

INTRODUCING A REVOLUTIONARY DESIGN FROM THE WORLD  
LEADER IN SURGE SUPPRESSION TECHNOLOGY SINCE 1971

# SANDWICH BLOCK™ TECHNOLOGY

*UL 1449 Second Edition Listed*



DISSIPATES MAXIMUM SURGE CURRENT IN MINIMAL TIME

# WHAT IS SANDWICH BLOCK™ TECHNOLOGY?

Lightning strikes the heart of your operation. Whether it's the strike itself or other commonly induced transients, voltage surges can severely impact your systems' reliability and often cause loss of your system equipment.

To safeguard your systems from high voltage anomalies, LEC Inc. offers the most advanced surge protection in the industry, the LEC Sandwich Block™ (SB) modules. The LEC engineering team, including former NASA engineers, has designed a new high tech packaging system that enables MOV-based (Metal Oxide Varistor) surge suppressors to perform at the *highest level ever*. Starting with extra large MOV wafers and then "sandwiching" the wafers between highly conductive metal plates, LEC created a revolutionary design that allows the *full face* of each MOV to have a direct connection with the plates with *no internal wiring*.

LEC's SB technology with full face MOV design solves the problems commonly associated with standard MOV-based surge suppressors. For example:

- **Current is evenly distributed to all points on the surface of the SB MOV wafers.**

In traditional MOVs, local current density build-ups are common at the solder points, leading to overstress and cracks in the structural material and ultimately resulting in the failure of the suppressor. Eliminating concentration of the surge current eliminates the related impedance created by the solder points.

- **The SB can handle a long sequence of an extended lightning pulse train *instantaneously*.**

The elimination of solder and wire eliminates any slowing down of the surge current.

LEC's new full face SB design also minimizes a critical factor in MOV-based designs, MOV degradation. The SB design is the only module with heat sinking capabilities. The problem with other MOV-based modules is that they tend to "punch-through" where the solder and wire are joined, and the heat at these connections builds up and reduces product life. The excess heat build-up will degrade these traditional MOV components and this in turn will compromise your attached systems.

Available Components	Preserves MTBF	High Current	High Energy	Fast Reaction	Safe Clamp	Long Life
Gas Tubes		✓	✓			✓
MOVs	LIMITATIONS			✓	✓	LIMITATIONS
Avalanche Diodes	✓			✓	✓	
Selenium Rectifiers		✓	✓			LIMITATIONS
LEC's SB	✓	✓	✓	✓	✓	✓

Component Characteristics

## ***FASTER ENERGY DISSIPATION***

**Dissipates the maximum energy in less than 50 nanoseconds!**

**Full-face contact means no lag time from circuitry**

- “Lag time” is the response time delay between the surge build-up and the time for the circuit to react
- The quicker the response time, the better your equipment is protected

***Sensitive MOV wafers fully protected inside the weather-resistant insulation and rugged aluminum casing***

## ***SUPERIOR ENERGY DISSIPATION***

**Handles up to 1,280,000 amps per phase!**

**Evenly distributes current density to all points of wafer surface**

**Prevents:**

- Current density build-ups on wafers
- Heat build up in local areas of wafer
- Local stresses in material
- Cracks in the structure of the wafer material and destruction of device



**UL** US

## ***EXTENDS EQUIPMENT RELIABILITY***

**Backed by 10 Year Warranty!**

**Extended life of the SB MOV means securing the safety of your equipment**

**Rapid heat dissipation reduces material deterioration, maximizes life of MOVs**

**Fewer components assures higher reliability**

**Prevents overstressing of components**

- Full-face heat sink
- Even distribution of current
- Lowers density amounts of energy dissipated

***Built in heat sink prevents overstressing of components***

## MAX PROTECTION AT MAX CUR-

Contemporary electronics and electrical circuits must be protected against voltage anomalies entering from the electrical service entrance. Each new generation of equipment is increasingly sensitive to transient surge phenomena. Process control systems are not only vulnerable to power line transients, but also to induced transient surges caused by the secondary effects of nearby storms.

LEC has considered the importance of a safe clamp level across a diverse range of allowed surge currents. One of the major functions of LEC SB technology is to clamp the “let through” voltage (voltage applied to the protected load) as low as possible, across a wide spectrum of surge currents. For example, the curves in Figure 1 illustrate the average clamp level characteristics associated with other similarly rated industry surge suppressors as compared to the clamp levels of LEC SB technology. All surge suppressor clamp levels will be directly related to the applied impulse or surge current. The greater the surge current, the higher the voltage clamp.

