

960kW Power Cabinet - Official Commercial BESS Technical Overview & Datasheet

PRODUCT OVERVIEW: 960kW POWER CABINET

As the central power conversion and conditioning backbone for utility-scale and commercial Battery Energy Storage Systems (BESS), the 960kW Power Cabinet represents a paradigm shift in grid-interfacing reliability. Designed for Tier-1 integrators and Independent Power Producers (IPPs), this unit integrates a bi-directional PCS (Power Conversion System), upstream protection, and high-precision monitoring into a single outdoor-rated enclosure. The cabinet enables seamless DC-coupling for PV arrays and delivers AC power at medium voltage levels, optimizing Levelized Cost of Storage (LCOS) through high cyclic efficiency.



SYSTEM ARCHITECTURE & SAFETY

The architecture follows a modular multi-level topology. Each 960kW cabinet aggregates DC input from up to 8 battery racks (or PV strings) via fused combiner sections, converting power using an 3-level IGBT (Insulated Gate Bipolar Transistor) NPC (Neutral Point Clamped) inverter. The AC side features integrated sine wave filters and a solid-state breaker for sub-5ms grid disconnection. Safety is enforced by a dual-channel redundant watchdog: an independent PLd (Performance Level d) safety relay monitors contactor welding, insulation resistance, and DC arc fault signatures, triggering passive shutdown or active suppression circuits.

KEY FEATURES

- Feature 1: VECTOR GRID SUPPORT: Pre-certified IEEE 1547-2018 and UL 1741 SA. Provides configurable Volt-VAr, Volt-Watt, and Frequency-Watt response modes. Hardware-accelerated phase-locked loop (PLL) ensures <20ms reactive power injection for fault ride-through.
- Feature 2: HYBRID DC BUS & PV READY: Two independent MPPT (Maximum Power Point Tracking) channels per cabinet, each rated for 1500V DC input. Supports direct PV string connection (up to 600kWp per channel), enabling DC-Coupled solar+storage without external combiner boxes.

- Feature 3: LIQUID-COOLED POWER STACK: IGBT modules are mounted on a sealed cold plate connected to a dry coolant loop. Achieves NTC (Negative Temperature Coefficient) regulation: keeps junction temperature delta $<5^{\circ}\text{C}$ across phases, boosting continuous power by 15% versus forced-air designs.
- Feature 4: BLACK START CAPABILITY: Integrated 48V auxiliary supply can be energized from a single battery string. Supports autonomous micro-grid formation without external genset or grid reference.

COMPLIANCE & STANDARDS

Designed and type-tested to international requirements for grid-connected and islanded storage systems. The cabinet carries cETLus Listing for US/Canada, CE marking for EU, and certification to IEC 62477 (Power Electronics Safety). Specific compliance includes: UL 1741 (Inverters, Converters, and Controllers), IEEE 1547 (Interconnection), IEC 61000-6-2 (Industrial Immunity), and UN 38.3 for transport of internal components. Additionally, the enclosure meets NEMA 3R / IP54 for outdoor installation (non-hazardous locations), and the control circuits comply with IEC 61508 SIL 2 for high-risk functions.

TECHNICAL SPECIFICATIONS

AC OUTPUT (Grid-Tied):

Rated Power: 960 kVA at 0.8 PF leading/lagging

Nominal AC Voltage: 480 V (3P4W, 3P3W option) / 600 V / 690 V ($\pm 10\%$ adjustable)

AC Frequency: 50 / 60 Hz (± 5 Hz configurable)

Max Output Current: 1155 A @ 480V

Current THD: $<3\%$ at rated power

DC INPUT (Battery / PV):

Operating Voltage Range: 800 VDC – 1500 VDC

Full Power MPPT Range: 850 V – 1300 V

Max Input Current per MPPT: 600 A (combined via two channels)

DC Bus Capacitance Discharge: <30 seconds

EFFICIENCY & THERMAL:

Max Efficiency: 98.7% (including auxiliaries)

Cooling: Liquid-cooled power stack + IP54 forced air for control section

Operating Temperature: -25°C to $+55^{\circ}\text{C}$ (derated $>45^{\circ}\text{C}$)

Altitude: 2000m without derating (max 4000m)

Parameter	Specification
Nominal Capacity	N/A (Inverter cabinet). DC input: up to 2.0 MWh per 2-hour cycle

Cooling Method	Hybrid: Liquid-cooled IGBT stack + IP54 forced air control bay
Cell Chemistry	External battery interface (Tier-1 LFP recommended, 800-1500Vdc)
Rated AC Power	960 kW at 0.8 PF (continuous, 45 ° C ambient)
Max Efficiency	98.7% (peak, transformerless design)
Grid Standards	IEEE 1547-2018, UL 1741 SA, IEC 61727
Enclosure Rating	NEMA 3R / IP54 outdoor, stainless steel hardware
Dimensions (WxDxH)	1400 mm x 1100 mm x 2200 mm (approx)
Weight (Dry)	~1950 kg

INDUSTRIAL DEPLOYMENT

For peak shaving at manufacturing plants or EV charging depots, the 960kW cabinet is deployed as a single unit or in parallel (up to 6 units per transformer, 5.76 MW). Installation requires a reinforced concrete pad (min 3000 kg point load), top-entry for power cables (sized for 1250 kcmil copper per phase), and

optional bottom entry for communication conduits. Ambient conditions: protection against airborne pollutants and salt mist (ISO 9227 C5-M option). Default remote monitoring via Modbus TCP/RTU or DNP3 over fiber. Ensure 1.2m service clearance on all sides.

