

Vertiv Liebert® RXA
250 A – 400 A
Remote Power Panel (RPP)

GUIDE SPECIFICATIONS

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1 GENERAL

1.1 SUMMARY

These specifications describe requirements for a smart small-footprint remote power panel with touch-proof panelboard, supplying power to sensitive loads. It shall include all equipment to properly interface the AC power source with the intended load.

1.2 DEFINITIONS

- RPP : Remote Power Panel
- PDU: Power Distribution Unit
- EMC: Electromagnetic Compatibility
- BCMS: Branch Circuit Monitoring System
- MICB: Main Input Circuit Breaker
- EPO: Emergency Power Off
- REPO: Remote Emergency Power Off

1.3 STANDARDS

The system shall be designed, manufactured, tested and installed in compliance with:

- ISO 9001
- The RPP shall be CE marked and compliance with IEC 61439-2.
- The RPP shall comply with latest FCC Part 15 EMI emission limits for Class A computing devices and for use in Business/Industrial/Commercial Environment.
- Emission: IEC 61000-6-4 CLASS A:
 - IEC61000-4-2 electrostatic discharge test +/-8kV air discharge, +/-4kV contact discharge criterion B
 - IEC 61000-4-3 80Mhz to 1Ghz and 1,4Ghz to 2Ghz Radiated radio frequency electromagnetic test 10V/m on enclosures (for this test we need the semi anechoic chamber) criterion A
 - IEC 61000-4-4 +/- 2kV on power ports, +/-1kV on signal ports including auxiliary circuits and function earth criterion B
 - IEC 61000-4-5 immunity to surge tests +/- 2kV line to earth criterion B
 - +/- 1kV (line to line) criterion B
 - +/- 1kV (line to earth) on signal ports for this it would be useful to have shielded cables. criterion B
 - IEC 61000-4-6 150kHz to 80Mhz 10V on power ports, signal ports and functional earth.
 - IEC 61000-4-8 30 A/m on enclosure ports criterion A (depending on the size of the unit)
 - Immunity to voltage dips and interruptions IEC 61000-4-11:
 - 30% reduction for 0.5 cycles criteria B
- 60% reduction for 5s and 50 cycles Criteria C
- >95% reduction for 250 cycles criteria C
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1.4 SUBMITTAL DOCUMENTATION REQUIREMENTS

- A. Furnish documentation associated with this bid proposal and Contract including submittals, shop drawings, user manual, and test reports as follows:
 - Submit documents in portable document format (PDF).
- B. Provide a Compliance Review of the Specifications, Drawings and Addenda. The Compliance Review is a paragraph-by-paragraph review of the Specifications with the following information; “C”, “D” or “E” marked in the margin of the original Specifications and any subsequent Addenda. “C”, “D”, “E” to be completed for all specs, including reference specs.
 - “C”: Comply with no exceptions.
 - “D”: Comply with deviations. For every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.
 - “E”: Exception, do not comply. For every exception, provide a numbered footnote with reasons and possible alternatives.
- C. SUBMITTALS
 1. Product Data: For each type of power distribution unit, overcurrent protective device, TVSS device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
 2. Shop Drawings: For each power distribution unit and related equipment.
 - a. Dimensioned drawings with elevations, sections, and details.
 - b. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
 3. Users' Manual - The manufacturer shall furnish an installation/users' manual (soft-copy) with installation, start-up, operation, and maintenance instructions for the specified system

1.5 SYSTEM DESCRIPTION

1.5.1 Electrical Requirements

Input/output voltage shall be (400/230V \pm 5%, 50/60Hz) AC, three-phase, four-wire-plus-ground.

1.5.2 Environmental Requirements

- A. Storage temperature range: -25° to +55°C.
- B. Operating temperature range: 0° to +40°C.
- C. Relative humidity: Operation shall be reliable in an environment with 0% to 95% noncondensing relative humidity.
- D. Operating altitude: Up to 2,000m above Mean Sea Level; de-rated for higher altitude applications.
- E. Storage/transport: Up to:12,200 m above Mean Sea Level.
- F. Audible noise: The audible noise level of the specified system shall be less than 45dBA.

A. DOCUMENTATION

1.5.3 Drawings

Wiring diagrams and drawings of major components shall be furnished.

1.5.4 Spare Parts

A list of recommended spare parts shall be supplied at the customer's request.

1.5.5 User's List

An in-service user's list shall be furnished upon request.

1.6 WARRANTY

The manufacturer shall provide a one-year warranty against defects in material and workmanship for 12 months after initial startup or 18 months after shipping date, whichever occurs first. (Refer to the Warranty Statement for details.)

