

**Liebert AccuVar (ACV Series)
Surge Protective Device (SPD)
(With Noise Filtering)**

**GUIDE SPECIFICATIONS
for a Parallel Surge Suppression System**

Part 1 General

1.01 Summary

- A.** These specifications describe the electrical and mechanical requirements for a high energy surge protective device (abbreviated as SPD in this specification and on all drawings). The specified system shall provide effective high energy surge current diversion, sine wave tracking for electrical line noise filtering and be suitable for application in ANSI/IEEE C62.41 Category A, B, and C environments, as tested by ANSI/IEEE C62.11, C62.45 and MIL-STD-220A. The system shall be connected in parallel with the protected system; no series connected elements shall be used which limit load current or kVA capability.

1.02 Standards

- A.** The specified system shall be designed, manufactured, tested and installed in compliance with the following codes and standards:

Canadian Standards Association (CSA)
American National Standards Institute and
Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.11, C62.41, and C62.45)
Federal Information Processing Standards Publication 94 (FIP PUB 94)
National Electrical Manufacturer Association (NEMA LS-1 1992)
National Fire Protection Association (NFPA 20, 70, 75 and 780)
Underwriters Laboratories (UL 1449, UL 1283)
MIL-STD-220A
International Standards Organization (ISO) Company certified ISO 9001 for
manufacturing, design and service.
EMC Directive 89/336/EEC - CE Compliant

- B.** The individual SPD units shall be UL listed under UL 1449 (Rev 7/2/87) Standard for Transient Voltage Surge Suppressions and the surge ratings shall be permanently affixed to the SPD. The unit shall also be complimentary listed to UL 1283 Standard for EMI/RFI Facility Filters.

1.03 System Description

- A.** The SPD/Filter shall be constructed using multiple surge current diversion arrays of metal oxide varistors (MOV), matched to 1% variance. The array shall consist of multiple gap-less metal oxide varistors, with each MOV individually fused. The arrays shall be designed and constructed in a manner which ensures MOV surge current sharing. No gas tubes, silicon avalanche diodes or selenium plates/rectifiers shall be used. The status of each array shall be continuously monitored and a green LED shall be illuminated if the array is in full working order. All protection modes, including N-G, shall be monitored and internally fused, for compliance to NEC article 110.9, 110.10 and 280.22.

1.04 Electrical Requirements (*Selection Required*)

- A. Nominal system operating voltage shall be:**

_____ VAC, _____ Configuration, _____ Phase, _____ Wire plus Ground.

- B. Maximum Continuous Operating Voltage (MCOV)**

The SPD maximum continuous operating voltage shall be greater than 115% of the nominal system operating voltage to ensure the ability of the system to withstand temporary RMS overvoltage (swell) conditions.

- C. Operating Frequency**

The operating frequency range of the system shall be at least 47 to 63 Hertz.

1.05 Life Cycle Testing

- A. Life Expectancy Testing**

The unit shall be capable of protecting against and surviving at least 3000 10kA surges per ANSI/IEEE C62.41-1991 Category C without failing or degrading the UL 1449 surge suppression ratings by more than 5%.

- B. Maximum Continuous Operating Voltage (MCOV) Testing**

The unit shall be factory tested to assure proper MCOV of the unit.

1.06 Overcurrent Protection (Fusing)

- A.** All protection modes (including Neutral to Ground) of the TVSS shall be internally fused at the component level with the fuses I^2t capability to allow the suppressor's maximum

rated transient current to pass through the suppressor without fuse operation. If the rated I²T characteristic of the fusing is exceeded, the fusing shall be capable of opening in less than one millisecond and clear both high and low impedance fault conditions. The fusing shall be capable of interrupting up to 300 kA symmetrical fault current with 600 VAC applied. This overcurrent protection circuit shall be monitored and provide indication of suppression failure/operability. Conductor level fuses or circuit breakers internal or external to the SPD shall not be acceptable.

