ECS
ENERGY CONTROL SYSTEMS

IN OUR WORLD, SOME THINGS ARE FORBIDDEN

SineTamer

Advantage Series

STANDARD UNITS

ST-SSLA / ST-SKLA / ST-SDLA / ST-LSEA / ST-SMLA / ST-SILAM / ST-SHDLAM

Because we are constantly seeking to improve our products, specifications are subject to change at any time.

ST-SSLx

90kA Per Phase
ANSI/UL 1449-2006 3rd Edition

A=Type 2 SPD, I_n = 10kA
B=Type 2 SPD, I_n = 20kA
C=Type 1 SPD, I_n = 10kA
D=Type 1 SPD, I_n = 20kA

* Based on 3 Phase Wye, 4 Wire and Ground I_n = Nominal Discharge Current per ANSI/UL 1449-2006

KEY FEATURES

Discrete “All Mode” Circuitry: Directly Connected Protection Elements in “All Modes” (10 modes for 3 phase Wye circuits) as recommended by IEEE Std. 1100-2005

Industry Leading Measured Limiting Voltage (let-through) Performance

Local & Remote Diagnostics

Independent Verification of Performance and Safety

No moving parts or springs - No mechanical or electro-mechanical thermal/ over-current protection

Component-Level, Thermal Fusing

Patent Pending, Internal, Circuit Board Mounted, Over-Current Fusing

GENERAL

Application
The ST-SSLx series is one of the most versatile units in our product line. This device is intended for general load applications at locations ranging from individual equipment disconnects to small service entrances. It is extremely effective in limiting internally generated transients when used on lighting or HVAC panels.

Warranty
25 Years Unlimited Free Replacement

IEEE –C62.41.1 & C62.41.2-2002 environments
Suitable for Categories: A, B & C (Most Severe Electrical Environments)

IEC Environments
Suitable for use in IEC 61643-11 environments

Circuit Topology
Parallel configured Voltage Responsive Circuitry circuit design incorporating component-level, thermal fusing and circuit board mounted, Patented internal over-current fusing methodology with discrete “All Mode” protection (10 modes for 3 phase Wye units). All protection circuits are encapsulated in our high- dielectric compound to promote long component life and protection from the weather and vibration.

Protection Modes
Industry-best practice of dedicated protection components for all operational modes of the electrical system. Discrete L-N, L-L (Normal Mode) and L-G, N-G (Common Mode) Example: Directly Connected Protection Elements in All 10 modes for a 3 phase, 4 wire, Wye system, (i.e. 3 L-N modes, 3 L-L modes, 3 L-G modes and 1 N-G mode).

Input Power
50-400 Hz (60 Hz nominal)

Temperature Rating
Up to 80°C

Insertion Loss Data (L-N)

Frequency	280 kHz	1 MHz	Max Attenuation & Freq.
Attenuation	3 dB	17 dB	40 dB @ 135 kHz

Standard Enclosure
NEMA 1 Rated Standard Enclosure (Other enclosure options available)

Nominal Discharge Current (I_n) Rating
20 kA (ST-SSLB, ST-SSLD) 10 kA (ST- SSLC, ST-SSLA)

Diagnostics
Green LED’s, one per phase, normally on. A wide range of optional diagnostics is available.

Circuit Interrupt
Internal component-level, thermal fusing and patented circuit board mounted, over-current fusing. No external over-current protection required.

UL Short Circuit Current Rating
200 kAIC

Product Qualifications
Listed to ANSI/UL 1449-2006 3rd Edition by UL (E340498), CSA (MC#241804);
UL1283* and CE Compliant (*Type 2 SPDs only)
ISO 9001-2008 Certified Manufacturing Facility
2004/2006 TVSS Customer Value Enhancement Award from Frost & Sullivan

OPTIONS

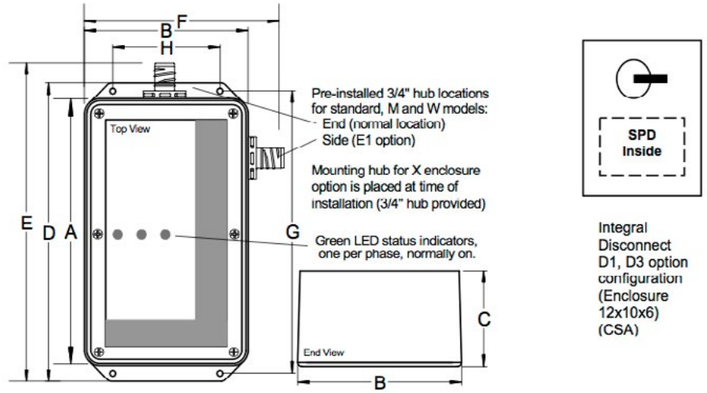
AC = Internal Audible Alarm w/ test button, mute switch and red LED
C = Form C dry relay contacts
D1 = Integral, non-fused disconnect switch (TVSS unit mounts inside)
D3 = Same as D1, except no external handle
E1 = Hub on side of enclosure
K = Gasket Kit
LP = Remote LED indicators in individual NEMA 4X housings
M = NEMA 12 Steel Enclosure
P = Flush Mount Plate
R2 = Remote lights on separate circuit board in separate enclosure
S = Surge counter w/ reset button
W = NEMA 4 Steel Enclosure
X = NEMA 4X Composite Enclosure (Box-in-box)
X1 = NEMA 4X Composite Enclosure with Clear Lid (Box-in-box)
X2 = NEMA 1, 2, 3, 3S, 4, 4X and 12 composite enclosure
XS = NEMA 4X Stainless Steel Enclosure

External Accessories: EACS = Externally mounted diagnostic module, combines **AC**, **C**, and **S** options (Also available: **EAC**, **EC**, **ECS**, and **ES**)
Other options may be available upon request.

MECHANICAL (Model Number Ex: ST-SSLC3Y2D3 / Base Model: ST-SSL / SPD type & Nominal Discharge Current (I_n) Rating: A, B, C, D / Voltage Code: 3Y2 / Options Code: D3)

Enclosure Dimensions				
Inches (mm)	Standard Model	Enclosure Options		
		M	W	X,X1
A	8.25 (210)	10.00 (254)	10.00 (254)	12.00 (305)
B	5.00 (127)	8.00 (204)	8.00 (204)	10.50 (267)
C	3.00 (77)	4.00 (102)	4.00 (102)	6.00 (153)
D	9.37 (238)	11.50 (293)	11.50 (293)	12.50 (337)
E	9.48 (242)	12.00 (305)	12.00 (305)	11.73 (299)
F	6.23 (159)	9.00 (229)	9.00 (229)	11.00 (280)
G	8.87 (226)	10.75 (274)	10.75 (274)	12.00 (305)
H	3.37 (86)	6.00 (153)	6.00 (153)	8.00 (204)
Type	NEMA 1 ABS	NEMA 12 Steel	NEMA 4 Steel	NEMA 4X Composite
lbs. (kg)	5 (2.27)	14 (6.36)	14 (6.36)	11 (4.99)

Flush mount trim plate available for standard and “M” option models.



Circuit Connection: #10 AWG wire (pre-installed)

Voltage Code	ANSI/UL 1449-2006 (Third Edition) Voltage Protection Rating (VPR)						
	L-N	HL-N	L-G	HL-G	N-G	L-L	HL-L
1S1	500	-	500	-	500	1000	-
3Y1	500	-	500	-	500	1000	-
3D1	500	1000	500	1000	500	1000	1000
3Y2	1000	-	1000	-	1200	1800	-
3N2	-	-	1000	-	-	1000	-
3N4	-	-	1800	-	-	1800	-

MEASURED LIMITING VOLTAGE PERFORMANCE AND ELECTRICAL SPECIFICATIONS

Voltage Code	Circuit Type	Peak Surge Current	MCOV	ANSI/IEEE C62.41.1™-2002, C62.41.2™-2002, C62.45™-2002, and C62.62™-2010 Measured Limiting Voltages (tested with 6 inches of lead length external to the enclosure per Clauses 6.1.1 of C62.62™-2010 and 37.4.4 of ANSI/UL 1449-2006)		
				Test Mode	Cat A 30 Ω 100 kHz Ring Wave 6 kV 200 A @ 90° Phase Angle	Category C (High) 10 kA 8/20 Current Driven Test†
1S1	120/240V 1Ø (Split) (3 wire + ground)	30 kA L-N 30 kA L-L 30 kA L-G 30 kA N-G 180 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	296 V 473 V 297 V 578 V	1011 V 1291 V 991 V 1431 V
3Y1	120/208 V 3Ø Wye (4 wire + ground)	30 kA L-N 30 kA L-L 30 kA L-G 30 kA N-G 300 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	296 V 473 V 297 V 578 V	1068 V 1381 V 1048 V 1431 V
3D1	120/240 V 3Ø High- Leg Delta (4 wire + ground)	30 kA L-N 30 kA L-L 30 kA HL-N 30 kA L-G 30 kA HL-G 30 kA N-G 300 kA Total	150 V 320 V 300 V 150 V 320 V 150 V	L-N HL-N L-L L-G HL-G N-G	296 V 443 V 473 V 297 V 450 V 578 V	1091 V 1411 V 1381 V 1076 V 1371 V 1431 V
3Y2	277/480V 3Ø Wye (4 wire + ground)	30 kA L-N 30 kA L-L 30 kA L-G 30 kA N-G 300 kA Total	320 V 550 V 320 V 320 V	L-N L-L L-G N-G	443 V 721 V 450 V 942 V	1334 V 1981 V 1304 V 1721 V
3N2	240 V 3Ø Delta (NN) (3 wire + ground)	30 kA L-L 30 kA L-G 180 kA Total	320 V 320 V	L-L L-G	450 V	1381 V 1304 V
3N4	480V 3Ø Delta (NN) (3 wire + ground)	30 kA L-L 30 kA L-G 180 kA Total	550 V 550 V	L-L L-G	721 V	1981 V 2144 V

