

ST510CS-2H-CNPowerStack - Official Commercial BESS Technical Overview & Datasheet

ST510CS-2H-CNPOWERSTACK: COMMERCIAL & INDUSTRIAL LIQUID COOLED ENERGY STORAGE SYSTEM

EXECUTIVE SUMMARY

The ST510CS-2H-CNPowerStack represents a next-generation, grid-tied commercial and industrial (C&I) battery energy storage system (BESS). Engineered for peak shaving, demand charge reduction, and backup power applications, this Tier-1 LFP-based solution integrates high-density liquid cooling, a bi-directional PCS, and an advanced three-layer BMS into a compact outdoor-rated enclosure. With a nameplate AC power of 100 kW and usable energy of 215 kWh per base cabinet, the platform supports direct parallel expansion up to MWh-scale, delivering a turnkey, UL9540-ready asset for commercial facilities, EV charging hubs, and micro-grids.



SYSTEM ARCHITECTURE & SAFETY

The ST510CS-2H-CNPowerStack employs a centralized DC-bus architecture.

Each cabinet integrates:

- LFP battery racks (350 V – 500 V DC nominal)
- Dual-channel 50 kW PCS (total 100 kW AC, 480 V / 400 V configurable)
- Intelligent liquid cooling distribution unit (LCDU)
- Local EMS controller with cloud IoT gateway

SAFETY LAYER OVERVIEW:

1. Cell-level: Ceramic separator + pressure relief + CID (UL 1642, IEC 62619)
2. Module-level: Passive propagation resistance + flame-retardant plastics (UL94 V-0)
3. Rack-level: HV DC contactors + pre-charge circuit + fast fusing

4. Cabinet-level: Aerosol-based fire suppression (NFPA 69) + gas venting + IP55 ingress protection

5. System-level: Dry contact to external fire alarm panel + emergency power off (EPO)

KEY FEATURES

- HIGH DENSITY LIQUID COOLING: $\pm 1^{\circ}\text{C}$ cell-to-cell variance enabling 1,000+ cycles at 1C without derating.

- TURNKEY PARALLEL SCALING: Up to 10 cabinets (1.0 MW / 2.15 MWh) share a single AC coupling transformer, reducing balance-of-system costs by >20%.

- GRID-FORMING READY: Virtual inertia & black start capability for islanded micro-grids (optional EMS license).

- ACTIVE CELL EQUALIZATION: Passive + active balancing (2 A) maximizes usable capacity and extends second-life potential.

- SMART THERMAL RUNAWAY DETECTION: Multi-gas (CO, H₂, VOC) + aerosol particle sensor triggers pre-warning >5 minutes before thermal event.

COMPLIANCE & STANDARDS

- Safety: UL 9540A (cell, module, unit), UL 1973, IEC 62619, IEC 62477-1, UN38.3

- Grid interconnection: IEEE 1547, UL 1741 SA (grid-support), VDE-AR-N 4105

- EMC: FCC Part 15 Class A, EN 61000-6-2/4
- Environmental: RoHS, REACH, CE marking
- Cybersecurity: IEC 62443-3-3 (base compliance, remote access via encrypted VPN)

TECHNICAL SPECIFICATIONS

Parameter	Specification
Usable Energy (AC, base cabinet)	215 kWh (C-rate: 0.5C)
AC Power (Grid-tied)	100 kW @ 480V / 400V, 3P+N+PE, 60/50 Hz
Max DC Power	115 kW (charge/discharge)
Round-trip Efficiency (DC/DC)	94.5% (0.5C, +25°C)
Round-trip Efficiency (AC/AC)	87.5% (including PCS + aux losses)
Cooling Method	Liquid cooling (Ethylene-glycol / water), IP55 outdoor unit
Cell Chemistry	LFP (Lithium Iron Phosphate), Tier-1 automotive format (280 Ah)
Cycle Life (EOL 70%)	≥6,000 cycles @ 1C/1C, +25±3°C
Operating Temperature	-20°C to +50°C (derating above 45°C)
Ingress Protection	IP55 (cabinet), IP67 (battery modules)
Fire Suppression	Aerosol-based + pressure relief (UL /

	FM approved)
Dimensions (W×D×H)	1200 mm × 1100 mm × 2200 mm
Weight (total)	~2100 kg
Parallel Scaling	Up to 10 cabinets (1.0 MW / 2.15 MWh), AC coupled
Communication	Modbus TCP/IP, CAN 2.0, optional 4G/WiFi gateway
Certifications	UL 9540 (system), UL 1973, IEC 62619, UN38.3, CE



INDUSTRIAL DEPLOYMENT

TARGET APPLICATIONS:

- Manufacturing facilities (demand charge reduction >30% typical)
- EV fast-charging stations (grid peak shaving + battery buffering)
- Office campuses & data centers (uninterruptible power + energy arbitrage)
- Retail & cold storage (power factor correction + backup for critical loads)

TYPICAL DEPLOYMENT DENSITY:

- Footprint: 1.8 m² per cabinet (1.2 m W × 1.1 m D × 2.2 m H)
- Pad requirements: Level concrete pad with 200 mm clearance for airflow, 500 mm service access front.
- Ambient range: -20°C to +50°C (full power up to 45°C, derated thereafter).

WARRANTY & SUPPORT:

- Standard: 10 years / 6,000 cycles (70% EOL capacity retention, 1C/1C, 25±3°C)
- Extended: 12 years / 8,000 cycles available (performance-based SLA)
- Remote monitoring: Cloud EMS dashboard with predictive failure alerts + local HMI touch panel.