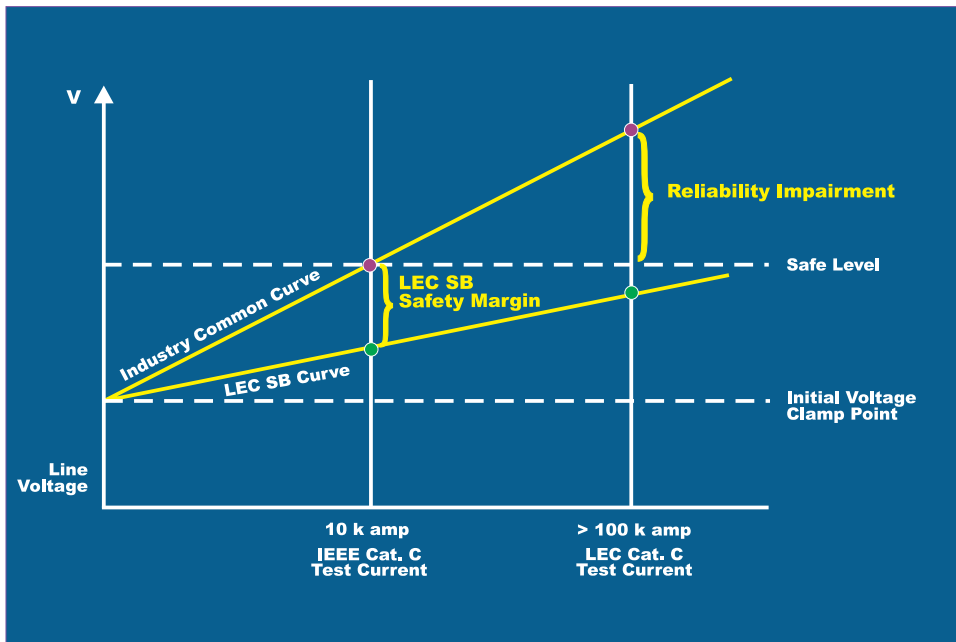


Figure 1: Clamping Characteristics

These curves show that a typical surge suppressor provides an industry standard clamp level at only 10 kA. The problem here is that surge suppressors will more often encounter surges *in excess of 10kA*, and these typical suppressors will fail to protect equipment reliability in such an event. In contrast, Sandwich Block technology provides a safe, effective voltage clamp from **10kA to over 100kA** (1280kA per phase). The SB assures that protected equipment is at no point compromised by excessive voltages.



## LEADERSHIP IN SURGE SUPPRESSION TECHNOLOGY

Since 1971, our engineers have been world leaders in surge protection technology. LEC's engineering team was the first to introduce a series-hybrid surge suppression product to the market. Now, LEC's patent protected Sandwich Block Module is the world's first "full-face" design. LEC SB technology yields an extraordinary product - the most robust surge protector available on the market.



LEC supplies a wide range of surge suppression products to thousands of customers worldwide including:

FEDERAL EXPRESS, U.S. NAVY, DEPARTMENT OF ENERGY, MOBIL OIL CORP., GE PLASTICS, EXXON, ARAB OIL PIPELINE, NASA, STENNIS SPACE CENTER, MARTIN MARIETTA, PEMEX, CHEVERON, FBI ACADEMY, KOREAN ELECTRIC POWER, EI DUPONT, JOHNS HOPKINS UNIVERSITY (Appl. Phys. Lab), GEORGIA PACIFIC, U.S. ARMY, UNION CAMP, PETRO DE VENEZUELA, HITACHI, DISNEY WORLD, DIS TRAN PRODUCTS, INC., CORPOVEN, US WEST, PPG INDUSTRIES, TELEVISA, AT&T, ETHYL CORP, FEDERAL AVIATION ADMIN., TAMPA AIRPORT, DOW CHEMICAL CORP, PHILLIPS PETROLEUM CO., GULF POWER CORP, MERALCO ELECTRIC, HOUSTON LIGHTING & POWER, GULF STATES UTILITIES, FLORIDA DEPARTMENT OF TRANSPORTATION, ROLLINS ENVIRONMENTAL, U.S. COAST GUARD, VANGUARD CELLULAR, PROCON SYSTEM CO. LTD., BALTON CP LTD., TENNESSEE GAS PIPELINE, AUGUSTA SERVICES/COLUMBIA NITROGEN, CITY OF TALLAHASSEE, TRI-STATE GENERATION & TRANSMISSION, MAINE YANKEE ATOMIC POWER CO., PONCE BROADCASTING CO. WZAR, STATE OF GA - W. CENTRAL REGIONAL HOSPITAL, ETHYL CORP, GENERAL PUBLIC UTILITIES, ELECTRIZA LTD., MG INDUSTRIES, FLORIDA POWER CORP, CHEVRON, PHILADELPHIA ELECTRIC, TU ELECTRIC, CITY OF JACKSONVILLE, WEYERHAUSER, STAR ENTERPRISE, U.S. AIR FORCE

