

■ Surge and Signal Protection  
for Business-Critical Continuity

*Liebert Hybrid Advantage*  
Total Protection For Your High Availability Systems



# Multi-Stage System of Suppression

S • A • D Hybrid Technology

The Liebert Hybrid Advantage is the first hybrid product in the industry to offer a true, coordinated multi-stage system of suppression. It integrates the fast response time of the Silicone Avalanche Diode (SAD) with the high-energy capability of the standard Liebert Interceptor MOV (Metal Oxide Varistor). Its patent-pending Surge Current Transition Circuit continually monitors the operating level of the SAD-switching to the secondary network of MOVs long before component failure becomes a concern.

## Other "hybrid" products fall into one of two categories:

**Self-sacrificing:** This system significantly degrades or fails with nominal fluctuations or high-energy events. This design is extremely inconvenient to the customer, and more importantly, it leaves an opportunity for critical load upsets/failures.

**Oversized components:** Large components allow the system to deal with nominal line voltage, as a result clamping levels increase, defeating what it is designed to do.

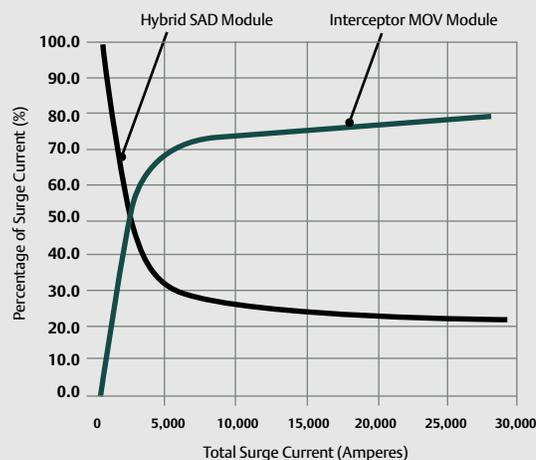
## The Liebert Answer: The transitional method

Our answer lies in a two-part design that actively disconnects the nominally close components during a sustained overvoltage and transitions from a sensitive SAD circuit to a hardier MOV array when subjected to damaging transient levels.

First, a solid state comparator network actively switches the SAD components out of the transient control circuit when exposed to line voltages in excess of their Maximum Continuous Operating Voltage (MCOV). While SAD components are removed from the system, an appropriately sized transient control network is available for continued protection. During this disconnect phase, the nominal levels are continually monitored until the system voltage is stable, at which point the SAD circuit is brought back on line.

Second, a regulated amount of high-energy surge current is transitioned to the secondary MOV suppression modules. This is accomplished through an impedance matching network utilizing a series of controlled copper geometries in conjunction with custom engineered high-voltage/high-energy component distribution. This ultimately limits the amount of high-energy surge current through the SAD module to an acceptable level and diverting the remaining surge current through the MOV module.

Typical Hybrid Advantage Surge Current Sharing Data





The Liebert Hybrid Advantage features the fast response time of the Silicone Avalanche Diode (SAD).

## Specifying The Appropriate Model

All model numbers begin with a prefix. Use Chart A to build your Liebert Hybrid Advantage starting with the SAD Surge Energy column. Moving left to right, choose the correct configuration from each column for your application. Your completed model number should look similar to the example below:

**Example Part Number:** H 2 120 Y 444 R - 03

Chart A

SAD Surge Energy	L-N Voltage	Configuration	Surge Current Rating	Connection Type	Monitoring Options
1 250J	120 120V	N Single Phase L-N	111 250kA Per Phase	"blank" Compression	01 LED
2 500J	208 208V	L Single Phase L-L	222 320kA Per Phase	Lugs	04 LED, Alarm
	230 230V	S Split Phase	333 400kA Per Phase		R Rotary Disconnect
	240 240V	Y 3 Phase Wye	444 750kA Per Phase	06 LED, Alarm, Surge Counter	
	277 277V	D 3 Phase Delta		03 LED, Alarm, Dual Surge Counters	
	480 480V	H 3 Phase Hi-Leg			

## Liebert Hybrid Advantage Models

Medium Exposure Units (250kAmp and 320kAmp current capacity units)

