Vertiv™ Liebert® PPC
Second Generation
150kVA, 200kVA, 225kVA, 300kVA, 400kVA, 430kVA, 450kVA, 500kVA & 800kVA Power Conditioning System
PDU for Two-Stage Distribution
GUIDE SPECIFICATIONS

1.0 GENERAL

1.1 Summary

These specifications describe requirements for a complete power conditioning and distribution system, supplying computer grade power to sensitive loads. The specified system shall provide isolation, distribution, control and monitoring of AC 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)
- Canadian Standards Association (CSA)
- U.S. Department of Energy (DOE)
- Federal Information Processing Standards Publication 94 (FIPS Pub 94)
- Institute of Electrical and Electronics Engineers (IEEE)
- ISO 9001
- National Electrical Code (NEC - NFPA 70)
- National Electrical Manufacturers Association (NEMA)
- National Fire Protection Association (NFPA 75)
- Underwriters Laboratories (UL)

The system shall be UL listed as a complete system under UL 60950 Standard for Information Technology Equipment.

The specified system shall comply with latest FCC Part 15 EMI emission limits for Class A computing devices and the emission and immunity limits of EN50081-2/EN550022 Class A and EN50082-2.

The system shall safely withstand without misoperation or damage:

- Transient voltage surges on the AC power input as defined by ANSI/IEEE C62.41 for Category B3 locations (high surge exposure industrial and commercial facilities),
- Electrostatic discharges (ESD) up to 10kV at any point on the exterior of the unit and
- Electromagnetic fields from portable transmitters within 3 ft. (1m) of the unit.
- System Description

1.2.1 Electrical Requirements

- Output capacity shall be (150) (200) (225) (300) (400) (430) (450 (500) (800) kVA.
- Input voltage shall be (600) (480) volts AC, 60 Hz, three-phase, three-wire-plus-ground.
- Output voltage shall be 208/120 volts AC, three-phase, four-wire-plus-ground, wye configuration.

1.2.2 Environmental Requirements

1. **Storage temperature range:** -67 to +185°F (-55 to +85°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 6,600 ft. (2,000m) above mean sea level. Derated for higher altitude applications.
5. **Storage/transport:** Up to 40,000 ft. (12,200m) above mean sea level.
6. **Audible noise level:** Under normal operation noise level shall not exceed the NEMA ST-20 standard for transformers.

1.3 Documentation

1.3.1 Equipment Manual

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

1.3.2 Drawings

Wiring diagrams and drawings of major components shall be furnished.

1.3.3 Spare Parts

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

1.3.4 User's List

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

1.4 Warranty

The manufacturer shall provide a 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.

1.5 Quality Assurance

The specified system 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 according to 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 welded steel 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 removable input and output cable trays. All installation and service shall be capable of being performed with access to the front only. Retrofitting additional power distribution cables shall require access to the front of the unit only. A tool shall be required to remove the exterior panels, which protect the hazardous voltage area of the unit. To ensure grounding integrity and for static protection and EMI/RFI shielding, the removable exterior panels shall be grounded to the frame by way of stranded copper wire. Hinged front doors shall provide access to the main input circuit breaker, panelboard main breaker and to all output circuit breakers. The color of the exterior panels shall be the manufacturer's standard color, black gray matte. 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 without activation of overtemperature circuits. Heat rejection shall be through a screened, protective top that prohibits entry of foreign material.

(The complete system dimensions for 150 to 300kVA units shall be a maximum of 86 in. (2184mm) wide by 77 in. (1956 mm) high by 32 in. (813 mm) deep.) (The complete system dimensions for 430kVA units shall be a maximum of 104 in. (2642 mm) wide by 77 in. (1956 mm) high by 32 in. (813 mm) deep.) The complete system dimensions for an 800kVA unit shall be a maximum of 173 in. (4394mm) wide by 77 in. (1956 mm) high by 32 in. (813 mm) deep.) The distributed floor weight shall be less than 250 lb./ft^2 (1225 kg/m^2).