### 10 YEAR WARRANTY

***LEC Inc. warrants the SB Series Modules for 10 years to be free from defects in workmanship and material and to operate under recommended use and conditions.***

# LEC SB-Series Products

## SB-Series Specifications

### Electrical

Nominal Operating Voltage (Vrms)	100 through 600 VAC +/- 10%
Frequency Range (Hz)	50/60
Nominal RMS Load Current per Phase	Unlimited
<b>Protection Modes</b>	
Normal Modes	L - N or L - L (Delta Modules)
Common Mode	L - G and N - G

### Mechanical

Cooling	Internal Heat Sink
Enclosure Type <sup>1</sup>	NEMA 4, 4X, 12, 13

### Environmental

Operating Temperature	-40 C to 85 C
Operating Humidity	5% to 95% Non-Condensing

### Performance

Max. Surge Current per mode (8 x 20us)	Available in 80,000; 160,000; 320,000 or 640,000
Max. Surge Current per phase (8 x 20us)	Available in 160,000; 320,000; 640,000 or 1.28MA
Maximum EMI/RFI Noise Attenuation	20 KHz through 2 MHz <sup>2</sup>
Normal	Up to 50 dB
Common	Up to 50 dB
Response Time	< 1 nanosecond
Efficiency at Full Load	> 99%
ANSI/IEEE C62.41 (1991) and C62.45 Tested	Category C3 Bi-Wave Impulses
Guaranteed to Survive	1,000 Sequential Category C3 - Bi-Wave Impulses
Standard Warranty	10 Years (Replacement)

1. Consult factory for other NEMA enclosure types
2. MIL-STD 220A, 50 ohm insertion loss test method



## Options

### LEC Systems Options

Surge Counter	A
Audible Alarm	B
Disconnect (63, 100 amp.)	C
NEMA 4X	D
Spare Parts	E
Options A, B, C	F
Options A, C, D	G

Note: Add the alpha character as a suffix to the model number. Example: SB 27-(120/208)-3Y-G.

## SB-Series Panel Product Voltage Ratings

Single Phase I	Two Pole 3W (2P3W)	Two Pole 4W (2P4W)	Split Phase (SP)	Three Phase Delta (3D)	Three Phase WYE (3Y)	Center Phase GND Delta (CPGD)	Phase GND Delta (PGD)
120	208	120/208	120/240	-	120/208	120/240 (208)	120/240
220	380	220/380	-	240	220/380	120/240 (240)	-
240	415	240/415	-	380	240/415	-	-
277	600	277/480	-	480	277/480	-	-

Note: Models are available in other voltage ranges. Contact your local LEC representative or the factory for prices and delivery times

## Voltage Suppression Ratings for SB Products

Voltage	Applications <sup>1</sup>	UL 1449 Second Edition Voltages <sup>2</sup>			
		L - N	L - G	L - L	N - G
120	(1), (3), (4)	500	500	-	500
220	(1), (3)	600	600	-	600
240	(1), (2), (3)	700	700	700	700
277	(1), (3)	800	800	-	800
480	(2)	-	-	1000	-

## Surge Current Conversion Table

Model Number	Max Surge Current per Mode	Max Surge Current per Phase
SB-21 (Voltage) Source, Options	80,000 amps	160,000 amps
SB-22 (Voltage) Source, Options	160,000 amps	320,000 amps
SB-23 (Voltage) Source, Options	320,000 amps	640,000 amps
SB-27 (Voltage) Source, Options	640,000 amps	1,280,000 amps

Contact your LEC Representative

1. Applications: (1) Single Phase (2) Delta (3) Wye (4) Split Phase
2. Suppression Voltage Rating (SVR) testing performed to UL 1449 SVR requirements



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