EMS3000 Storage Platform Specification & System Architecture Whitepaper

EMS3000 ENERGY MANAGEMENT SYSTEM

OFFICIAL COMMERCIAL BESS TECHNICAL OVERVIEW & DATASHEET

EXECUTIVE SUMMARY

The EMS3000 Energy Management System represents a paradigm shift in commercial and industrial (C&I) energy storage orchestration. Designed as the central intelligence for behind-the-meter, micro-grid, and utility-scale auxiliary applications, the EMS3000 delivers deterministic real-time control, advanced grid-edge analytics, and seamless multi-device interoperability. This whitepaper details the system architecture, safety logic, and certified performance parameters for engineering, procurement, and asset management teams.

SYSTEM ARCHITECTURE & SAFETY

The EMS3000 employs a distributed, hardware-software co-design architecture featuring a redundant dual-LAN backbone and edge-compute controller. The system integrates with third-party PCS, BMS, and smart meters via a library of 50+ pre-validated communication protocols (IEC 61850, Modbus TCP/RTU, IEC 60870-5-104, DNP3). A hardware-enforced security module (HSM) secures all dispatch commands, while the dynamic safety envelope controller (DSEC) continuously calculates operational boundaries based on thermal, voltage, and current data—triggering pre-emptive throttling or isolated shutdown within 40ms.

KEY FEATURES

- Deterministic Real-Time Control: Sub-20ms command loop for frequency regulation and peak shaving with ±0.5% power accuracy.
- Adaptive Grid-Forming & Grid-Following: Seamless transition between grid-following (P/Q) and grid-forming (V/f) modes for islanding and black-start capability.
- AI-Driven Energy Arbitrage: Integrated forecasting engine (weather, load, price) with reinforcement learning for daily profit optimization.
- Cyber-Resilient Design: IEC 62443-4-2 certified with role-based access, secure

boot, and encrypted audit trails.

- Vendor-Agnostic BMS Integration: Pre-integrated with LFP, NMC, and lead-carbon BMS protocols; active balancing control and state-of-health trending.

COMPLIANCE & STANDARDS

The EMS3000 has been certified by third-party bodies for global deployment. Compliance includes:

- IEEE 1547-2018 / 2030.5 (grid interconnection and smart inverter functions)
- IEC 62351 (power system cybersecurity)
- UL 1998 (software safety for programmable components)
- NERC CIP (optional variant for bulk-electric system)
- RoHS / REACH (environmental compliance)

TECHNICAL SPECIFICATIONS

Parameter	**Specification**
Processor	Dual-core ARM Cortex-A72 @ 1.5GHz, 4GB RAM, 32GB eMMC
I/O Capacity	4x RS485, 2x CAN, 4x AI (4-20mA/0-10V), 8x DI, 4x DO

Ethernet Ports	2x Gigabit (isolated), 1x SFP (fiber ready)
Protocol Support	Modbus RTU/TCP, IEC 61850 MMS/GOOSE, DNP3, OPC UA
Real-time Log Rate	100ms per data point (configurable to 10ms)
Power Supply	24V DC (18-36V range), 25W typical, 45W max
RTC Backup	Lithium battery, 7 days retention
Operating Temp/Humidity	-30 ° C to +60 ° C / 5% to 95% non-condensing

INDUSTRIAL DEPLOYMENT

For C&I peak shaving, the EMS3000 coordinates up to 20 PCS units and 50 battery racks in parallel, supporting aggregate DC busbar currents up to 10,000A. In micro-grid configurations, the system includes a built-in load-shedding logic controller with 12 configurable priority tiers. The web-based SCADA interface provides real-time heatmaps, predictive maintenance alerts, and automated monthly performance reports (MWh arbitraged, avoided demand charges, system round-trip efficiency). Remote

firmware updates are managed via secure TLS 1.3 channels without interrupting operational state.

DEPLOYMENT NOTES

- Operating ambient: -30°C to +60°C (derated above 50°C)
- Cooling: Passive convection, no internal fans
- Ingress: IP20 (controller cabinet), IP54 (field I/O terminals optional)
- Mounting: 19-inch rack or wall-mount (4U height)
- Commissioning: Automated device discovery and tuning wizard (<2 hours)

For complete application notes on EV supercharging integration, diesel genset substitution, or solar-plus-storage co-optimization, refer to the EMS3000 Engineering Reference Manual (document ID: EMS3K-ERM-EN-2420).