2.1.2 Input Power Connections

(Copper busbars for two-hole lugs shall be provided on the line side terminals of the main input circuit breaker for connection of the input power conductors (150-430kVA units).) (Copper busbars for two-hole lugs shall be provided for connection of the input power conductors (800kVA units).) A copper ground busbar shall be provided for connection of a parity-sized insulated ground conductor.

2.1.3 Main Input Circuit Breaker

The specified unit shall be equipped with a main input circuit breaker to provide overcurrent protection and a means for disconnecting all power to the unit. The main input circuit breaker shall be a three-pole molded case circuit breaker sized for 125% of the specified full load input current and rated for 600VAC. The minimum UL-listed interrupting rating for the main input circuit breaker shall be 65,000 RMS symmetrical amperes at 480VAC. The main input circuit breaker shall include a 24VDC shunt trip mechanism to interface with unit controls, EPO buttons and other remote controls as required by the NEC and local codes.

2.1.4 Isolation Transformer

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. The transformer shall conform to UL 1561, with 300°F (150°C) maximum temperature rise. All transformer windings shall be copper. The transformer shall be energy efficient and meet DOE standards TP-1 2016.

The transformer shall exhibit the following characteristics in addition to Table 1: common mode noise attenuation, 120 dB; harmonic voltage distortion, 0.5% maximum additive.

Table 1: Standard Transformer Characteristics

kVA	Percent Impedance	Full Load Efficiency
150kVA	4.2%	97.98%
200kVA	4.0%	98.00%
225kVA	3.9%	98.04%
300kVA	4.6%	98.40%
400kVA	4.2%	98.40%
430kVA	4.2%	98.39%
450kVA	4.2%	98.39%
500KVA	4.6%	98.44%
800kVA	4.7%	98.75%

(The 150 to 500kVA isolation transformers shall be provided with six full-capacity compensation taps at 2-1/2% increments to accommodate field adjustment to match the source voltage. Tap changes include: two above nominal voltage (upper range limit of +5%) and four below nominal voltage (lower range limit of -10. (The 800kVA isolation transformer shall be provided with four full-capacity compensation taps at 3.5% increments to accommodate field adjustment to match the source voltage. Tap changes include: two above nominal voltage (upper range limit of +7%) and two below nominal voltage (lower range limit of -7%).) These compensation taps shall be accessible by removing an accent panel.

The unit shall be provided with additional 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 located in each coil of the three-phase windings.

2.1.5 Manual Restart

The specified unit shall be equipped with a manual restart feature to allow for an orderly supervised startup after power failure. The control circuit shall automatically energize the shunt trip mechanism of the main input breaker upon sensing output voltage failure. A field-selectable auto-restart mode shall be provided to deactivate the manual restart if desired.

2.1.6 Emergency Power Off (EPO)

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 main input circuit breaker. 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. 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.

2.1.7 Computer-Grade Ground

The specified system shall include a computer-grade, single-point ground in accordance with computer manufacturers' recommendations, IEEE Std. 1100 and the requirements of the NEC. The transformer output neutral shall be solidly grounded in accordance with NEC article 250-26. Grounding conductors shall be sized in accordance with IEC 364-HD-384 and applicable national and local codes.

2.1.8 Output Distribution Panelboards

(The system shall contain one vertically mounted output Square D I-Line single row panelboard for distribution to the intended loads. The output distribution panelboard shall be individually protected by a 100% rated main panelboard circuit breaker. The panelboard shall be totally enclosed with an accent panel that provides access to the panelboard. The panelboard shall have a rating of 1200A. The panelboard shall provide space for a total of eleven 250A frame or eight 400A LA frame or six 400A LI frame three-pole branch circuit breaker. [for 150, 200, 225, 300 and 430kVA].)

(The system shall contain two vertically mounted output Square D I-Line single row panelboard for distribution to the intended loads. Each output distribution panelboard shall be individually protected by a 1200A, 100% rated main panelboard circuit breaker. Each panelboard shall be totally enclosed with an accent panel that provides access to that panelboard. Each panelboard shall have a rating of 1200 amperes; with an overall short-circuit current rating of 65kA RMS symmetrical amperes. Each panelboard shall provide space for a total of eleven 250A frame or eight 400A LA frame or six 400A LI frame three-pole branch circuit breaker. [800kVA].)