1.7 QUALITY ASSURANCE

1.7.1 Manufacturer's Qualifications:

1. The manufacturer shall have a minimum of 40 years' experience in the design, manufacture and testing of PDU's.
2. The quality system for the engineering and manufacturing facility shall be certified to conform to Quality System Standard ISO 9001 for the design and manufacture of power protection systems for computers and other sensitive electronics.
3. The specified system shall be factory-tested before shipment. Testing shall include, but shall not be limited to: Quality Control Checks and Metering Calibration Tests.

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3 PRODUCT

3.1 RATINGS / ELECTRICAL REQUIREMENTS

Full load continuous capacity 250A/400A: 170/277 kVA @ 400 V 3Ph

- a) Rated and operational Voltage (Un) & (Ue): 230/400 V \pm 5% ; three-phase, three-phase-plus-neutral, four-wire-plus-ground
- b) Rated Frequency: 50/60Hz \pm 10%
- c) Rated Current (In): 250 A – 400 A
- d) Rated conditional short-circuit current of assembly (Icc): 36 kA RMS - Withstand ratings shall be tested and certified; a label shall be applied to the unit clearly identifying this rating as required by the IEC 61439.
- e) Wiring Access: Top and Bottom entry and exit within the same cabinet. To facilitate bottom cable entry, a terminal connection kit on the bottom part of the unit should be available as option

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3.2 COMPONENTS

3.2.1 Frame Construction and Enclosure

The frame shall be constructed of galvanized steel to provide a strong substructure. The cabinet shall meet a grade of IP20 in compliance with IEC 60529. The unit shall have a lockable, removable, hinged door. The unit shall have top and bottom input/output cable trays, with dedicated areas to separate input from output cables.

All service shall be capable of being performed with access to the front. Retrofitting additional power distribution cables shall require access to the front of the unit only. Opening the main hinged door, a second access door shall provide separate access to the main panelboard circuit breaker with a top panel and to all output circuit breakers with a bottom panel. A tool shall be required to remove the second access door panels which access the hazardous voltage area of the unit.

The top panel of the second access door shall have a box to house the BCMS' boards.

The color of the exterior door and panels shall be the manufacturer's standard color, black gray matte RAL 7021. Optional custom painting to match or accent the data processing equipment shall be available.

The unit shall be naturally convection-cooled. No fans for forced-air cooling system shall be used. The convection cooling method shall allow continuous full-load operation. Heat rejection shall be through a protective top that prohibits entry of foreign material. Only front and top clearance required.

The cabinet dimensions shall be a maximum of 604 mm wide by 329 mm deep by 2000 mm high.

The weight shall be 160 Kg for the 250 A version, and 190 kg for the 400 A version. The Liebert RXA must be back-supported by column, unistrut, or wire cage or two units can be installed back-to-back as a single unit that is a drop-in replacement for a 604 x 604mm raised floor tile.

The unit shall have removable input and output aluminum conduit plates on the top and bottom of the enclosure. The top and bottom shall be composed of 3 parts to allow separation between input and output cables.

3.2.2 Input Power Connections

Input three-phase with neutral power conductors shall connect to the main input circuit breaker (MICB).

The input terminals of the MICB shall be extended types in order to facilitate the connection and ensure enough heating dissipation of the terminals. Input neutral conductor shall be rated at 100% as per phases. Ground bar size section shall be at least WxD=20x6 mm.

To facilitate bottom cable entry, a terminal connection kit on the bottom part of the unit should be available as option

3.2.3 RPP Internal Wiring

Wiring practices, materials and coding shall be in accordance with the requirements of the National Electrical Code and applicable local codes and standards. All bolted connections on bus bars, lugs and cables shall be in accordance with requirements of the National Electric Code and other applicable standards. All electrical power connections shall be tightened by applying the recommended torque values and marked with a visual indicator.

3.2.4 Main Input Circuit Breaker – MICB

The distribution panelboard shall be protected by a main input circuit breaker.

The circuit breaker and their accessories shall be constructed in conformity with:

- Standard: IEC 60947-2

The MICB shall be a 250A or 400A continuous current rated circuit breaker with a rated ultimate short-circuit breaking capacity, I_{cu} of 36kA @ 415 V.

The MICB shall be with electronic trip relay with LS/I protections:

- against overload (L): $0.4...1 \times I_n$ adjustable protection threshold, with adjustable time trip curve;
- against short-circuit with delay (S): $1...10 \times I_n$ adjustable protection threshold, with adjustable time trip curve (as an alternative to I protection);
- against instantaneous short-circuit (I): $1...10 \times I_n$ adjustable protection threshold, with instantaneous trip curve (as an alternative to S protection);
 - of the neutral in four-pole circuit-breakers:
 - for $I_n \geq 100A$ can be selected in the OFF or ON positions, 50%, 100% of the phases;

The MICB shall include a 24 VDC shunt trip mechanism to interface with unit controls, EPO button and other remote controls included.