1.07 Design Requirements

A. Protection Modes (*Selection Required*)

1. L-L (Delta systems)
2. L-N (Wye systems)
3. L-N, and N-G
4. All Modes. L-N, L-L, L-G, (N-G where applicable)

Note: L = Line, N = Neutral, G = Ground

1.08 Performance Ratings

A. Surge Current Capacity

The SPD surge current capacity, based on an 8 x 20 microsecond waveform shall be:
(*Selection Required*)

	<u>DELTA</u>	<u>WYE</u>	<u>TOTAL PER PHASE</u>
ACVXXXX100	40kA L-L	40kA L-N	40kA
ACVXXXX101		40kA L-N + 40kA N-G	40kA
ACVXXXX200	80kA L-L	80kA L-N	80kA
ACVXXXX201		80kA L-N + 40kA N-G	80kA
ACVXXXX111RKE		40kA L-G + 40kA L-N + 40kA N-G	80kA
ACVXXXX110RKE	40kA L-L + 40kA L-G	40kA L-N + 40kA L-G	80kA
ACVIIXXXX100	65kA L-L	65kA L-N	65kA
ACVIIXXXX101		65kA L-N + 65kA N-G	65kA
ACVIIXXXX200	130kA L-L	130kA L-N	130kA
ACVIIXXXX201		130kA L-N + 65kA N-G	130kA
ACVIIXXXX111RKE		65kA L-G + 65kA L-N + 65kA N-G	130kA
ACVIIXXXX110RKE	65kA L-L + 65kA L-G	65kA L-N + 65kA L-G	130kA

Note: XXXX replaced with systems RMS voltage and (Y) Wye, (S) Split, (D) Delta configuration type.

B. UL 1449 Ratings

The system performance ratings shall be based on the UL 1449 listing ratings for IEEE C62.41 Category B3 impulse waveforms of 6kV 1.2 x 50 microseconds, 3kA 8 x 20 microsecond waveshapes. The maximum UL 1449 listed surge rating for each and/or all of the specified protection modes shall not exceed:

400 Volts for 120, 120/208, or 120/240 volt systems.
800 Volts for 208, 240, 277, 220/380, 240/415 or 277/480 volt systems,
1200 Volts for 346, 346/600 volt systems,
500 Volts for 480 volt systems, and
2000 Volts for 600 volt systems.

C. Noise Attenuation (Optional, selection required)

The SPD/Filter unit shall provide noise attenuation for electrical line noise of a maximum of 60 dB per the 50 ohm measurement method with a frequency range of 10 kHz to 100 MHz. The unit shall be complimentary listed to UL 1283. Only UL 1283 complimentary Listed products will be acceptable for this requirement all others shall be rejected.

D. Response Time

Typical response time of all suppression components shall be .5 nanoseconds.

1.09 Submittals

A. Documentation

These specifications are based on the Liebert SPD product. All other manufacturers shall submit for 10 day pre-approval, a completed SPD manufacturers evaluation questionnaire (available from the engineer) and provide detailed compliance or exception statements to all provisions of this specification to allow consideration. Additionally, manufacturers shall submit independent test data from a nationally recognized testing laboratory verifying the following: life cycle testing, overcurrent protection, UL 1449, noise attenuation and surge current capacity. Failure to do so will result in product disapproval. Any deviation from the published specification will result in an applicable deduct applied.

B. Equipment Manual

The manufacturer shall furnish an installation manual with installation, start up, trouble shooting guide and operating instructions for the specified system.

C. Drawings

Electrical and mechanical drawings shall be provided by the manufacturer which show unit dimensions, weights, component and connection locations, mounting provisions, connection details and wiring diagram.

D. UL 1449 Ratings

Documentation of specified system's UL 1449 Listing and clamping voltage ratings of all protection modes shall be included as required product data submittal information.

E. UL 1283 Complimentary Listing

Documentation of the specified system's UL 1283 Complimentary Listing shall be included as required product data submittal information.

1.10 Quality Assurance

- A.** The manufacturer shall be ISO 9001 certified. The specified system shall be tested at the component and fully assembled level, under surge conditions with AC power applied for a minimum of 1 hour. Testing shall include but not be limited to quality control checks, dielectric voltage withstand test per UL and CSA requirements, UL ground continuity tests and operational and calibration tests.
- B.** The unit shall be designed and manufactured in the USA by a qualified manufacturer of power conditioning equipment and Active Tracking Filters. The manufacturer shall have been engaged in the design and manufacture of such products for a minimum of ten years.