Measured Limiting Voltage (MLV) Test Parameters: Positive polarity, Category A: Line power applied, Category C: No line power applied, Voltages are peak (±10%). Measured Limiting Voltages are measured from the insertion point on the sine wave to the peak of the surge for powered tests. Each phase is the average of the modes within that mode of protection. In order to duplicate the results, the specified mode of protection must be tested in all modes (except N-G) and averaged together. (Individual mode or shot results may vary by more than 10%. *Scope Settings: Time Base = 10 microseconds per division, Sampling Rate = 2.5 Gigasamples/sec, Bandwidth = 400 MHz (200 MHz for Cat C), Probes: Tektronix P5100/P6015A. These settings help to assure MLV results are accurate).* **All tests performed with 6" lead length (external to the enclosure), simulating actual installed performance.** The MLVs reported above are certified by Third-Party, Independent Testing. Individual test reports are available upon request.
†Category C High, 10 kA is equivalent to the MLV recorded during the Nominal Discharge Current (I_n) Test from C62.62™-2010 and ANSI/UL 1449-2006.
**Other voltage configurations may be available. Contact your sales representative for additional assistance.*

ST-SKLx

120kA Per Phase
ANSI/UL 1449-2006 3rd Edition

A=Type 2 SPD, I_n = 10kA
B=Type 2 SPD, I_n = 20kA
C=Type 1 SPD, I_n = 10kA
D=Type 1 SPD, I_n = 20kA

* Based on 3 Phase Wye, 4 Wire and Ground I_n = Nominal Discharge Current per ANSI/UL 1449-2006

KEY FEATURES

Discrete “All Mode” Circuitry: Directly Connected Protection Elements in “All Modes” (10 modes for 3 phase Wye circuits) as recommended by IEEE Std. 1100-2005

Industry Leading Measured Limiting Voltage (let-through) Performance

Local & Remote Diagnostics

Independent Verification of Performance and Safety

No moving parts or springs - No mechanical or electro-mechanical thermal/ over-current protection

Component-Level, Thermal Fusing

Patent Pending, Internal, Circuit Board Mounted, Over-Current Fusing

GENERAL

Application
The ST-SKLx series is one of the most versatile units in our product line. This device is intended for general load applications at locations ranging from individual equipment disconnects to small service entrances. It is extremely effective in limiting internally generated transients when used on lighting or HVAC panels.

Warranty
25 Years Unlimited Free Replacement

IEEE –C62.41.1 & C62.41.2-2002 environments
Suitable for Categories: A, B & C (Most Severe Electrical Environments)

IEC Environments
Suitable for use in IEC 61643-11 environments

Circuit Topology
Parallel configured Voltage Responsive Circuitry circuit design incorporating component-level, thermal fusing and circuit board mounted, Patented internal over-current fusing methodology with discrete “All Mode” protection (10 modes for 3 phase Wye units). All protection circuits are encapsulated in our high- dielectric compound to promote long component life and protection from the weather and vibration.

Protection Modes
Industry-best practice of dedicated protection components for all operational modes of the electrical system. Discrete L-N, L-L (Normal Mode) and L-G, N-G (Common Mode) Example: Directly Connected Protection Elements in All 10 modes for a 3 phase, 4 wire, Wye system, (i.e. 3 L-N modes, 3 L-L modes, 3 L-G modes and 1 N-G mode).

Input Power
50-400 Hz (60 Hz nominal)

Temperature Rating
Up to 80°C

Insertion Loss Data (L-N)

Frequency	280 kHz	1 MHz	Max Attenuation & Freq.
Attenuation	3 dB	17 dB	40 dB @ 135 kHz

Standard Enclosure
NEMA 1 Rated Standard Enclosure (Other enclosure options available)

Nominal Discharge Current (I_n) Rating
20 kA (ST-SKLB, ST-SKLD) 10 kA (ST- SKLC, ST-SKLA)

Diagnostics
Green LED’s, one per phase, normally on. A wide range of optional diagnostics is available.

Circuit Interrupt
Internal component-level, thermal fusing and patented circuit board mounted, over-current fusing. No external over-current protection required.

UL Short Circuit Current Rating
200 kAIC

Product Qualifications
Listed to ANSI/UL 1449-2006 3rd Edition by UL (E340498), CSA (MC#241804);
UL1283* and CE Compliant (*Type 2 SPDs only)
ISO 9001-2008 Certified Manufacturing Facility
2004/2006 TVSS Customer Value Enhancement Award from Frost & Sullivan

OPTIONS

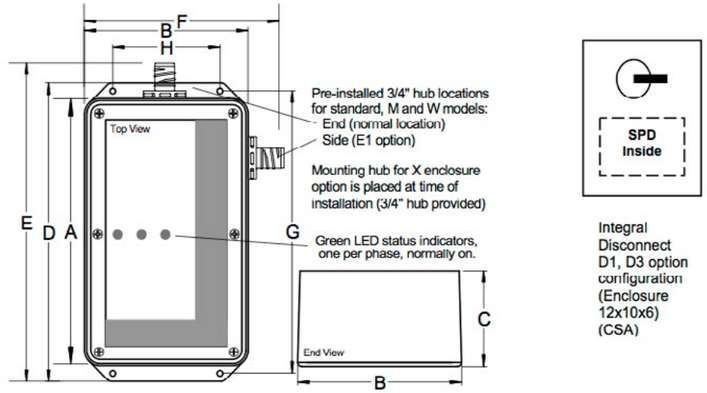
AC = Internal Audible Alarm w/ test button, mute switch and red LED
C = Form C dry relay contacts
D1 = Integral, non-fused disconnect switch (TVSS unit mounts inside)
D3 = Same as D1, except no external handle
E1 = Hub on side of enclosure
K = Gasket Kit
LP = Remote LED indicators in individual NEMA 4X housings
M = NEMA 12 Steel Enclosure
P = Flush Mount Plate
R2 = Remote lights on separate circuit board in separate enclosure
S = Surge counter w/ reset button
W = NEMA 4 Steel Enclosure
X = NEMA 4X Composite Enclosure (Box-in-box)
X1 = NEMA 4X Composite Enclosure with Clear Lid (Box-in-box)
X2 = NEMA 1, 2, 3, 3S, 4, 4X and 12 composite enclosure
XS = NEMA 4X Stainless Steel Enclosure

External Accessories: EACS = Externally mounted diagnostic module, combines **AC**, **C**, and **S** options (Also available: **EAC**, **EC**, **ECS**, and **ES**)
Other options may be available upon request.

MECHANICAL (Model Number Ex: ST-SKLC3Y2D3 / Base Model: ST-SKL / SPD type & Nominal Discharge Current (I_n) Rating: A, B, C, D / Voltage Code: 3Y2 / Options Code: D3)

Enclosure Dimensions				
Inches (mm)	Standard Model	Enclosure Options		
		M	W	X, X1
A	8.25 (210)	10.00 (254)	10.00 (254)	12.00 (305)
B	5.00 (127)	8.00 (204)	8.00 (204)	10.50 (267)
C	3.00 (77)	4.00 (102)	4.00 (102)	6.00 (153)
D	9.37 (238)	11.50 (293)	11.50 (293)	12.50 (318)
E	9.48 (242)	12.00 (305)	12.00 (305)	13.23 (337)
F	6.23 (159)	9.00 (229)	9.00 (229)	11.73 (299)
G	8.87 (226)	10.75 (274)	10.75 (274)	12.00 (305)
H	3.37 (86)	6.00 (153)	6.00 (153)	8.00 (204)
Type	NEMA 1 ABS	NEMA 12 Steel	NEMA 4 Steel	NEMA 4X Composite
lbs. (kg)	5 (2.27)	14 (6.36)	14 (6.36)	11 (4.99)

Flush mount trim plate available for standard and “M” option models.



Circuit Connection: #10 AWG wire (pre-installed)

Voltage Code	ANSI/UL 1449-2006 (Third Edition) Voltage Protection Rating (VPR)						
	L-N	HL-N	L-G	HL-G	N-G	L-L	HL-L
1S1	500	-	500	-	500	1000	-
3Y1	500	-	500	-	500	1000	-
3D1	500	1000	500	1000	500	1000	1000
3Y2	1000	-	1000	-	1200	1800	-
3N2	-	-	1000	-	-	1000	-
3N4	-	-	1800	-	-	1800	-

MEASURED LIMITING VOLTAGE PERFORMANCE AND ELECTRICAL SPECIFICATIONS

Voltage Code	Circuit Type	Peak Surge Current	MCOV	ANSI/IEEE C62.41.1™-2002, C62.41.2™-2002, C62.45™-2002, and C62.62™-2010 Measured Limiting Voltages (tested with 6 inches of lead length external to the enclosure per Clauses 6.1.1 of C62.62™-2010 and 37.4.4 of ANSI/UL 1449-2006)		
				Test Mode	Cat A 30 Ω 100 kHz Ring Wave 6 kV 200 A @ 90° Phase Angle	Category C (High) 10 kA 8/20 Current Driven Test†
1S1	120/240V 1Ø (Split) (3 wire + ground)	40 kA L-N 40 kA L-L 40 kA L-G 40 kA N-G 240 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	296 V 473 V 297 V 578 V	1011 V 1291 V 991 V 1431 V
3Y1	120/208 V 3Ø Wye (4 wire + ground)	40 kA L-N 40 kA L-L 40 kA L-G 40 kA N-G 400 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	296 V 473 V 297 V 578 V	1068 V 1381 V 1048 V 1431 V
3D1	120/240 V 3Ø High- Leg Delta (4 wire + ground)	40 kA L-N 40 kA L-L 40 kA HL-N 40 kA L-G 40 kA HL-G 40 kA N-G 400 kA Total	150 V 320 V 300 V 150 V 320 V 150 V	L-N HL-N L-L L-G HL-G N-G	296 V 443 V 473 V 297 V 450 V 578 V	1091 V 1411 V 1381 V 1076 V 1371 V 1431 V
3Y2	277/480V 3Ø Wye (4 wire + ground)	40 kA L-N 40 kA L-L 40 kA L-G 40 kA N-G 400 kA Total	320 V 550 V 320 V 320 V	L-N L-L L-G N-G	443 V 721 V 450 V 942 V	1334 V 1981 V 1304 V 1721 V
3N2	240 V 3Ø Delta (NN) (3 wire + ground)	40 kA L-L 40 kA L-G 240 kA Total	320 V 320 V	L-L L-G	450 V	1381 V 1304 V
3N4	480V 3Ø Delta (NN) (3 wire + ground)	40 kA L-L 40 kA L-G 240 kA Total	550 V 550 V	L-L L-G	721 V	1981 V 2144 V