The MICB shall include 24 Vdc auxiliary contacts: one changeover contact open-closed and one changeover for tripped indication. They shall be available on the top plate of the enclosure to facilitate customer connections.

3.2.5 Emergency Power Off (EPO) (Choose bullet point 1 or 2)

1. The local EPO shall include a covered Emergency Power Off (EPO) push button.
 - Pressing the EPO switch shall immediately shut down the unit by activating the shunt trip of the MICB.
 - The EPO switch shall be in red and protected to avoid unwanted switch off and shall be located as part of the bezel of the display on the front door.
 - The EPO switch shall be activatable or de-activatable by using the interface.
 - As part of the EPO circuit, an interface shall also be provided for connecting one or more normally open or normally closed remote EPO switches to the EPO circuit (called REPO). The interface shall be installed to the top of the enclosure to facilitate customer connections.
 - For flexibility in meeting shutdown control schemes, the local EPO (unit shutdown) circuit shall be isolated from the remote EPO (room shutdown) circuit.
 - The remote EPO circuit shall be designed to allow direct connection of multiple units with single and multiple shutdown control contacts.
2. A local EPO shall not be included.
 - An interface shall be provided to connecting one or more Normally Open or Normally Closed remote EPO switches which can be used to remotely shunt trip the main input breaker.
 - No local EPO button shall be provided.

3.2.6 Distribution Panelboards

The RPP shall contain two vertically mounted panelboards for distribution to the intended loads. The panelboards shall be totally enclosed and the enclosure shall have a dedicated panel that provides access to the panelboards.

- RPP 250 A version: The panelboards shall have a rating of 250 A, and shall be connected in series downstream the MICB, in order to guarantee an interrupting conditional short circuit rating (I_{cc}) of 100

kA (415 Vac). It shall integrate busbars for L1, L2, L3, N and 2 additional busbars for Ground and Neutral connections, the additional N-bar shall permit not-protected neutral connection to the load. The panelboards shall allow up to 84 output circuits with neutral and safety-ground connections. The protection devices can be directly connected to the system.

- RPP 400 A version: The panelboards shall have a rating of 400 A, and shall be connected in series downstream the MICB, in order to guarantee an interrupting conditional short circuit rating (I_{cc}) of 36 kA (415 Vac). It shall integrate busbars for L1, L2, L3, N and 2 additional busbars for Ground and Neutral connections, the additional N-bar shall permit not-protected neutral connection to the load. The panelboards shall allow up to 84 output circuits with neutral and safety-ground connections. The protection devices can be directly connected to the system.

All installed protective devices shall be able to be removed from the integrated system quickly, easily and without removal of input wiring and shall be interchangeable. Selectable spare locations shall be protected against accidental contact.

The busbar system shall be finger-safe (IP20B) together with the socket end piece. Components can now be plugged in or unplugged load-free under voltage.

3.3 ACCESSORIES (OPTIONAL COMPONENTS)

3.3.1 Branch Circuit Monitoring System and Controls

Provide interface for solid-state digital power monitoring as shown on the electrical one-line diagrams, communications block diagrams and in compliance with XXXX Electrical Power Monitoring Control. Coordinate with the A/E on the specific product manufactures approved for the project.

The specified system shall be equipped with a microprocessor-based power monitoring system. The monitoring system shall gather and process information from electrical and environmental sensors, relays and switches both internal and external to the unit. The monitored parameters and alarms shall be displayed on the unit control panel / display and shall also be available for communication to a centralized monitoring system.

Monitor the current and voltage of the panelboard main circuit breaker using 9.0" color touchscreen display with bezel. The bezel shall include a power and alarm LED strip and audible alarm speaker. It will display all the power parameters and alarms listed in this section. The display shall be mounted on the exterior of the front door.

These measurements are used for reporting the average RMS current, power and other parameters. The monitor will report alarms and status conditions for each circuit breaker.

The display shall monitor and display the following parameters the MICB:

- Phase Current
- Neutral Current
- Ground Current
- Current Load percentage
- Voltage Line-to-Line
- Voltage Line-to-Neutral
- Frequency
- Real Power (kW)
- Apparent Power (kVA)
- Power Factor
- Energy (kW-Hours)

- Peak Current (A)
- Peak Demand (kW)
- Current Crest Factor
- Current Total Harmonic Distortion (THD) in total THD and includes 3rd, 5th, 7th and 9th Harmonics
- Voltage Total Harmonic Distortion (THD) in total THD and includes 3rd, 5th, 7th and 9th Harmonics
- Circuit identification and status of the MICB.