The output distribution section shall be of dead-front construction, with fillers plates provided for unused circuit breaker positions. The panelboard shall employ copper busbars and be capable of accepting plug-in type circuit breakers.

Each panelboard shall include separate isolated neutral and safety-ground busbars for the output neutral and safety-ground connections. The neutral busbar and wiring shall be sized for at least 1.73 times the panelboard full load rating to accommodate high harmonic neutral currents.

Panelboard shall have removable output cable landing trays.

2.2 Power Monitoring System

The specified system shall be equipped with a microprocessor-based power monitor panel. The monitor panel 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 monitor panel and shall also be available for communication to a Liebert centralized monitoring system using a two-wire, twisted-pair, low-voltage signal circuit for reliable communication up to 3280 ft. (1000m). The monitoring system shall be equipped with an DB-9 setup port for adjusting parameters and performing diagnostics. Three IntelliSlot ports shall be provided to allow communication to remote monitoring systems using IntelliSlot cards.

2.2.1 Monitored Parameters

The monitoring system shall monitor and display the following parameters:

- Input Voltage, Line-to-Line for all three phases
- Output Voltages, Line-to-Line for all three phases
- Output Voltages, Line-to-Neutral for all three phases
- Output Voltage Total Harmonic Distortion (THD) for all three phases
- Output Current for all three phases
- Output Current Total Harmonic Distortion (THD) for all three phases
- Output Current Crest Factor (Peak/RMS) for all three phases

- Output Current Harmonic K-Factor for all three phases
- Output Neutral Current
- System Ground Current
- Output Frequency
- Output kVA
- Output kW
- Output Power Factor
- Output kW-Hours
- Percent Load
- Date
- Time

All three phases of the three-phase parameters shall be displayed simultaneously. All voltage and current parameters shall be monitored using true RMS measurements for accurate representation of non-sinusoidal waveforms typical of computers and other sensitive loads.

2.2.2 Alarm Annunciation

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

- Output Overvoltage
- Output Undervoltage
- Output Overcurrent
- Neutral Overcurrent
- Ground Overcurrent
- Output Voltage Distortion
- Frequency Deviation
- Phase Sequence Error
- Phase Loss
- Transformer Overtemp

All alarm thresholds for monitored parameters shall be adjustable by way of the DB-9 setup port to match site requirements. The factory setpoints for the alarms shall be:

- **Output Overvoltage** - voltage exceeds +6% of nominal
- **Output Undervoltage** - voltage falls below -13% of nominal
- **Output Overcurrent** - current exceeds 95% of full load amps
- **Neutral Overcurrent** - current exceeds 95% of full load amps
- **Ground Overcurrent** - current exceeds (10A for 150-225kVA), (15A @ 300kVA), (20A @ 430kVA), (25A @ 800kVA)
- **Output Voltage Distortion** - output voltage THD exceeds 10%

- **Frequency Deviation** - output frequency exceeds ±0.5Hz of nominal

To facilitate troubleshooting, all alarms shall be stored in battery-backed (non-volatile) memory until reset to protect against erasure by a power outage. Alarms shall be able to be manually reset after the alarm condition has been corrected either at the unit or by way of the central monitoring system.

2.2.3 Custom Alarm Annunciation

The monitoring system shall be capable of providing alarm annunciation for up to five contact closures (4 N.O. and one N.C.). A custom alarm message up to 20 characters shall be provided for each contact. Alarm messages shall be programmable by way of the DB-9 setup port to match site requirements.

2.2.4 Summary Alarm Contact

A Form C (1 N.O. and 1 N.C.) Summary Alarm Contact shall be provided for remote alarm status. The contacts shall change state upon occurrence of any alarm and shall reset upon alarm silence.

2.2.5 Display

All monitored parameters and alarm messages shall be displayed on a monochrome Liquid Crystal Display (LCD) with oval bezel that includes a covered Emergency Power Off (EPO) switch, power and alarm LED's, an audible alarm and an alarm silence/reset push button. The display shall be mounted on the front door, the display and switches shall be accessible without opening the door.

