

**Vertiv™ Liebert® EXM Distribution Cabinet**  
**Guide Specifications**  
**For 30-250kVA, 480V UPS**

**1.0 GENERAL**

**1.1 Summary**

These specifications describe requirements for a distribution cabinet, supplying power to sensitive electronic loads. The specified center shall have the ability to provide isolation, distribution, monitoring of AC output power. It shall include all equipment to properly interface the AC power source to the intended load.

**1.2 Standards**

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

- American National Standards Institute (ANSI)
- National Electrical Code (NEC - NFPA 70)
- Underwriters Laboratories (UL)
- ISO 9001
- National Electrical Manufacturers Association (NEMA)
- Institute of Electrical and Electronics Engineers (IEEE)

The Liebert® EXM Distribution Cabinet shall be cULus listed and marked per UL Standard 1778, 5th Edition and shall comply with FCC Part 15 Class A.

**1.3 System Description**

**Electrical Requirements**

- Output capacity shall match the rating of the UPS.
- Input voltage shall be
  - 480 volts AC, 60Hz, three-phase, three-wire-plus-ground.
- Output voltage shall be (select one:)
  - 480VAC, three phase, three wire plus ground
  - 480/277VAC, three-phase, four-wire-plus-ground
  - 208/120VAC, three-phase, four-wire-plus-ground

### 1.3.1 Environmental Requirements

1. **Storage temperature range:** -13° to +158°F (-25° to +70°C).
2. **Operating temperature range:** +32° to 104°F (0° to 40°C).
3. **Relative humidity:** 0% to 95% without condensing.
4. **Operating altitude:** Up to 4920 ft. (1500m) above Mean Sea Level; derated for higher altitude applications.

## 1.4 Documentation

### 1.4.1 Equipment Manual

The manufacturer shall furnish an installation, operation and maintenance manual with installation, startup, operation and maintenance instructions for the specified system.

### 1.4.2 Drawings

Submittal drawings shall include:

- One-line wiring diagrams
- Outline drawings including dimensions and recommended service clearances
- Location and detailed layout of customer power and control connections

### 1.4.3 Spare Parts

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

## 1.5 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 ship date, whichever occurs first. (Refer to the Warranty Statement for details.)

## 1.6 Quality Assurance

The specified center shall be factory-tested before shipment. Testing shall include, but shall not be limited to: Quality Control Checks, "Hi-Pot" Test (two times rated voltage plus 1000 volts, per UL requirements) and Metering Calibration Tests. The system shall be designed and manufactured per world-class quality standards. The manufacturer shall be ISO 9001 certified.

## 2.0 PRODUCT

### 2.1 Components

#### 2.1.1 Frame Construction and Enclosure

- The frame shall be constructed of galvanized steel and shall be pop-riveted to provide a strong substructure. The enclosure shall be mounted on heavy-duty swivel casters for portability and ease of installation and shall be provided with permanent leveling jacks for final installation. The unit shall have easily removable output cable trays on the top and bottom to allow matching the size and number of cable/conduit openings to the site requirements.
- The Vertiv™ Liebert® EXM Distribution Cabinet shall be designed to permit all service to be performed with access to the (front, rear) (front) and top. Retrofitting additional power distribution cables shall require access to the (front) (rear) of the unit only. A tool shall be required to remove the exterior panels, which permit access the hazardous voltage area of the unit.
- The unit shall have removable, hinged front door that is 16-gauge perforated sheet metal construction to maximize ventilation. Doors shall provide access to the main input circuit breaker and to all output circuit breakers. Doors and side panels (if supplied) shall be finished in the manufacture's standard color using powder-coat paint.
- 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 without activation of overtemperature circuits. Heat rejection shall be through a screened protective top, which prohibits entry of foreign material.
- The unit shall be designed (as stand-alone separate from) (to attach to) the Liebert® EXM UPS.
- Dimensions shall be (select one:)
  - 30-150kVA units shall be 23.6" x 39.4" x 78.7" (600mm x 1000mm x 2000mm) (W x D x H)
  - 150-250kVA units shall be 34.6" x 39.4" x 78.7" (880mm x 1000mm x 2000mm) (W x D x H)

#### 2.1.2 Input Power Connections

Input power terminal blocks or bus bar for two-hole lugs shall be provided for connection of the input power conductors and a parity-sized insulated ground conductor.

#### 2.1.3 Cable Entry

The Liebert® EXM Distribution Cabinet shall have provisions for top and bottom cable entry and exit.

#### 2.1.4 Optional Isolation Transformer

**NOTE:** For the "Transformerless Configuration," delete this section.

The unit shall contain an electrostatically shielded isolation transformer with a rating as described in Section 1.3. The transformer shall be a dry-type, double-shielded, three-phase, common-core, convection air-cooled transformer.