The monitoring system shall monitor and display all the following panelboard branch breaker parameters

- Phase Current
- Percent Load
- Real Power (kW)
- Power Factor
- Energy (kW-Hours)
- Peak Current (A)
- Peak Demand (kW)
- Circuit identification of each breaker shall be displayed.
- The monitoring system shall detect and annunciate by alarm message the following conditions for each panelboard main and branch circuit breaker:
 - Output Overvoltage
 - Output Undervoltage
 - Neutral Overcurrent
 - Ground Overcurrent
 - Phase Overcurrent
 - Phase Loss
 - Summary Alarm

All alarm thresholds for monitored parameters shall be adjustable by graphical user interface (GUI) and USB port to match site requirements. The factory set points for the alarms shall be as follows:

- Output Overvoltage—at least one of the line-to-line voltages exceeds +6% of nominal
- Output Undervoltage—at least one of the line-to-line or line-to-neutral voltages falls below -13% of nominal
- Output Overcurrent—current exceeds 80% of breaker amps
- Neutral Overcurrent—current exceeds 95% of breaker amps
- Ground Overcurrent—current exceeds (10A for 250A), (15A @ 400A)
- Output Undercurrent
- Neutral Undercurrent

Summary Alarm—Shall detect and annunciate upon occurrence of any alarm.

To facilitate troubleshooting, all alarms shall be stored in non-volatile memory to protect against erasure by a power outage.

Alarms shall be manually reset after the alarm condition has been corrected. Alarms can be reset through the communication card or the display.

3.3.2 Control Panel / Display

The RPP shall be provided with a microprocessor-based control panel for operator interface (may also be referred to as graphical user interface or GUI) to configure and monitor the RPP. The control panel shall be located on the front of the unit where it can be operated without opening the hinged front door.

- A 9.0”, backlit, menu-driven, full-graphics, color touchscreen liquid crystal display shall be used to display system information, metering information, a one-line diagram of the RPP, active events and event history.
- No mechanical push buttons shall be used to control the interface. Mechanical EPO push buttons are acceptable.
- Control Panel Logic:
 - System logic and control programming shall reside in a microprocessor-based control system with nonvolatile flash memory.
 - System control logic shall utilize high-speed digital signal processors (DSPs). CANbus shall be used to communicate between the logic and the User Interface as well as the options.

3.3.3 Remote Monitoring Communication

The BCMS shall have up to two communication cards’ ports to allow communication to remote monitoring systems.

Equipped RDU101 Cards, for remote communication, can use up to two of the following protocols: HTTP/HTTPS, Vertiv Protocol, Email, SMS, SNMP v1/v2c/v3, BACnet IP and Modbus TCP output, BACnet/MSTP and Modbus/RTU support will require a USB to RS-485 adapter. The adapter is available as an accessory.

Note: Two of the 3rd party protocols (SNMP, Modbus or BACnet) may be configured and used simultaneously.

Modbus RTU and BACnet MSTP cannot both be enabled simultaneously.

3.3.4 Export Crating

Heavy-duty solid wood crating shall be provided to meet international requirements regarding package strength and special markings for overseas shipments.

4 FACTORY SERVICES

4.1.1 Factory Witness Test

The producer shall permit the owner or a representative to witness the factory test of each unit. The factory shall perform its standard witness test to demonstrate that the unit meets the RPP specifications.

4.1.2 Certified Test Report

A certified copy of the factory test report shall be provided for each unit.

5 EXECUTION

Factory startup, preventive maintenance and full service for the specified system shall be available and included upon request. The manufacturer shall directly employ a service organization of factory-trained field service personnel dedicated to the startup, maintenance and repair of the manufacturer's power equipment. The manufacturer shall maintain a dispatch center 24 hours per day, 365 days per year, to minimize service response time and to maximize availability of qualified service personnel.

6 SUPPLEMENTAL ACCESSORIES / OPTIONS

6.1.1 TVSS Rating

The specified system shall comply with IEC 61643-11 / EN 61643-11 with a Voltage Protection Level (Up) (L-N) 1,4 kV, (N-PE) 1,4 kV and (L-PE) 1,5 kV. The system shall be Type 2 – arrester class II.

AC surge protection to include:

- The system shall be protected by a proper device protection reported by producer of the system.
- The system shall be equipped with a Surge Protective Device to divert high-voltage input power surges to all 4 poles quickly and safely to ground.
- The surge arrester shall be mounted ahead of all electrical components to provide maximum protection of the unit insulation and wiring.