>94%
Max. Charge/Discharge Rate	0.5C / 1.0C
Operating Temperature Range	-30°C to +55°C
Cycle Life (80% SOH)	>8,000 cycles
Enclosure Protection	IP65 (Enclosure)
Safety Compliance	UL 9540, IEC 62619
Communications Protocol	Modbus TCP/IP, IEC 61850

INDUSTRIAL DEPLOYMENT

Our extreme-temperature-tested BESS is engineered for seamless integration into a wide array of applications, offering unparalleled flexibility and reliability. The robust thermal performance ensures stable peak shaving, demand charge management, and PV self-consumption optimization in hot desert climates or cold mountainous regions. For industrial microgrids and utility-scale projects, the system's architecture supports black-start capability and seamless islanding transition. The hardware is pre-commissioned in a factory-tested, plug-and-play configuration, significantly reducing on-site installation time and costs. Backed by a comprehensive global service network and a standard 10-year performance warranty, this platform represents a low-risk, high-return

investment for C&I and front-of-the-meter projects, ensuring financial performance is not compromised by environmental extremes.