Measured Limiting Voltage (MLV) Test Parameters: Positive polarity, Category A: Line power applied, Category C: No line power applied, Voltages are peak (±10%). Measured Limiting Voltages are measured from the insertion point on the sine wave to the peak of the surge for powered tests. Each phase is the average of the modes within that mode of protection. In order to duplicate the results, the specified mode of protection must be tested in all modes (except N-G) and averaged together. (Individual mode or shot results may vary by more than 10%. *Scope Settings: Time Base = 10 microseconds per division, Sampling Rate = 2.5 Gigasamples/sec, Bandwidth = 400 MHz (200 MHz for Cat C), Probes: Tektronix P5100/P6015A. These settings help to assure MLV results are accurate).* **All tests performed with 6" lead length (external to the enclosure), simulating actual installed performance.** The MLVs reported above are certified by Third-Party, Independent Testing. Individual test reports are available upon request.
†Category C High, 10 kA is equivalent to the MLV recorded during the Nominal Discharge Current (I_n) Test from C62.62™-2010 and ANSI/UL 1449-2006.
**Other voltage configurations may be available. Contact your sales representative for additional assistance.*

ST-SDLx

180kA Per Phase
ANSI/UL 1449-2006 3rd Edition

A=Type 2 SPD, I_n = 10kA
B=Type 2 SPD, I_n = 20kA
C=Type 1 SPD, I_n = 10kA
D=Type 1 SPD, I_n = 20kA

* Based on 3 Phase Wye, 4 Wire and Ground I_n = Nominal Discharge Current per ANSI/UL 1449-2006

KEY FEATURES

Discrete “All Mode” Circuitry: Directly Connected Protection Elements in “All Modes” (10 modes for 3 phase Wye circuits) as recommended by IEEE Std. 1100-2005

Industry Leading Measured Limiting Voltage (let-through) Performance

UL 1283 EMI/RFI Parallel Configured

Local & Remote Diagnostics

Independent Verification of Performance and Safety

No moving parts or springs - No mechanical or electro-mechanical thermal/ over-current protection

Patent Pending, Internal, Circuit Board Mounted, Over-Current Fusing

GENERAL

Application
The ST-SDLA series is one of the most versatile units in our product line. This device is intended for general load applications at locations ranging from individual equipment disconnect to small service entrances. It is extremely effective in limiting internally generated transients when used on lighting or HVAC panels.

Warranty
25 Years Unlimited Free Replacement

IEEE –C62.41.1 & C62.41.2-2002 environments
Suitable for Categories: A, B & C (Most Severe Electrical Environments)

IEC Environments
Suitable for use in IEC 61643-11 environments

Circuit Topology
Parallel configured circuit design incorporating component-level, thermal fusing and circuit board mounted, Patented internal over-current fusing methodology with discrete “All Mode” protection (10 modes for 3 phase Wye units). All protection circuits are encapsulated in our high-dielectric compound to promote long component life and protection from the weather and vibration.

Protection Modes
ndustry-best practice of dedicated protection components for all operational modes of the electrical system. Discrete L-N, L-L (Normal Mode) and L-G, N-G (Common Mode) Example: Directly Connected Protection Elements in All 10 modes for a 3 phase, 4 wire, Wye system, (i.e. 3 L-N modes, 3 L-L modes, 3 L-G modes and 1 N-G mode).

Input Power
50-400 Hz (60 Hz nominal)

Temperature Rating
Up to 80°C

Insertion Loss Data (L-N)

Frequency	280 kHz	1 MHz	Max Attenuation & Freq.
Attenuation	3 dB	17 dB	40 dB @ 135 kHz

Standard Enclosure
NEMA 1 Rated Standard Enclosure (Other enclosure options available)

Nominal Discharge Current (I_n) Rating
20 kA (ST-SDLB, ST-SDLD) 10 kA (ST- SDLC, ST-SDLA)

Diagnostics
Green LED’s, one per phase, normally on. A wide range of optional diagnostics is available.

Circuit Interrupt
Internal component-level, thermal fusing and patented circuit board mounted, over-current fusing. No external over-current protection required.

UL Short Circuit Current Rating
200 kAIC

Product Qualifications
Listed to ANSI/UL 1449-2006 3rd Edition by UL (E340498), CSA (MC#241804);
UL1283* and CE Compliant (*Type 2 SPDs only)
ISO 9001-2008 Certified Manufacturing Facility
2004/2006 TVSS Customer Value Enhancement Award from Frost & Sullivan

OPTIONS

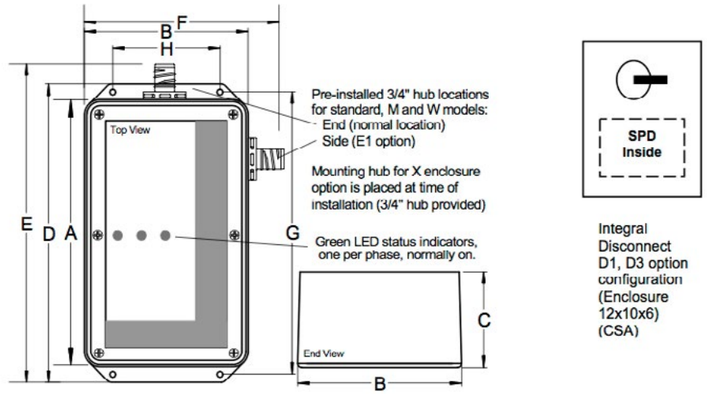
AC = Internal Audible Alarm w/ test button, mute switch and red LED
C = Form C dry relay contacts
D1 = Integral, non-fused disconnect switch (TVSS unit mounts inside)
D3 = Same as D1, except no external handle
E1 = Hub on side of enclosure
K = Gasket Kit
LP = Remote LED indicators in individual NEMA 4X housings
M = NEMA 12 Steel Enclosure
P = Flush Mount Plate
R2 = Remote lights on separate circuit board in separate enclosure
S = Surge counter w/ reset button
W = NEMA 4 Steel Enclosure
X = NEMA 4X Composite Enclosure (Box-in-box)
X1 = NEMA 4X Composite Enclosure with Clear Lid (Box-in-box)
X2 = NEMA 1, 2, 3, 3S, 4, 4X and 12 composite enclosure
XS = NEMA 4X Stainless Steel Enclosure

External Accessories: EACS = Externally mounted diagnostic module, combines **AC**, **C**, and **S** options (Also available: **EAC**, **EC**, **ECS**, and **ES**)
Other options may be available upon request.

MECHANICAL (Model Number Ex: ST-SDLC3Y2D3/ Base Model: ST-SDL / SPD type & Nominal Discharge Current (I_n) Rating: A, B, C, D / Voltage Code: 3Y2 / Options Code: D3)

Enclosure Dimensions				
Inches (mm)	Standard Model	Enclosure Options		
		M	W	X, X1
A	8.25 (210)	10.00 (254)	10.00 (254)	12.00 (305)
B	5.00 (127)	8.00 (204)	8.00 (204)	10.50 (267)
C	3.00 (77)	4.00 (102)	4.00 (102)	6.00 (153)
D	9.37 (238)	11.50 (293)	11.50 (293)	12.50 (318)
E	9.48 (242)	12.00 (305)	12.00 (305)	13.23 (337)
F	6.23 (159)	9.00 (229)	9.00 (229)	11.73 (299)
G	8.87 (226)	10.75 (274)	10.75 (274)	12.00 (305)
H	3.37 (86)	6.00 (153)	6.00 (153)	8.00 (204)
Type	NEMA 1 ABS	NEMA 12 Steel	NEMA 4 Steel	NEMA 4X Composite
lbs. (kg)	5 (2.27)	14 (6.36)	14 (6.36)	11 (4.99)

Flush mount trim plate available for standard and “M” option models.