(select one:)

1. The transformer shall conform to UL1561, with 302°F (150°C) maximum temperature rise. All transformer windings shall be copper. The transformer shall be energy efficient and shall meet DOE standard TP-1 2016. The transformer shall exhibit the following characteristics:
  - percent impedance of 3.2 to 5.4%
  - common mode noise attenuation of 120 dB

- harmonic voltage distortion of 0.5% maximum additive
- full-load efficiency of 97.1 to 98.3%.

The unit shall be provided with thermal overload protection for the transformer. An alarm shall notify personnel if the transformer temperature reaches 356°F (180°C). The unit shall automatically shut down if the transformer temperature reaches 392°F (200°C). Temperature sensors shall be in each coil of the three phase windings.

2. The transformer shall have a K20 rating in accordance with UL1561 to allow full load operation with highly nonlinear loads. Transformer neutral shall be sized for at least 200% of full load. The transformer shall be designed to operate with 100% single-phase, switch-mode power supplies and associated harmonic phase and neutral currents without derating. The transformer shall also conform to UL1561 with 302°F (150°C) maximum temperature rise. All transformer windings shall be copper. The transformer shall be energy efficient and shall meet DOE standard TP-1 2016. The transformer shall exhibit the following characteristics:

- percent impedance of 3.2 to 5.4%
- common mode noise attenuation of 120 dB
- harmonic voltage distortion of 0.5% maximum additive
- full-load efficiency of 97.1 to 98.3%.

The unit shall be provided with thermal overload protection for the transformer. An alarm shall notify personnel if the transformer temperature reaches 356°F (180°C). The unit shall automatically shut down if the transformer temperature reaches 392°F (200°C). Temperature sensors shall be in each coil of the three phase windings.

### 2.1.5 Vertiv™ Liebert® Distribution Monitoring (LDMF)

The system shall be capable of receive input from branch current sensor modules. Each sensor module shall contain twenty-one 100A current transformers (CT) capsulated in an epoxy filled plastic enclosure designed to mount next to the panelboard. No individual current transformers mounted on a printed circuit board shall be used. Sensor Module shall be designed to work with (Square D) (GE) panelboards.

In addition to monitor the branch circuit breakers the Liebert® LDMF shall monitor the current and voltage of the panelboard main circuit breaker. These measurements are used for reporting the average RMS current, power and other parameters.

The Liebert® LDMF shall report alarm and status conditions for each branch circuit breaker and the panelboard main circuit breaker.

The Liebert® LDMF shall monitor and display the following parameters for the panelboard main circuit breaker and each branch circuit breaker:

- Phase Current
- Percent Load
- kW
- kW-Hours

In addition, the Liebert® LDMF shall monitor and display the following parameters for the panelboard main circuit breaker:

- Voltage
  - Line-to-Line
  - Line-to-Neutral

- Neutral Current
- Ground Current
- kVA
- Power Factor
- Voltage Total Harmonic Distortion (THD)
- Current Total Harmonic Distortion (THD)
- Crest Factor

Circuit identification and status of each breaker shall be displayed.

The Vertiv™ Liebert® LDMF shall detect and annunciate by alarm message the following conditions:

- Overvoltage - panelboard main breaker
- Undervoltage - panelboard main breaker
- Neutral Overcurrent - panelboard main breaker
- Ground Overcurrent - panelboard main breaker
- Phase Overcurrent – panelboard main breaker and branch breakers
- Phase Overcurrent Warning – panelboard main breaker and branch breakers
- Phase Low Current Warning – branch breakers
- Summary Alarm

All alarm thresholds for monitored parameters shall be adjustable by way of the service port to match site requirements. The factory set points for the alarms shall be as follows:

**Panelboard Main Breaker:**

- Overvoltage – at least one of the line-to-line voltages exceeds +6% of nominal
- Undervoltage - at least one of the line-to-line or line-to-neutral voltages falls below -13% of nominal
- Phase Overcurrent Warning - current exceeds 75% of breaker amps
- Phase Overcurrent - current exceeds 80% of breaker amps
- Neutral Current - current exceeds 95% of main breaker amps
- Ground Current - current exceeds 5 amps

**Branch Breakers**

- Overcurrent Warning - current exceeds 75% of breaker amps
- Phase Overcurrent - current exceeds 80% of breaker amps
- Low Current Warning – Minimum current level of a branch breaker.

## Summary Alarm

- 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 Vertiv™ Liebert® IntelliSlot card or the Vertiv™ Liebert® LDMF display.