Model	Configuration	Surge Current Capability (kAmps)					Dimensions* (inches) H x W x D
		Phase	L-G	L-L	L-N	N-G	
H1/H2xxxS111	Split Single Phase 3 wire and ground	250	125		125	125	20 x 16 x 9
H1/H2xxxY111	Three Phase Wye	250	125		125	125	20 x 16 x 9
H1/H2xxxD110	Three Phase Delta 3 wire and ground	250	125	125			20 x 16 x 9
H1/H2xxxH111	Three Phase Delta Hi-Leg, 4 wire and ground	250	125		125	125	20 x 16 x 9
H1/H2xxxS222	Split Single Phase 3 wire and ground	320	160		160	160	24 x 20 x 9
H1/H2xxxY222	Three Phase Wye 4 wire and ground	320	160		160	160	24 x 20 x 9
H1/H2xxxD220	Three Phase Delta 3 wire and ground	320	160	160			24 x 20 x 9
H1/H2xxxH222	Three Phase Delta Hi-Leg 4 wire and ground	320	160		160	160	24 x 20 x 9

High Exposure Units (400kAmp and 750kAmp current capacity units)

Model	Configuration	Surge Current Capability (kAmps)					Dimensions* (inches) H x W x D
		Phase	L-G	L-L	L-N	N-G	
H1/H2xxxS333	Split Single Phase 3 wire and ground	400	200		200	200	24 x 24 x 9
H1/H2xxxY333	Three Phase Wye 4 wire and ground	400	200		200	200	24 x 24 x 9
H1/H2xxxD330	Three Phase Delta 4 wire and ground	400	200	200			24 x 24 x 9
H1/H2xxxH333	Three Phase Delta Hi-Leg, 4 wire and ground	400	200		200	200	24 x 24 x 9
H1/H2xxxS444	Split Single Phase 3 wire and ground	750	375		375	375	30x 24 x 9
H1/H2xxxY444	Three Phase Wye 4 wire and ground	750	375		375	375	30x 24 x 9
H1/H2xxxD440	Three Phase Delta 3 wire and ground	750	375	375			30x 24 x 9
H1/H2xxxH444	Three Phase Delta Hi-Leg 4 wire and ground	750	375		375	375	30x 24 x 9

\* Optional Disconnect Doesn't Change Dimensions

## Nominal Voltage Codes (substitute for xxx to complete model number)

Split Single Phase, 3 Wire plus Ground	120/240
Three Phase Wye, 4 Wire plus Ground	120/208, 230/400, 277/480
Three Phase Delta, 3 Wire plus Ground	208, 240, 400, 480
Three Phase Delta Hi-Leg, 4 Wire plus Ground	120/240

Note: For other voltage configurations not listed, please consult factory.

## At a Glance

- Unique "Surge Current Transition Circuit" allows for seamless transition from primary (SAD technology) to secondary (MOV array technology) suppression system. A true, shared suppression system.
- Industry's only Active Disconnect System protects against system failure and degradation due to overvoltages.
- Lowest UL 1449 clamping voltages achieved—330VAC line to neutral for a 120/208V Wye unit.
- Technology of choice for speed, allowing picosecond response time.
- All surge suppression components used are computer tested and matched. SAD's are matched to +/- 1% and MOVs are matched to 1 volt for optimum reliability and long life.
- Matched low impedance buss system for both SAD and MOV modules.
- Liebert Hybrid Advantage builds upon industry standard Interceptor® Series design. Unique benefits include:
  - Patented component level monitoring — including neutral to ground.
  - Unique sand-packed silver fuse network UL Rated at 300kAIC for safety.
  - Highest surge current capability and survivability in the industry.
  - 10-year warranty on parts and 5-year on-site labor, backed by Emerson Power Service.

# Specifications

Connection Means	Parallel Connected
Agency Listing	UL 1449 Listed (Second Edition), UL 1283, CUL
Protection Modes	All modes standard (L-N, L-G, N-G, L-L); Optional – any combination
Surge Current Capacity	250 to 750kAmps per phase depending on model
Primary Stage Joule Rating (L-N) per phase	H1 Models – 250 Joules H2 Models – 500 Joules
EMI/RFI Filtering	41 dB at 100 KHz, 31 dB at 1 MHz, 35 dB at 10 MHz, 53 dB at 100 MHz
Response Time	Picosecond range
Repetitive Surge	15,000 - 120,000 10kA Category C3 surges per phase depending on model
Enclosure	NEMA 12 standard Optional - NEMA 3R, 4, 4X and caseless
Line Frequency	47-63 Hertz
Line Voltage	+/-15% nominal
Temperature	-40 to +60 degrees C
Relative Humidity	0 to 95% noncondensing
Altitude	0 to 18,000 feet
Audible noise	Less than 45 dBa
Warranty	10-years parts, 5-year labor
Standard Features	Unit status indicators, Dual, isolated form C dry contacts
Optional Features	Integral disconnect, Audible alarm, Transient counter – single or dual

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