Circuit Connection: #10 AWG wire (pre-installed)

Voltage Code	ANSI/UL 1449-2006 (Third Edition) Voltage Protection Rating (VPR)						
	L-N	HL-N	L-G	HL-G	N-G	L-L	HL-L
1S1	500	-	500	-	500	1000	-
3Y1	500	-	500	-	500	1000	-
3D1	500	1000	500	1000	500	1000	1000
3Y2	1000	-	1000	-	1200	1800	-
3N2	-	-	1000	-	-	1000	-
3N4	-	-	1800	-	-	1800	-

MEASURED LIMITING VOLTAGE PERFORMANCE AND ELECTRICAL SPECIFICATIONS

Voltage Code	Circuit Type	Peak Surge Current	MCOV	ANSI/IEEE C62.41.1™-2002, C62.41.2™-2002, C62.45™-2002, and C62.62™-2010 Measured Limiting Voltages (tested with 6 inches of lead length external to the enclosure per Clauses 6.1.1 of C62.62™-2010 and 37.4.4 of ANSI/UL 1449-2006)		
				Test Mode	Cat A 30 Ω 100 kHz Ring Wave 6 kV 200 A @ 90° Phase Angle	Category C (High) 10 kA 8/20 Current Driven Test†
1S1	120/240V 1Ø (Split) (3 wire + ground)	60 kA L-N 60 kA L-L 60 kA L-G 60 kA N-G 360 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	296 V 473 V 297 V 578 V	1011 V 1291 V 991 V 1431 V
3Y1	120/208 V 3Ø Wye (4 wire + ground)	60 kA L-N 60 kA L-L 60 kA L-G 60 kA N-G 600 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	296 V 473 V 297 V 578 V	1068 V 1381 V 1048 V 1431 V
3D1	120/240 V 3Ø High- Leg Delta (4 wire + ground)	60 kA L-N 60 kA L-L 60 kA HL-N 60 kA L-G 60 kA HL-G 60 kA N-G 600 kA Total	150 V 320 V 300 V 150 V 320 V 150 V	L-N HL-N L-L L-G HL-G N-G	296 V 443 V 473 V 297 V 450 V 578 V	1091 V 1411 V 1381 V 1076 V 1371 V 1431 V
3Y2	277/480V 3Ø Wye (4 wire + ground)	60 kA L-N 60 kA L-L 60 kA L-G 60 kA N-G 600 kA Total	320 V 550 V 320 V 320 V	L-N L-L L-G N-G	443 V 721 V 450 V 942 V	1334 V 1981 V 1304 V 1721 V
3N2	240 V 3Ø Delta (NN) (3 wire + ground)	60 kA L-L 60 kA L-G 360 kA Total	320 V 320 V	L-L L-G	450 V	1381 V 1304 V
3N4	480V 3Ø Delta (NN) (3 wire + ground)	60 kA L-L 60 kA L-G 360 kA Total	550 V 550 V	L-L L-G	721 V	1981 V 2144 V

Measured Limiting Voltage (MLV) Test Parameters: Positive polarity, Category A: Line power applied, Category C: No line power applied, Voltages are peak (±10%). Measured Limiting Voltages are measured from the insertion point on the sine wave to the peak of the surge for powered tests. Each phase is the average of the modes within that mode of protection. In order to duplicate the results, the specified mode of protection must be tested in all modes (except N-G) and averaged together. (Individual mode or shot results may vary by more than 10%. *Scope Settings: Time Base = 10 microseconds per division, Sampling Rate = 2.5 Gigasamples/sec, Bandwidth = 400 MHz (200 MHz for Cat C), Probes: Tektronix P5100/P6015A. These settings help to assure MLV results are accurate).* **All tests performed with 6" lead length (external to the enclosure), simulating actual installed performance.** The MLVs reported above are certified by Third-Party, Independent Testing. Individual test reports are available upon request.
†Category C High, 10 kA is equivalent to the MLV recorded during the Nominal Discharge Current (I_n) Test from C62.62™-2010 and ANSI/UL 1449-2006.
**Other voltage configurations may be available. Contact your sales representative for additional assistance.*

ST-LSEx

240kA Per Phase
ANSI/UL 1449-2006 3rd Edition

A=Type 2 SPD, I_n = 10kA
B=Type 2 SPD, I_n = 20kA
C=Type 1 SPD, I_n = 10kA
D=Type 1 SPD, I_n = 20kA

* Based on 3 Phase Wye, 4 Wire and Ground I_n = Nominal Discharge Current per ANSI/UL 1449-2006

KEY FEATURES

Discrete “All Mode” Circuitry: Directly Connected Protection Elements in “All Modes” (10 modes for 3 phase Wye circuits) as recommended by IEEE Std. 1100-2005

Industry Leading Measured Limiting Voltage (let-through) Performance

Local & Remote Diagnostics

Independent Verification of Performance and Safety

No moving parts or springs - No mechanical or electro-mechanical thermal/ over-current protection

Component-Level, Thermal Fusing

Patent Pending, Internal, Circuit Board Mounted, Over-Current Fusing

GENERAL

Application
The ST-LSEx series is one of the most versatile units in our product line. This device is intended for general load applications at locations ranging from individual equipment disconnects to service entrances. It is extremely effective in limiting internally generated transients when used on lighting or HVAC panels.

Warranty
25 Years Unlimited Free Replacement

IEEE –C62.41.1 & C62.41.2-2002 environments
Suitable for Categories: A, B & C (Most Severe Electrical Environments)

IEC Environments
Suitable for use in IEC 61643-11 environments

Circuit Topology
Parallel configured combination Voltage Responsive Circuitry circuit design incorporating component-level, thermal fusing and circuit board mounted, Patented internal over-current fusing methodology with discrete “All Mode” protection (10 modes for 3 phase Wye units). All protection circuits are encapsulated in our high-dielectric compound to promote long component life and protection from the weather and vibration.

Protection Modes
Industry-best practice of dedicated protection components for all operational modes of the electrical system. Discrete L-N, L-L (Normal Mode) and L-G, N-G (Common Mode) Example: Directly Connected Protection Elements in All 10 modes for a 3 phase, 4 wire, Wye system, (i.e. 3 L-N modes, 3 L-L modes, 3 L-G modes and 1 N-G mode).

Input Power
50-400 Hz (60 Hz nominal)

Temperature Rating
Up to 80°C

Insertion Loss Data (L-N)

Frequency	280 kHz	1 MHz	Max Attenuation & Freq.
Attenuation	3 dB	17 dB	40 dB @ 135 kHz

Standard Enclosure
NEMA 1 Rated Standard Enclosure (Other enclosure options available)

Nominal Discharge Current (I_n) Rating
20 kA (ST-LSEB, ST-LSED) 10 kA (ST- LSEC, ST-LSEA)

Diagnostics
Green LED’s, one per phase, normally on. A wide range of optional diagnostics is available.

Circuit Interrupt
Internal component-level, thermal fusing and patented circuit board mounted, over-current fusing. No external over-current protection required.

UL Short Circuit Current Rating
200 kAIC

Product Qualifications
Listed to ANSI/UL 1449-2006 3rd Edition by UL (E340498), CSA (MC#241804);
UL1283* and CE Compliant (*Type 2 SPDs only)
ISO 9001-2008 Certified Manufacturing Facility
2004/2006 TVSS Customer Value Enhancement Award from Frost & Sullivan

OPTIONS

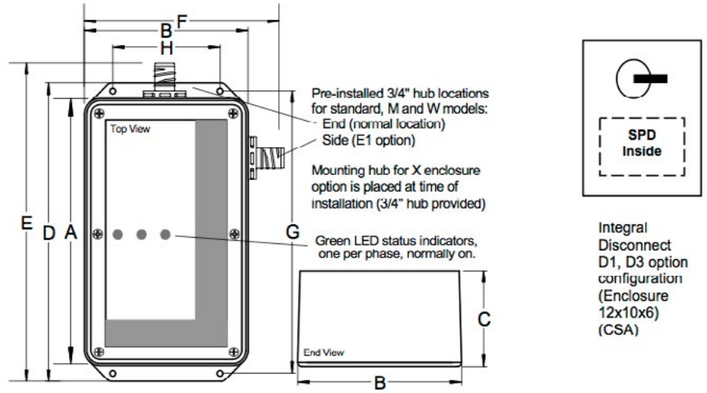
AC = Internal Audible Alarm w/ test button, mute switch and red LED
C = Form C dry relay contacts
D1 = Integral, non-fused disconnect switch (TVSS unit mounts inside)
D3 = Same as D1, except no external handle
E1 = Hub on side of enclosure
K = Gasket Kit
LP = Remote LED indicators in individual NEMA 4X housings
M = NEMA 12 Steel Enclosure
P = Flush Mount Plate
R2 = Remote lights on separate circuit board in separate enclosure
S = Surge counter w/ reset button
W = NEMA 4 Steel Enclosure
X = NEMA 4X Composite Enclosure (Box-in-box)
X1 = NEMA 4X Composite Enclosure with Clear Lid (Box-in-box)
X2 = NEMA 1, 2, 3, 3S, 4, 4X and 12 composite enclosure
XS = NEMA 4X Stainless Steel Enclosure

External Accessories: EACS = Externally mounted diagnostic module, combines **AC**, **C**, and **S** options (Also available: **EAC**, **EC**, **ECS**, and **ES**)
Other options may be available upon request.

MECHANICAL (Model Number Ex: ST-LSEC3Y2D3 / Base Model: ST-LSE / SPD type & Nominal Discharge Current (I_n) Rating: A, B, C, D / Voltage Code: 3Y2 / Options Code: D3)

Enclosure Dimensions				
Inches (mm)	Standard Model	Enclosure Options		
		M	W	X
A	8.25 (210)	10.00 (254)	10.00 (254)	12.00 (305)
B	5.00 (127)	8.00 (204)	8.00 (204)	10.50 (267)
C	3.00 (77)	4.00 (102)	4.00 (102)	6.00 (153)
D	9.37 (238)	11.50 (293)	11.50 (293)	12.50 (318)
E	9.48 (242)	12.00 (305)	12.00 (305)	13.23 (337)
F	6.23 (159)	9.00 (229)	9.00 (229)	11.73 (299)
G	8.87 (226)	10.75 (274)	10.75 (274)	12.00 (305)
H	3.37 (86)	6.00 (153)	6.00 (153)	8.00 (204)
Type	NEMA 1 ABS	NEMA 12 Steel	NEMA 4 Steel	NEMA 4X Composite
lbs. (kg)	5 (2.27)	14 (6.36)	14 (6.36)	11 (4.99)

Flush mount trim plate available for standard and “M” option models.