## Communication

Liebert® LDMF shall have three Liebert® IntelliSlot ports; up to Liebert® IntelliSlot cards can be added for customer connections to a Building Management System (BMS) or Liebert® LDMF, Vertiv™ Liebert® SiteScan™ monitoring interface.

### 2.1.6 Liebert® LDMF Display

A monochrome liquid crystal display (LCD) with oval bezel that includes power and alarm LEDs, an audible alarm and an alarm silence/reset push button. It will display all the Liebert® LDMF power parameters and alarms listed in Section 2.3.18 for the panelboard mains and branch breakers. A display shall be mounted on the front door, the display and switches are accessible without opening the door.

### 2.1.7 Subfeed Breaker Monitoring (Requires LDMF Monitoring)

Provide current transformer kits to monitor subfeed circuit breakers. The system shall monitor the three phases, neutral and ground of each subfeed circuit breaker.

The Subfeed Breaker Monitoring shall monitor and display the following parameters for each subfeed circuit breaker:

- Phase Current
- Percent Load
- kW
- kW-Hours
- Voltage
  - Line-to-Line
  - Line-to-Neutral
- Neutral Current
- Ground Current
- kVA
- Power Factor
- Voltage Total Harmonic Distortion (THD)
- Current Total Harmonic Distortion (THD)
- Crest Factor

Circuit identification and status of each breaker shall be displayed.

The monitoring shall detect and annunciate by alarm message the following conditions:

- Neutral Overcurrent
- Ground Overcurrent
- Phase Overcurrent
- Phase Overcurrent Warning
- Summary Alarm

All alarm thresholds for monitored parameters shall be adjustable by way of the DB9 setup port to match site requirements.

### 2.1.8 Vertiv™ Liebert® IntelliSlot IS-UNITY-DP Card

The Vertiv™ Liebert® PPC shall be supplied with an Vertiv™ Liebert® IS-UNITY-DP Card for remote communication using two of the following protocols: HTTP/HTTPS, Emerson Protocol, Email, SMS, SNMP v1/v2c/v3, BACnet IP/MSTP and Modbus TCP/RTU output. A serial RS-485 two wire connectors shall be supplied. 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.

### 2.1.9 Vertiv™ Liebert® LDMF, Vertiv™ Liebert® SiteScan™ Monitoring Interface

Monitoring interface module shall allow Liebert® Distribution Monitoring (LDMF) to communicate to Liebert® SiteScan™ Web 4.0 or greater. The interface module shall include software and graphics that support up to 168 branch breakers using an Ethernet connection.

### 2.1.10 No Monitoring System (Delete if monitoring is selected)

- The no monitoring system shall have transformer overtemperature and Emergency Power Off (EPO) circuits. All indicators and controls shall be on the front door.
- The transformer overtemperature circuit shall include an audible and visual alarm if any internal transformer winding temperature reaches 356°F (180°C). A “alarm silence/reset” switch shall be provided to quiet the audible alarm. The transformer overtemperature circuit shall also trip the main input breaker to remove power automatically when any transformer winding temperature reaches 392°F (200°C).

### 2.1.11 Isolated Ground Busbar

An isolated ground busbar shall be provided for each panelboard to connect the output cable isolated ground conductor. The isolated ground busbar is in addition to the standard equipment ground busbar.

## 2.2 Optional Distribution

### 2.2.1 Output Distribution Panelboards (208/120VAC output only)

The specified system may contain one vertically mounted Square D® bolt-in output panelboards for distribution to the intended loads. The output distribution panelboard shall be individually protected by a main panelboard circuit breaker. The panelboard shall be totally enclosed with a hinged accent panel that provides access to that panelboard without exposing other portions of the unit. The panelboard shall have a rating of (225) (400) (600) amperes, with an overall short-circuit current rating of 65kA RMS symmetrical amperes. The panelboard shall provide a total of (42) (54) (84) single-pole branch circuit breaker positions.

### 2.2.2 Output Subfeed Breakers (Select one:)

- The specified system may contain (one) (two) (four) (six) output subfeed breaker(s) for distribution to the intended loads. The output breaker(s) up to 250A shall be thermal-magnetic three-pole molded case circuit breaker(s). The system shall have an overall short-circuit current rating of (25 kA) (65kA) RMS symmetrical amperes.
- The specified system may contain (two) (four) output subfeed breaker(s) for distribution to the intended loads. The output breaker(s) 300A to 400A shall be electronic trip three-pole molded case circuit breaker(s). The system shall have an overall short-circuit current rating of (25 kA) (65kA) RMS symmetrical amperes.



### 3.0 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 nationwide 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 national dispatch center 24 hours per day, 365 days per year to minimize service response time and to maximize availability of qualified service personnel.