The Alarm Silence switch shall be used to silence the audible alarm and reset inactive alarms.

2.3 Accessories (Optional Components)

2.3.1 Input Lightning/Surge Arrester

The specified unit shall be equipped with a secondary-class surge arrester to divert high-voltage input power surges 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. The surge arrester shall be capable of repeated operation. It shall consist of utility-grade metal-oxide varistors rated for up to 20,000 amps of surge current. The surge arrester shall be rated for maximum FOW sparkover of 3200V with maximum discharge voltage of 2.2kV at 1500A, assuming a standard 8 x 20 microsecond waveform.

2.3.2 Output Surge Suppression Module

The unit shall be equipped with a surge suppression module to eliminate high-speed, high-energy transients and to filter high-frequency noise. The surge suppression module shall be mounted on the output of the unit. The surge suppressor components shall be UL-recognized.

The surge suppressor shall utilize high-energy Metal Oxide Varistors (MOV) with a response time of less than 1 nanosecond. The clipping level shall be 212 volts on a system with a nominal peak line voltage of 170 volts and 354 volts on a system with a nominal peak line voltage of 340 volts. Peak current handling capability shall be at least 13,000 amperes based on an 8 x 20 microsecond waveform. Energy absorption capability shall be at least 200 joules per phase.

A passive filter, utilizing metalized polypropylene film capacitors, shall provide normal mode noise attenuation of at least 20 dB from 10kHz to 1 MHz. The capacitors shall be equipped with an integral pressure-sensitive interrupter to provide short-circuit current interrupting capability of up to 10,000 amperes at 600VAC.

2.3.3 Output Vertiv™ Liebert® ACV Surge Suppression

The unit shall be equipped with a Liebert® ACV high-energy, UL 1449 and UL 1283 listed Transient Voltage Surge Suppression (TVSS) module connected to the unit output with minimal interconnecting wiring for maximum surge suppression. The TVSS shall consist of multiple gapless Metal Oxide Varistor (MOV) arrays with their clamping voltages matched to within 1%. Each MOV shall be individually fused to protect against MOV failure while still allowing maximum rated surge current to flow without fuse operation. The fuses shall have a 100 kA interrupting capacity. Each array shall be capable of withstanding at least 1250 IEEE C62.41 category C3 surges (20kV, 10kA) without failure. The complete TVSS module shall have a total surge current capacity of 80kA per phase based on a standard 8 x 20 microsecond surge waveform. The UL 1449 surge clamping rating shall not exceed 400 volts for a 120/208 volt system. The maximum continuous operating voltage shall be at least 150VAC for a 120/208V system. The TVSS shall also provide electrical noise attenuation of 25 dB from 100kHz to 100MHz (based on MIL220A and 50 OHM impedance). An alarm contact of the TVSS module shall be connected to the unit monitoring system to annunciate any TVSS failure.

2.3.4 K20-Rated Transformer

The unit transformer shall have a K20 rating in accordance with UL 1561 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 be energy efficient and meet DOE standards TP-1 2016. The transformer shall exhibit the following characteristics in addition to Table 2: common mode noise attenuation, 120 dB; harmonic voltage distortion, 0.5% maximum additive.

Table 2: K20 Transformer Characteristics

kVA	Percent Impedance	Full Load Efficiency
150kVA	4.3%	97.96%
200kVA	4.2%	98.00%
225kVA	3.6%	98.20%
300kVA	4.5%	98.37%
400kVA	5.5	98.27
430kVA	3.9%	98.58%
450kVA	3.9%	98.58%
500kVA	4.6%	98.56%
800kVA	4.2%	98.90%

(The 150 to 500kVA isolation transformers shall be provided with six full-capacity compensation taps at 2-1/2% increments to accommodate field adjustment to match the source voltage. Tap changes include: two above nominal voltage (upper range limit of +5%) and four below nominal voltage [lower range limit of -10%]). (The 800kVA isolation transformer shall be provided with four full-capacity compensation taps at 3.5% increments to accommodate field adjustment to match the source voltage. Tap changes include: two above nominal voltage (upper range limit of +7%) and two below nominal voltage [lower range limit of -7%]). These compensation taps shall be accessible by removing an accent panel.