Circuit Connection: #10 AWG wire (pre-installed)

Voltage Code	ANSI/UL 1449-2006 (Third Edition) Voltage Protection Rating (VPR)						
	L-N	HL-N	L-G	HL-G	N-G	L-L	HL-L
1S1	500	-	500	-	500	1000	-
3Y1	500	-	500	-	500	1000	-
3D1	500	1000	500	1000	500	1000	1000
3Y2	1000	-	1000	-	1200	1800	-
3N2	-	-	1000	-	-	1000	-
3N4	-	-	1800	-	-	1800	-

MEASURED LIMITING VOLTAGE PERFORMANCE AND ELECTRICAL SPECIFICATIONS

Voltage Code	Circuit Type	Peak Surge Current	MCOV	ANSI/IEEE C62.41.1™-2002, C62.41.2™-2002, C62.45™-2002, and C62.62™-2010 Measured Limiting Voltages (tested with 6 inches of lead length external to the enclosure per Clauses 6.1.1 of C62.62™-2010 and 37.4.4 of ANSI/UL 1449-2006)		
				Test Mode	Cat A 30 Ω 100 kHz Ring Wave 6 kV 200 A @ 90° Phase Angle	Category C (High) 10 kA 8/20 Current Driven Test†
1S1	120/240V 1Ø (Split) (3 wire + ground)	80 kA L-N 80 kA L-L 80 kA L-G 80 kA N-G 480 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	289 V 436 V 296 V 570 V	1011 V 1291 V 991 V 1431 V
3Y1	120/208 V 3Ø Wye (4 wire + ground)	80 kA L-N 80 kA L-L 80 kA L-G 80 kA N-G 800 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	289 V 436 V 296 V 570 V	1068 V 1381 V 1048 V 1431 V
3D1	120/240 V 3Ø High- Leg Delta (4 wire + ground)	80 kA L-N 80 kA L-L 80 kA HL-N 80 kA L-G 80 kA HL-G 80 kA N-G 800 kA Total	150 V 320 V 300 V 150 V 320 V 150 V	L-N HL-N L-L L-G HL-G N-G	289 V 410 V 436 V 296 V 420 V 570 V	1091 V 1411 V 1381 V 1076 V 1371 V 1431 V
3Y2	277/480V 3Ø Wye (4 wire + ground)	80 kA L-N 80 kA L-L 80 kA L-G 80 kA N-G 800 kA Total	320 V 550 V 320 V 320 V	L-N L-L L-G N-G	410 V 686 V 420 V 806 V	1334 V 1981 V 1304 V 1721 V
3N2	240 V 3Ø Delta (NN) (3 wire + ground)	80 kA L-L 80 kA L-G 480 kA Total	320 V 320 V	L-L L-G	420 V	1381 V 1304 V
3N4	480V 3Ø Delta (NN) (3 wire + ground)	80 kA L-L 80 kA L-G 480 kA Total	550 V 550 V	L-L L-G	686 V	1981 V 2144 V

Measured Limiting Voltage (MLV) Test Parameters: Positive polarity, Category A: Line power applied, Category C: No line power applied, Voltages are peak (±10%). Measured Limiting Voltages are measured from the insertion point on the sine wave to the peak of the surge for powered tests. Each phase is the average of the modes within that mode of protection. In order to duplicate the results, the specified mode of protection must be tested in all modes (except N-G) and averaged together. (Individual mode or shot results may vary by more than 10%. *Scope Settings: Time Base = 10 microseconds per division, Sampling Rate = 2.5 Gigasamples/sec, Bandwidth = 400 MHz (200 MHz for Cat C), Probes: Tektronix P5100/P6015A. These settings help to assure MLV results are accurate).* **All tests performed with 6" lead length (external to the enclosure), simulating actual installed performance.** The MLVs reported above are certified by Third-Party, Independent Testing. Individual test reports are available upon request.
†Category C High, 10 kA is equivalent to the MLV recorded during the Nominal Discharge Current (I_n) Test from C62.62™-2010 and ANSI/UL 1449-2006.
**Other voltage configurations may be available. Contact your sales representative for additional assistance.*

ST-SMLx

300kA Per Phase
ANSI/UL 1449-2006 3rd Edition

A=Type 2 SPD, I_n = 10kA
B=Type 2 SPD, I_n = 20kA
C=Type 1 SPD, I_n = 10kA
D=Type 1 SPD, I_n = 20kA

* Based on 3 Phase Wye, 4 Wire and Ground I_n = Nominal Discharge Current per ANSI/UL 1449-2006

KEY FEATURES

Discrete “All Mode” Circuitry: Directly Connected Protection Elements in “All Modes” (10 modes for 3 phase Wye circuits) as recommended by IEEE Std. 1100-2005

Industry Leading Measured Limiting Voltage (let-through) Performance

Local & Remote Diagnostics

Independent Verification of Performance and Safety

No moving parts or springs - No mechanical or electro-mechanical thermal/ over-current protection

Component-Level, Thermal Fusing

Patent Pending, Internal, Circuit Board Mounted, Over-Current Fusing

GENERAL

Application
The ST-SMLx series was developed to answer a broad variety of demands from our customers. This device is robust enough to handle the punishment of service entrance applications while providing protection from transients that are generated inside the facility. The constant bombardment of this combination of transients can damage valuable equipment and waste budget dollars.

Warranty
25 Years Unlimited Free Replacement

IEEE –C62.41.1 & C62.41.2-2002 environments
Suitable for Categories: A, B & C (Most Severe Electrical Environments)

IEC Environments
Suitable for use in IEC 61643-11 environments

Circuit Topology
Parallel configured Voltage Responsive Circuitry circuit design incorporating component-level, thermal fusing and circuit board mounted, Patented internal over-current fusing methodology with discrete “All Mode” protection (10 modes for 3 phase Wye units). All protection circuits are encapsulated in our high- dielectric compound to promote long component life and protection from the weather and vibration.

Protection Modes
Industry-best practice of dedicated protection components for all operational modes of the electrical system. Discrete L-N, L-L (Normal Mode) and L-G, N-G (Common Mode) Example: Directly Connected Protection Elements in All 10 modes for a 3 phase, 4 wire, Wye system, (i.e. 3 L-N modes, 3 L-L modes, 3 L-G modes and 1 N-G mode).

Input Power
50-400 Hz (60 Hz nominal)

Temperature Rating
Up to 80°C

Insertion Loss Data (L-N)

Frequency	280 kHz	1 MHz	Max Attenuation & Freq.
Attenuation	3 dB	17 dB	40 dB @ 135 kHz

Standard Enclosure
NEMA 1 Rated Standard Enclosure (Other enclosure options available)

Nominal Discharge Current (I_n) Rating
20 kA (ST-SMLB, ST-SMLD) 10 kA (ST- SMLC, ST-SMLA)

Diagnostics
Green LED’s, one per phase, normally on. A wide range of optional diagnostics is available.

Circuit Interrupt
Internal component-level, thermal fusing and patented circuit board mounted, over-current fusing. No external over-current protection required.

UL Short Circuit Current Rating
200 kAIC

Product Qualifications
Listed to ANSI/UL 1449-2006 3rd Edition by UL (E340498), CSA (MC#241804);
UL1283* and CE Compliant (*Type 2 SPDs only)
ISO 9001-2008 Certified Manufacturing Facility
2004/2006 TVSS Customer Value Enhancement Award from Frost & Sullivan

OPTIONS

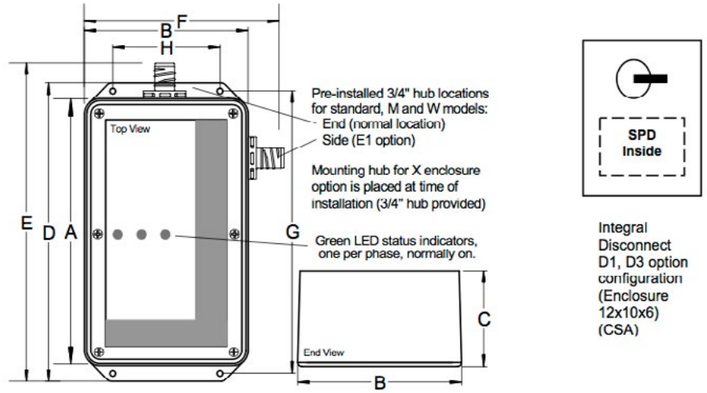
AC = Internal Audible Alarm w/ test button, mute switch and red LED
C = Form C dry relay contacts
D1 = Integral, non-fused disconnect switch (TVSS unit mounts inside)
D3 = Same as D1, except no external handle
E1 = Hub on side of enclosure
K = Gasket Kit
LP = Remote LED indicators in individual NEMA 4X housings
M = NEMA 12 Steel Enclosure
P = Flush Mount Plate
R2 = Remote lights on separate circuit board in separate enclosure
S = Surge counter w/ reset button
W = NEMA 4 Steel Enclosure
X = NEMA 4X Composite Enclosure (Box-in-box)
X1 = NEMA 4X Composite Enclosure with Clear Lid (Box-in-box)
X2 = NEMA 1, 2, 3, 3S, 4, 4X and 12 composite enclosure
XS = NEMA 4X Stainless Steel Enclosure

External Accessories: EACS = Externally mounted diagnostic module, combines **AC**, **C**, and **S** options (Also available: **EAC**, **EC**, **ECS**, and **ES**)
Other options may be available upon request.