1.11 Environmental Requirements

A. Storage Temperature

Storage temperature range shall be -55 to +85 C (-67 to +187 F)

B. Operating Temperature

Operating Temperature range shall be -40 to +60 C (-40 to +140 F)

C. Relative Humidity

Operation shall be reliable in an environment with 0% to 95% non-condensing relative humidity.

D. Audible Noise

The TVSS shall not generate any appreciable audible noise.

E. Magnetic Fields

The unit shall not generate any appreciable magnetic fields and shall be suitable for use directly inside computer rooms.

F. Operating Altitude

The system shall be capable of operating up to an altitude of 18,000 feet above sea level.

1.12 Warranty

The manufacturer shall provide a limited five year warranty from date of shipment against failure when installed in compliance with manufacturer's written instructions, UL listing requirements, and any applicable national or local electrical codes. Manufacturer shall make available for consultation, (local, national) engineering service support.

Part 2 Products

2.01 Enclosure

- A.** The unit case shall be an enclosure rated UL94-5V, the best rating for resistance to flammability available. Further the enclosure shall be designed and tested to NEMA 12, 4 and 4X standards. The enclosure dimensions shall be 7 inches/177.8 millimeters long by 4.25 inches/108 millimeters wide by 4 inches/101.6 millimeters deep. The unit shall weigh 7 pounds/3.2 kilograms maximum.

2.02 Connections

- A.** The unit shall be designed to be installed using the flexible conduit provided by SPD manufacturer. All parallel connections to the SPD shall be kept as short as possible. The connection to the SPD shall be made using #10 AWG maximum (ring terminal shall be provided).

2.03 Accessories

A. Unit Status Indicators

The unit shall have an integral status circuit that monitors the operational status of all modes of protection, including Line to Neutral, Line to Ground and Neutral to Ground. No manual testing is required to confirm the integrity of the suppression and filter systems. If the unit does fail, the green LED will go out and the red LED will be lit.

B. Summary Alarm Relay Contacts (Optional, selection required)

In addition to the LED indicators, the unit shall be equipped with a summary alarm relay with one set of Normally Open and Normally Closed (Form C) dry contacts rated for 125 VAC, 1 Amp (minimum). The contacts will change state and indicate a failure of the unit, a phase loss condition or a full power loss condition.

C. Undervoltage Detection

Unit shall be equipped with 70% undervoltage detection capability.

D. Phase Loss Monitoring

Unit shall be equipped with phase loss monitoring.

E. Power Loss Monitoring

Unit shall be equipped with power loss monitoring.

F. Remote Monitor Panel (optional)

A self contained, UL Listed, monitoring panel shall be provided to allow remote annunciation of the system status. Input power to the monitoring panel shall be equipped with a 6 foot/1828.8 millimeters long input power cord with a NEMA 5-15

plug. The monitor panel shall have an audible alarm, red and green LEDs, an alarm on/off switch to silence and a push-to-test alarm switch.

G. Disconnect Switch (optional)

Unit shall be equipped with a 30 amp, UL recognized disconnect switch.

2.04 Testing

- A.** Unit shall include an on-line circuit which continuously tests and redundantly monitors individual components in all protection modes including neutral to ground (where applicable). Units that require external test sets or equipment are unacceptable.

Part 3 Execution

3.01 Installation

- A.** The installing contractor shall connect the SPD in parallel to the power source, keeping conductors as short and straight as practically possible. The contractor shall twist the SPD input conductors together to reduce input conductor impedance. When installed to an electrical distribution panelboard the unit shall be close nipped to the panel and be supplied by a 30 amp circuit breaker. The contractor shall follow the SPD manufacturer's recommended installation practices and comply with all applicable codes.

NOTE: This Guide Specification complies with the outlines of the Construction Specifications Institute per CSI MP-2-2-85 and MP-2-1-88.