The unit shall be provided with additional 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 located in each coil of the three-phase windings.

2.3.5 Transformer High-Temperature Alarm

The transformer high-temperature shutdown sensors shall be connected to provide a Transformer Hightemp alarm instead of automatically shutting down the unit when temperature reaches 392°F (200°C). Temperature sensors shall be located in each coil of the three-phase windings. The NC contact of the temperature sensors shall be connected to Power Monitoring Panel Customer Alarm Number 5 and shall annunciate a Transformer Hightemp alarm.

2.3.6 Square D I-Line Breakers

Three-pole circuit breakers shall be provided (100) (125) (150) (175) (225) (250) (300) (350) (400)*A. The fault current withstand rating for the circuit breakers shall be 65,000 AIC.

* Total of eleven 100-250A or eight 300-400A LA frame or six 300-400A LI rated breakers can be specified. The total number of breakers depends on the quantity and frame size of the breakers.

2.3.7 Remote Emergency Power Off (REPO) Switches

Provisions shall be available for adding multiple REPO switches to meet specific site needs and local codes. The REPO switch shall activate the shunt trip of the main input circuit breaker to shut down the system. Each REPO switch shall be a covered, normally open, switch in a wall box. The REPO switch shall have (50) (100) (150) (200) (250) feet of three-conductor cable to connect to the specified system.

2.3.8 Emergency Power Off (EPO) Button Deduct

Deduct the local EPO button from the monitoring bezel. 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.

2.3.9 Vertiv™ Liebert® LDMF (Distribution Monitoring)

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 panelboard main circuit breaker.

The Liebert® LDMF shall monitor and display the following parameters for the panelboard main 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 Vertiv™ Liebert® LDMF shall detect and annunciate by alarm message the following conditions for each panelboard main breaker:

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

All alarm thresholds for monitored parameters shall be adjustable by using a DB-9 setup port to match site requirements. The factory set points for the alarms shall be as follows:

- **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 breaker amps
- **Ground Current** - current exceeds (10A for 150 to 225kVA), (15A @ 300kVA), (20A @ 430kVA), (25A @ 800kVA)

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 LDMF display.

Communication

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

Liebert® LDMF Display

A monochrome Liquid Crystal Display (LCD) with oval bezel that includes power and alarm LED's, an audible alarm and an alarm silence/reset push button. It will display all the Liebert® LDMF power parameters and alarms listed in Section 2.3.9 for the panelboard mains and Section 2.3.11 for output breakers. A display shall be mounted on the front door; the display and switches shall be accessible without opening the door.

2.3.10 Output Breaker Monitoring (Requires LDMF Monitoring)

Provide current transformer kits to monitor output circuit breakers rated at (100A) (125A) (150A) (175A) (200A) (225A) (300A) (350A) (400A) (600A). The system shall monitor the three phases, neutral and ground of each output circuit breaker.

The Output Breaker Monitoring shall monitor and display the following parameters for each output 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 DB-9 setup port to match site requirements.

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™ LDMF display.

Communication

The Output Breaker Monitoring shall communicate remotely using the Liebert® IntelliSlot cards in the LDMF.

2.3.11 Vertiv™ Liebert® IntelliSlot IS-UNITY-DP Card

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

NOTE: Two of the third-party protocols (SNMP, Modbus or BACnet) may be configured and used simultaneously. Modbus RTU and BACnet MSTP cannot both be enabled simultaneously.

2.3.12 Vertiv™ Liebert® LDMF and Vertiv™ Liebert® SiteScan™ Monitoring Interface

The Liebert® LDMF 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 supports up to 16 Square D I-Line breakers using an Ethernet connection.

2.3.13 No Monitoring System

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). An “alarm silence/reset” switch shall be provided to silence 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).

2.3.14 Certified Test Report

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

2.3.15 Factory Witness Test

The owner and/or the owner’s representative shall be permitted to witness the factory test of each unit. The factory shall perform its standard witness test to demonstrate that the unit meets the Vertiv™ Liebert® PPC specifications.