MECHANICAL (Model Number Ex: ST-SMLC3Y2D3 / Base Model: ST-SML / SPD type & Nominal Discharge Current (I_n) Rating: A, B, C, D / Voltage Code: 3Y2 / Options Code: D3)

Enclosure Dimensions				
Inches (mm)	Standard Model	Enclosure Options		
		M	W	X,X1
A	8.25 (210)	10.00 (254)	10.00 (254)	12.00 (305)
B	5.00 (127)	8.00 (204)	8.00 (204)	10.50 (267)
C	3.00 (77)	4.00 (102)	4.00 (102)	6.00 (153)
D	9.37 (238)	11.50 (293)	11.50 (293)	12.50 (318)
E	9.48 (242)	12.00 (305)	12.00 (305)	13.23 (337)
F	6.23 (159)	9.00 (229)	9.00 (229)	11.73 (299)
G	8.87 (226)	10.75 (274)	10.75 (274)	12.00 (305)
H	3.37 (86)	6.00 (153)	6.00 (153)	8.00 (204)
Type	NEMA 1 ABS	NEMA 12 Steel	NEMA 4 Steel	NEMA 4X Composite
lbs. (kg)	5 (2.27)	14 (6.36)	14 (6.36)	11 (4.99)

Flush mount trim plate available for standard and “M” option models.



Circuit Connection: #10 AWG wire (pre-installed)

Voltage Code	ANSI/UL 1449-2006 (Third Edition) Voltage Protection Rating (VPR)						
	L-N	HL-N	L-G	HL-G	N-G	L-L	HL-L
1S1	500	-	500	-	500	1000	-
3Y1	500	-	500	-	500	1000	-
3D1	500	1000	500	1000	500	1000	1000
3Y2	1000	-	1000	-	1200	1800	-
3N2	-	-	1000	-	-	1000	-
3N4	-	-	1800	-	-	1800	-

MEASURED LIMITING VOLTAGE PERFORMANCE AND ELECTRICAL SPECIFICATIONS

Voltage Code	Circuit Type	Peak Surge Current	MCOV	ANSI/IEEE C62.41.1™-2002, C62.41.2™-2002, C62.45™-2002, and C62.62™-2010 Measured Limiting Voltages (tested with 6 inches of lead length external to the enclosure per Clauses 6.1.1 of C62.62™-2010 and 37.4.4 of ANSI/UL 1449-2006)		
				Test Mode	Cat A 30 Ω 100 kHz Ring Wave 6 kV 200 A @ 90° Phase Angle	Category C (High) 10 kA 8/20 Current Driven Test†
1S1	120/240V 1Ø (Split) (3 wire + ground)	100 kA L-N 100 kA L-L 100 kA L-G 100 kA N-G 600 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	289 V 436 V 296 V 570 V	1011 V 1291 V 991 V 1431 V
3Y1	120/208 V 3Ø Wye (4 wire + ground)	100 kA L-N 100 kA L-L 100 kA L-G 100 kA N-G 1000 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	289 V 436 V 296 V 570 V	1068 V 1381 V 1048 V 1431 V
3D1	120/240 V 3Ø High- Leg Delta (4 wire + ground)	100 kA L-N 100 kA L-L 100 kA HL-N 100 kA L-G 100 kA HL-G 100 kA N-G 1000 kA Total	150 V 320 V 300 V 150 V 320 V 150 V	L-N HL-N L-L L-G HL-G N-G	289 V 410 V 436 V 296 V 420 V 570 V	1091 V 1411 V 1381 V 1076 V 1371 V 1431 V
3Y2	277/480V 3Ø Wye (4 wire + ground)	100 kA L-N 100 kA L-L 100 kA L-G 100 kA N-G 1000 kA Total	320 V 550 V 320 V 320 V	L-N L-L L-G N-G	410 V 686 V 420 V 806 V	1334 V 1981 V 1304 V 1721 V
3N2	240 V 3Ø Delta (NN) (3 wire + ground)	100 kA L-L 100 kA L-G 600 kA Total	320 V 320 V	L-L L-G	420 V	1381 V 1304 V
3N4	480V 3Ø Delta (NN) (3 wire + ground)	100 kA L-L 100 kA L-G 600 kA Total	550 V 550 V	L-L L-G	686 V	1981 V 2144 V

Measured Limiting Voltage (MLV) Test Parameters: Positive polarity, Category A: Line power applied, Category C: No line power applied, Voltages are peak (±10%). Measured Limiting Voltages are measured from the insertion point on the sine wave to the peak of the surge for powered tests. Each phase is the average of the modes within that mode of protection. In order to duplicate the results, the specified mode of protection must be tested in all modes (except N-G) and averaged together. (Individual mode or shot results may vary by more than 10%. *Scope Settings: Time Base = 10 microseconds per division, Sampling Rate = 2.5 Gigasamples/sec, Bandwidth = 400 MHz (200 MHz for Cat C), Probes: Tektronix P5100/P6015A. These settings help to assure MLV results are accurate).* **All tests performed with 6" lead length (external to the enclosure), simulating actual installed performance.** The MLVs reported above are certified by Third-Party, Independent Testing. Individual test reports are available upon request.
†Category C High, 10 kA is equivalent to the MLV recorded during the Nominal Discharge Current (I_n) Test from C62.62™-2010 and ANSI/UL 1449-2006.
**Other voltage configurations may be available. Contact your sales representative for additional assistance.*

ST-SILxM

360kA Per Phase

* Based on 3 Phase Wye, 4 Wire and Ground

KEY FEATURES

Discrete “All Mode” Circuitry: Directly Connected Protection Elements in “All Modes” (10 modes for 3 phase Wye circuits) as recommended by NEMA LS-1 and IEEE Std. 1100-2005

Industry Leading Measured Limiting Voltage (let-through) Performance

UL 1283 Listed EMI/RFI Parallel Configured Optimal Response Circuitry™

Local & Remote Diagnostics

Independent Verification of Performance and Safety

No moving parts or springs - No mechanical or electro-mechanical thermal/ over-current protection

Rated as Type 1 or Type 2 SPD

Component-Level, Thermal Fusing

Patent Pending, Internal, Circuit Board Mounted, Over-Current Fusing

GENERAL

Application
The ST-SILxM series was developed to answer a broad variety of demands from our customers. This device is robust enough to handle the punishment of service entrance applications while providing protection from transients that are generated inside the facility. The constant bombardment of these combination transients damages valuable equipment and wastes budget dollars.

Warranty
25 Years Unlimited Free Replacement

IEEE –C62.41.1 & C62.41.2-2002 environments
Suitable for Categories: A, B & C (Most Severe Electrical Environments)

IEC Environments
Suitable for use in IEC 61643-11 environments

Circuit Topology
Parallel configured Optimal Response Circuitry™ circuit design incorporating component-level thermal fusing and Patent Pending internal, circuit board mounted, over-current fusing; and discrete “All Mode” protection (10 modes for 3 phase Wye units). All protection circuits are encapsulated in our high dielectric compound to assure long component life and complete protection from the weather and vibration.

Protection Modes
Industry-best practice of true all mode dedicated protection components for all operational modes of the electrical system. Discrete L-N, L-L (Normal Mode) and L-G, N-G (Common Mode) Example: Directly Connected Protection Elements in All 10 modes for a 3 phase, 4 wire, Wye system, (i.e. 3 L-N modes, 3 L-L modes, 3 L-G modes and 1 N-G mode).

Input Power
50-400 Hz (60 Hz nominal)

Temperature Rating
Up to 80°C

Standard Enclosure
NEMA 12 rated, painted steel enclosure (Other enclosure options available)

SPD Type
Type 1 SPD (SILCM, SILDM)
Type 2 SPD (SILBM, SILAM)

Nominal Discharge Current (I_n) Rating
20 kA (SILBM, SILDM) 10 kA (SILCM, SILAM)

Diagnostics
Green LED’s, one per phase, normally on. A wide range of optional diagnostics is available

Circuit Interrupt
Internal component-level, thermal fusing and patented circuit board mounted, over-current fusing. No external over-current protection required.

UL Short Circuit Current Rating
200 kAIC

Product Qualifications
ANSI/UL 1449-2006 (3rd Edition) by CSA (CSA MC#241804); UL1283* and CE Compliant (* Type 2 SPDs only)
ISO 9001 Certified Manufacturing Facility
2004/2006 TVSS Customer Value Enhancement Award from Frost & Sullivan

OPTIONS

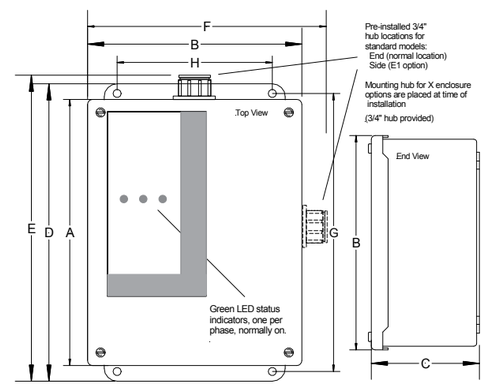
AC = Internal Audible Alarm w/ test button, mute switch and red LED
C = Form C dry relay contacts
D2 = External non-fused disconnect switch (TVSS mounts to outside)
D5 = SIntegral, non-fused disconnect switch (TVSS unit mounts inside)
D6 = Same as D5, except no external handle
E1 = Hub on side of enclosure
LP = Remote LED indicators in individual NEMA 4X housings
P = Flush Mount Plate
R1 = Remote lights on separate circuit board (board only – no enclosure)
R2 = Remote lights on separate circuit board in separate enclosure
S = Surge counter w/ reset button
W = NEMA 4 Steel Enclosure
X = NEMA 4X Composite Fiberglass Enclosure
XS = NEMA 4X Stainless Steel Enclosure

