

VRLA and Lithium Battery Sizing Calculator - Official Technical Overview & Hardware Datasheet

EXECUTIVE SUMMARY

This document serves as the definitive technical reference for the VRLA and Lithium Battery Sizing Calculator, a precision-engineered software and hardware appliance designed for mission-critical telecommunications and data center power infrastructure planning. As the industry transitions from traditional VRLA (Valve-Regulated Lead-Acid) to high-density Lithium-Ion (Li-Ion) energy storage systems, the complexity of accurately sizing battery banks for varying load profiles, autonomy times, and environmental conditions has escalated. This platform eliminates guesswork by integrating real-time telemetry, IEEE 485 and 1187 compliance algorithms, and predictive thermal modeling to deliver bank configurations that optimize both capital expenditure (CAPEX) and total cost of ownership (TCO). This datasheet details the system's architecture, feature set, technical specifications, and ordering options necessary for seamless integration into any carrier-grade or enterprise infrastructure.



ARCHITECTURE & CHASSIS DESIGN

The VRLA and Lithium Battery Sizing Calculator is architected as a high-performance 1RU rack-mountable appliance, engineered for either co-location within existing server racks or as a standalone network element. The platform is built upon a dual-core industrial-grade processor that operates in tandem with a dedicated FPGA for parallel processing of complex electrochemical algorithms. The front panel features a 4.3-inch capacitive touchscreen display, providing at-a-glance visualization of real-time power load (kW), total battery capacity (Ah), and estimated runtime (minutes). This display is protected by a hardened glass overlay, meeting IP40 ingress protection standards. Internal architecture includes a 128GB solid-state drive for logging up to 10 years of sizing calculations, a hardware random number generator for secure key storage, and a redundant cooling system with hot-swappable fans.

The chassis is constructed from heavy-duty cold-rolled steel with a black anodized finish, ensuring electromagnetic interference (EMI) shielding and compliance with strict ETSI and NEBS Level 3 vibration standards.

HARDWARE FEATURES

The platform's feature set is categorized into three core domains: Electrochemical Modeling, Connectivity & Integration, and Power Input Management. The Electrochemical Modeling engine utilizes a multi-variable solver that accounts for dynamic temperature coefficients, end-of-life capacity degradation (based on cycle count and float voltage), and non-linear discharge characteristics for both VRLA (Peukert exponent) and Li-Ion (Equivalent Series Resistance). This is complemented by a configurable library of over 1,500 commercial battery models from leading manufacturers such as EnerSys, C&D, and Samsung SDI. In terms of connectivity, the appliance includes dual 1GbE RJ-45 management ports supporting SNMPv3, RESTful APIs, and Modbus TCP for integration with DCIM (Data Center Infrastructure Management) software. Additionally, the system is equipped with a RS-232 serial console port, a USB 3.0 port for firmware updates and data import/export, and two SFP fiber optic interfaces to enable deployment in geographically distributed sites over a WAN. The power input stage accepts a wide-range AC input (100-240V, 50/60Hz) or optional DC input (-48V), with a built-in 1+1 redundant hot-swap power supply

unit (PSU) architecture that maintains >90% efficiency under typical loads.

COMPLIANCE & STANDARDS

The VRLA and Lithium Battery Sizing Calculator is verified for strict adherence to international standards. It conforms to IEEE 485 (Recommended Practice for Sizing Lead-Acid Batteries) and IEEE 1187 (Recommended Practice for Installation of Valve-Regulated Lead-Acid Batteries), as well as the emerging IEC 62620 standards for secondary lithium cells and batteries. Additionally, the system holds UL 62368-1 and CAN/CSA-C22.2 certification for safety, and meets the stringent emissions requirements of FCC Part 15, Class A, and EN 55032/EN 55024. Environmental compliance is achieved with full RoHS (EU Directive 2011/65/EU) and REACH adherence. The platform is also NEBS (Network Equipment-Building System) GR-63-CORE and GR-1089-CORE level 3 certified, ensuring operational reliability in temperature and humidity extremes found in uncontrolled telecom shelters.

TECHNICAL SPECIFICATIONS

Parameter	Specification
Form Factor	1RU Rack-Mountable Chassis (19-inch), Depth: 450 mm

Switching Capacity	N/A (Dedicated Compute Appliance)
Power Supply	1+1 Hot-Swappable, 80 Plus Platinum AC (100-240V) or DC (-48V)
Processor	Dual-Core Industrial Grade @ 2.5 GHz with Dedicated FPGA Coprocessor
Memory	16GB DDR4 ECC RAM
Storage	128GB M.2 NVMe SSD
Display	4.3-inch Capacitive Touchscreen (800 x 480)
Network Interfaces	2x 1GbE RJ-45 (Management), 2x SFP (Fiber), 1x RS-232 Console, 1x USB 3.0
Operating Temperature	0°C to 50°C (Ambient, NEBS Level 3 Compliant)
Relative Humidity	5% to 90% (Non-Condensing)
Dimensions (W x H x D)	19.0 x 1.75 x 17.7 inches (483 x 44 x 450 mm)
Weight	Approx. 5.6 kg (12.3 lbs) with Dual PSUs
Battery Libraries Supported	VRLA (AGM, GEL), Li-Ion (LFP, NMC, LTO)
Protocols	SNMPv3, Modbus TCP, RESTful API (JSON)

Regulatory Compliance	IEEE 485, IEEE 1187, UL 62368-1, FCC Class A, NEBS Level 3
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ORDERING OPTIONS

To accommodate varying site requirements, the VRLA and Lithium Battery Sizing Calculator is available in three primary configurations. Base Model (SBC-100) includes the standard 1RU chassis, 1+1 AC PSU, and access to the full sizing library with a perpetual perpetual license for up to 500 battery models. Enhanced Model (SBC-500) expands the model database to include all available international vendors, adds dual SFP ports for WAN connectivity, and includes a five-year software update subscription. Enterprise Model (SBC-ENT) bundles the Enhanced Model with a dedicated remote monitoring probe (RMP-2) for collecting temperature and voltage data from up to 250 DC power plants, enabling automatic sizing recalibration based on actual field performance. Accessory SKUs include the Wall-Mount Bracket Kit (ACC-WMB), Extended Warranty Support (SVC-EW-5), and the Optical Network Adapter for fiber backhaul (ACC-ONA). All units are shipped with a console cable, quick-start guide, and a certificate of calibration traceable to NIST.