2.3.16 Export Crating

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

2.4 Optional Narrow Profile PDU

2.4.1 Frame Construction and Enclosure (Replaces 2.1.1)

The frame shall be constructed of welded steel 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 removable input and output cable trays. All installation and service shall be capable of being performed with access to the front only. Retrofitting additional power distribution cables shall require access to the front of the unit only. A tool shall be required to remove the exterior panels, which protect the hazardous voltage area of the unit. To ensure grounding integrity and for static protection and EMI/RFI shielding, the removable exterior panels shall be grounded to the frame by way of stranded copper wire. Hinged front doors shall provide access to the main input circuit breaker, and to all output circuit breakers. The color of the exterior panels shall be the manufacturer’s standard color, black gray matte. Optional custom-painting to match or accent the data processing equipment is 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 without activation of overtemperature circuits. Heat rejection shall be through a screened protective top, which prohibits entry of foreign material.

Non-conductive unistrut support(s) shall be provided for customer cables.

An infrared scan port shall be provided on the inner panel of the transformer section to allow IR scan of the transformer output bus and tap connections.

(The complete system dimensions for 150 to 450kVA units shall be a maximum of 60 in. [1524mm] wide by 77 in. [1956mm] high by 43.2 in. [1098mm] deep.) (The complete system dimensions for 500kVA units shall be a maximum of 60 in. [1524mm] wide by 85 in. [2159mm] high by 43.2 in. [1098mm] deep.) The distributed floor weight shall be less than 250 lb./ft^2 (1225 kg/m^2).

Isolated Style (Replaces 2.1.8)

The transformer and distribution sections shall be constructed with compartments that are isolated from each other. All monitoring components and associated customer connections points shall be housed in an isolated compartment from power voltages and include a fused disconnect. The output section shall use non-conductive unistrut support for customer cables.

The output distribution section shall be of dead-front construction, with filler plates provided for unused circuit breaker positions.

The distribution section shall include compartmentalized plug-in circuit breaker bases with line side factory-wired and mechanical load lugs. The individual compartments shall cover load side phase, neutral and ground connections. Access holes shall be included for load power wiring. All vent holes and perforations in the compartment shall be designed to IP-20 standards. The isolated style construction shall allow the installation of customer load cabling and plug-in breaker to a distribution circuit without exposure to energized power during live PDU operation.

1. Isolated Distribution Circuits (Replaces 2.3.6)

   Breaker compartments can be provided from the factory with plug in bases only to accept future removeable breaker elements and/or complete breakers to allow application flexibility. The distribution section will accommodate up to (10) 250A 80% distribution circuits, up to (8) 600A 80% distribution circuits, or up to (8) 400A 100% distribution circuits. Circuit breakers shall be Square D PowerPact plug-in type J- and L-Frame circuit breakers. The fault current rating for the circuit breakers shall be 65,000 AIC at 208VAC.

Fixed Mount Distribution Style (Replaces 2.1.8)

All monitoring components and associated customer connections points shall be housed in an isolated compartment from power voltages and shall include a fused disconnect.

The output distribution section shall be of dead-front construction, with filler plates provided for unused circuit breaker positions. The distribution section shall be available with 22" (559mm) or 30" (762mm) width.

The distribution section shall include fixed mount circuit breakers with line side factory-wired and mechanical load lugs.

1. 30" Wide Fixed Mount Distribution Circuits (Replaces 2.3.6)

   The distribution section will accommodate up to (10) 250A 80% distribution circuits, up to (8) 600A 80% distribution circuits, or up to (8) 400A 100% distribution circuits. Circuit breakers will be Square D PowerPact fixed-mount, type J- and L-Frame circuit breakers. The fault current rating for the circuit breakers shall be 65,000AIC at 208VAC.

2. 22" Wide Fixed Mount Distribution Circuits (Replaces 2.3.6)

   The distribution section will accommodate up to (8) 250A 80% distribution circuits, up to (6) 600A 80% distribution circuits, or up to (6) 400A 100% distribution circuits. Circuit breakers will be Square D PowerPact fixed-mount, type J- and L-Frame circuit breakers. The fault current rating for the circuit breakers shall be 65,000AIC at 208VAC.

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.