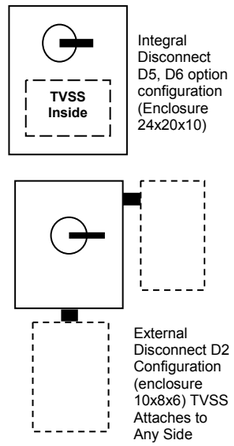
External Accessories: EACS = Externally mounted diagnostic module, combines **AC**, **C**, and **S** options (Also available: **EAC**, **EC**, **ECS**, and **ES**)
Other options may be available upon request. Type 1 SPDs are intended for installation on the line side of the service equipment

MECHANICAL (MODEL NUMBER EX: ST-SILA3Y2D6 / BASE MODEL: ST-SIL / SPD TYPE: A, B, C, D)

Circuit Connection: #10 AWG wire (pre-installed)
Mounting: 3/4” hub (provided) and integrat fee

Enclosure Dimensions			
Inches (mm)	Standard Model	Enclosure Options	
		W	X
A	10.00 (354)	10.00 (354)	16.00 (407)
B	8.00 (204)	8.00 (204)	14.00 (356)
C	4.00 (102)	4.00 (102)	8.00 (204)
D	11.50 (293)	11.50 (293)	12.00 (305)
E	11.98 (305)	11.98 (305)	17.98 (457)
F	9.98 (254)	9.98 (254)	15.98 (406)
G	10.75 (274)	10.75 (274)	16.94 (431)
H	6.00 (153)	6.00 (153)	12.00 (305)
Type	NEMA 12 Steel	NEMA 4 Steel	NEMA 4X Composite
lbs. (kg)	14 (6.36)	14 (6.36)	32 (14.52)





Because we are constantly seeking to improve our products, specifications are subject to change at any time.

Voltage Code	ANSI/UL 1449-2006 (Third Edition) Voltage Protection Rating (VPR)						
	L-N	HL-N	L-G	HL-G	N-G	L-L	HL-L
1S1	500	-	500	-	500	1000	-
3Y1	500	-	500	-	500	1000	-
3D1	500	1000	500	1000	500	1000	1000
3Y2	1000	-	1000	-	1000	1800	-
3N2	-	-	1000	-	-	1000	-
3N4	-	-	1800	-	-	1800	-

MEASURED LIMITING VOLTAGE PERFORMANCE AND ELECTRICAL SPECIFICATIONS

Voltage Code	Circuit Type	MCOV	Peak Surge Current	ANSI/IEEE C62.41.1 & .2-2002 and C62.45-2002 Let-through Voltage Test Results (tested w/6” lead length external to the enclosure per UL 1449)		
				Mode	Cat A 30 Ω 100 kHz Ring Wave 6 kV 200 A @ 90° Phase Angle	Cat C, 2 Ω Combination Wave 20 kV / 10 kA @ 90° Phase Angle
1S1	120/240V 1Ø (Split) (3 wire + ground)	120 kA L-N 120 kA L-L 120 kA L-G 120 kA N-G 720 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	295 V 444 V 287 V 493 V	902 V 1103 V 985 V 1086 V
3Y1	120/208 V 3Ø Wye (4 wire + ground)	120 kA L-N 120 kA L-L 120 kA L-G 120 kA N-G 1,200 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	295 V 444 V 287 V 493 V	902 V 1103 V 985 V 1086 V
3D1	120/240 V 3Ø High- Leg Delta (4 wire + ground)	120 kA L-N 120 kA L-L 120 kA HL-N 120 kA L-G 120 kA HL-G 120 kA N-G 1,200 kA Total	150 V 320 V 300 V 150 V 320 V 150 V	L-N HL-N L-L L-G HL-G N-G	295 V 429 V 444 V 287 V 409 V 493 V	902 V 1066 V 1103 V 985 V 1158 V 1086 V
3Y2	277/480V 3Ø Wye (4 wire + ground)	120 kA L-N 120 kA L-L 120 kA L-G 120 kA N-G 1,200 kA Total	320 V 550 V 320 V 320 V	L-N L-L L-G N-G	429 V 689 V 409 V 833 V	1066 V 1456 V 1158 V 1481 V
3N2	240 V 3Ø Delta (NN) (3 wire + ground)	120 kA L-L 120 kA L-G 720 kA Total	320 V 320 V	L-L L-G	409 V 409 V	1158 V 1158 V
3N4	480V 3Ø Delta (NN) (3 wire + ground)	120 kA L-L 120 kA L-G 720 kA Total	550 V 550 V	L-L L-G	689 V 689 V	1456 V 1456 V

***Measured Limiting Voltage (Let-Through) Test Environment:** Positive Polarity, All voltages are peak (±10%). All tests are static except 150 V MCOV modes. Let-through voltages on static tests calculated by subtracting sinewave peak from let-through measured from zero. 150 V MCOV mode let-through voltages measured from the insertion point on the sinewave. (Scope Settings: Time Base = 20 Microseconds, Sampling Rate = 250 Megasamples/sec. These settings assure Let-through voltages test results are accurate). **All tests performed with 6” lead length (external to the enclosure), simulating actual installed performance.**

ST-SHLxM

480kA Per Phase

* Based on 3 Phase Wye, 4 Wire and Ground

KEY FEATURES

Discrete “All Mode” Circuitry: Directly Connected Protection Elements in “All Modes” (10 modes for 3 phase Wye circuits) as recommended by NEMA LS-1 and IEEE Std. 1100-2005

Industry Leading Measured Limiting Voltage (let-through) Performance

UL 1283 Listed EMI/RFI Parallel Configured Optimal Response Circuitry™

Local & Remote Diagnostics

Independent Verification of Performance and Safety

No moving parts or springs - No mechanical or electro-mechanical thermal/ over-current protection

Rated as Type 1 or Type 2 SPD

Component-Level, Thermal Fusing

Patent Pending, Internal, Circuit Board Mounted, Over-Current Fusing

GENERAL

Application
The ST-SHLxM series was developed to answer a broad variety of demands from our customers. This device is robust enough to handle the punishment of service entrance applications while providing protection from transients that are generated inside the facility. The constant bombardment of these combination transients can damage valuable equipment and waste budget dollars.

Warranty
25 Years Unlimited Free Replacement

IEEE –C62.41.1 & C62.41.2-2002 environments
Suitable for Categories: A, B & C (Most Severe Electrical Environments)

IEC Environments
Suitable for use in IEC 61643-11 environments

Circuit Topology
Parallel configured Optimal Response Circuitry™ circuit design incorporating component-level thermal fusing and Patent Pending internal, circuit board mounted, over-current fusing; and discrete “All Mode” protection (10 modes for 3 phase Wye units). All protection circuits are encapsulated in our high dielectric compound to assure long component life and complete protection from the weather and vibration.

Protection Modes
Industry-best practice of true all mode dedicated protection components for all operational modes of the electrical system. Discrete L-N, L-L (Normal Mode) and L-G, N-G (Common Mode) Example: Directly Connected Protection Elements in All 10 modes for a 3 phase, 4 wire, Wye system, (i.e. 3 L-N modes, 3 L-L modes, 3 L-G modes and 1 N-G mode).

Input Power
50-400 Hz (60 Hz nominal)

Temperature Rating
Up to 80°C

Standard Enclosure
NEMA 12 rated, painted steel enclosure (Other enclosure options available)

SPD Type
Type 1 SPD (SHLCM, SHLDM)
Type 2 SPD (SHLBM, SHLAM)

Nominal Discharge Current (I_n) Rating
20 kA (SHLBM, SHLDM) 10 kA (SHLCM, SHLAM)

Diagnostics
Green LED’s, one per phase, normally on. A wide range of optional diagnostics is available

Circuit Interrupt
Internal component-level, thermal fusing and patented circuit board mounted, over-current fusing. No external over-current protection required.

UL Short Circuit Current Rating
200 kAIC

Product Qualifications
ANSI/UL 1449-2006 (3rd Edition) by CSA (CSA MC#241804); UL1283* and CE Compliant (* Type 2 SPDs only)
ISO 9001 Certified Manufacturing Facility
2004/2006 TVSS Customer Value Enhancement Award from Frost & Sullivan

OPTIONS

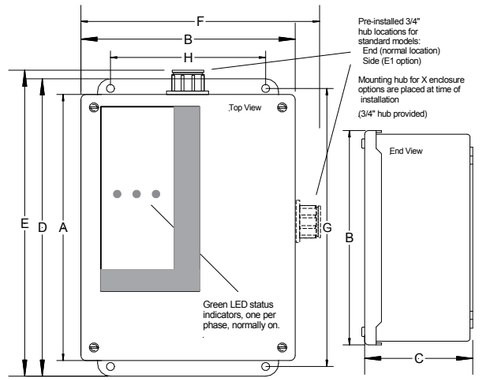
AC = Internal Audible Alarm w/ test button, mute switch and red LED
C = Form C dry relay contacts
D2 = External non-fused disconnect switch (TVSS mounts to outside)
D5 = SIntegral, non-fused disconnect switch (TVSS unit mounts inside)
D6 = Same as D5, except no external handle
E1 = Hub on side of enclosure
LP = Remote LED indicators in individual NEMA 4X housings
P = Flush Mount Plate
R1 = Remote lights on separate circuit board (board only – no enclosure)
R2 = Remote lights on separate circuit board in separate enclosure
S = Surge counter w/ reset button
W = NEMA 4 Steel Enclosure
X = NEMA 4X Composite Fiberglass Enclosure
XS = NEMA 4X Stainless Steel Enclosure

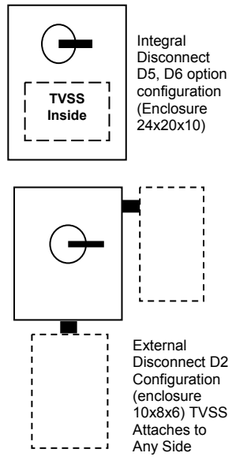
External Accessories: EACS = Externally mounted diagnostic module, combines **AC**, **C**, and **S** options (Also available: **EAC**, **EC**, **ECS**, and **ES**)
Other options may be available upon request. Type 1 SPDs are intended for installation on the line side of the service equipment

MECHANICAL (MODEL NUMBER EX: ST-SHDLA3Y2D6 / BASE MODEL: ST-SHDL / SPD TYPE: A, B, C, D)

Circuit Connection: #10 AWG wire (pre-installed)
Mounting: 3/4” hub (provided) and integrat fee

Enclosure Dimensions			
Inches (mm)	Standard Model	Enclosure Options	
		W	X
A	14.00 (356)	14.00 (356)	18.00 (458)
B	12.00 (305)	12.00 (305)	16.00 (407)
C	6.00 (153)	6.00 (153)	10.00 (254)
D	15.50 (394)	15.50 (394)	19.50 (496)
E	15.98 (406)	15.98 (406)	19.98 (508)
F	13.23 (309)	13.23 (309)	17.23 (411)
G	14.75 (375)	14.75 (375)	18.94 (482)
H	10.00 (254)	10.00 (254)	14.00 (356)
Type	NEMA 12 Steel	NEMA 4 Steel	NEMA 4X Composite
lbs. (kg)	30 (13.61)	30 (13.61)	55 (24.95)





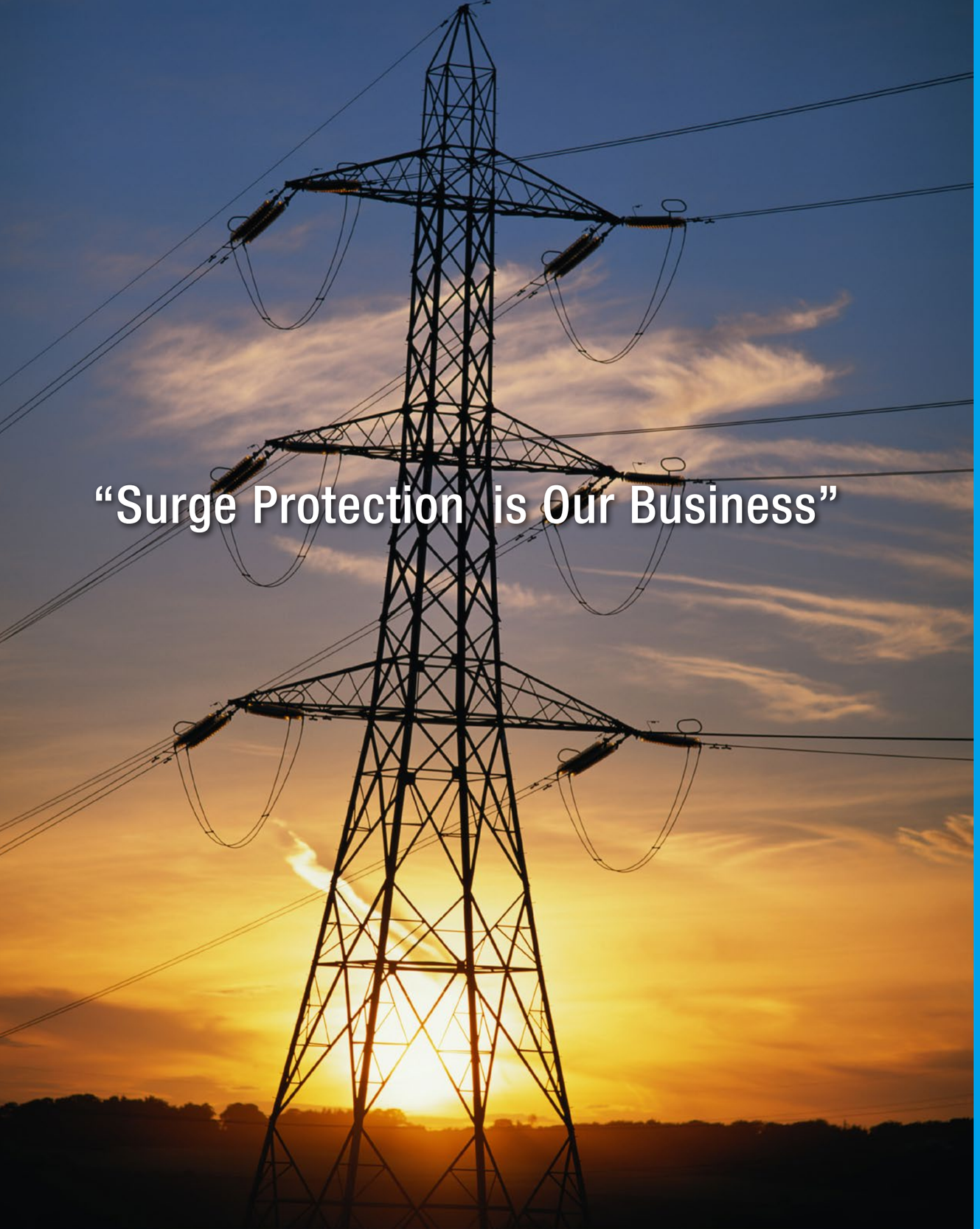
Because we are constantly seeking to improve our products, specifications are subject to change at any time.

Voltage Code	ANSI/UL 1449-2006 (Third Edition) Voltage Protection Rating (VPR)						
	L-N	HL-N	L-G	HL-G	N-G	L-L	HL-L
1S1	500	-	500	-	500	1000	-
3Y1	500	-	500	-	500	1000	-
3D1	500	1000	500	1000	500	1000	1000
3Y2	1000	-	1000	-	1000	1800	-
3N2	-	-	1000	-	-	1000	-
3N4	-	-	1800	-	-	1800	-

MEASURED LIMITING VOLTAGE PERFORMANCE AND ELECTRICAL SPECIFICATIONS

Voltage Code	Circuit Type	MCOV	Peak Surge Current	ANSI/IEEE C62.41.1 & .2-2002 and C62.45-2002 Let-through Voltage Test Results (tested w/6” lead length external to the enclosure per UL 1449)		
				Mode	Cat A 30 Ω 100 kHz Ring Wave 6 kV 200 A @ 90° Phase Angle	Cat C, 2 Ω Combination Wave 20 kV / 10 kA @ 90° Phase Angle
1S1	120/240V 1Ø (Split) (3 wire + ground)	160 kA L-N 160 kA L-L 160 kA L-G 160 kA N-G 960 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	292 V 441 V 296 V 451 V	899 V 1195 V 1058 V 1115 V
3Y1	120/208 V 3Ø Wye (4 wire + ground)	160 kA L-N 160 kA L-L 160 kA L-G 160 kA N-G 1,600 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	292 V 441 V 296 V 451 V	899 V 1195 V 1058 V 1115 V
3D1	120/240 V 3Ø High- Leg Delta (4 wire + ground)	160 kA L-N 160 kA L-L 160 kA HL-N 160 kA L-G 160 kA HL-G 160 kA N-G 1,600 kA Total	150 V 320 V 300 V 150 V 320 V 150 V	L-N HL-N L-L L-G HL-G N-G	292 V 462 V 441 V 296 V 457 V 451 V	899 V 1142 V 1195 V 1085 V 1226 V 1115 V
3Y2	277/480V 3Ø Wye (4 wire + ground)	160 kA L-N 160 kA L-L 160 kA L-G 160 kA N-G 1,600 kA Total	320 V 550 V 320 V 320 V	L-N L-L L-G N-G	462 V 735 V 457 V 796 V	1142 V 1531 V 1226 V 1467 V
3N2	240 V 3Ø Delta (NN) (3 wire + ground)	160 kA L-L 160 kA L-G 960 kA Total	320 V 320 V	L-L L-G	457 V 457 V	1226 V 1226 V
3N4	480V 3Ø Delta (NN) (3 wire + ground)	160 kA L-L 160 kA L-G 960 kA Total	550 V 550 V	L-L L-G	735 V 735 V	1531 V 1531 V

***Measured Limiting Voltage (Let-Through) Test Environment:** Positive Polarity, All voltages are peak (±10%). All tests are static except 150 V MCOV modes. Let-through voltages on static tests calculated by subtracting sinewave peak from let-through measured from zero. 150 V MCOV mode let-through voltages measured from the insertion point on the sinewave. (Scope Settings: Time Base = 20 Microseconds, Sampling Rate = 250 Megasamples/sec. These settings assure Let-through voltages test results are accurate). **All tests performed with 6” lead length (external to the enclosure), simulating actual installed performance.**



TRACKING UNITS

ST-CSLA / ST-CKLA / ST-CDLA / ST-CSEA / ST-CMLA / ST-CILA

Because we are constantly seeking to improve our products, specifications are subject to change at any time.

ST-CSLx

90kA Per Phase
with Sinewave Tracking
ANSI/UL 1449-2006 3rd Edition

A=Type 2 SPD, I_n = 10kA
B=Type 2 SPD, I_n = 20kA

* Based on 3 Phase Wye, 4 Wire and Ground I_n = Nominal Discharge Current per ANSI/UL 1449-2006

KEY FEATURES

Discrete “All Mode” Circuitry: Directly Connected Protection Elements in “All Modes” (10 modes for 3 phase Wye circuits) as recommended by IEEE Std. 1100-2005

Industry Leading Measured Limiting Voltage (let-through) Performance

Multi-stage Hybrid Frequency Attenuation Network

Local & Remote Diagnostics

Independent Verification of Performance and Safety

No moving parts or springs - No mechanical or electro-mechanical thermal/ over-current protection

Component-Level, Thermal Fusing

Patent Pending, Internal, Circuit Board Mounted, Over-Current Fusing

GENERAL

Application
The ST-CSLx series is one of the most versatile and effective devices in our product line. This durable, high performance device is intended for sensitive and critical load applications at main distribution panels, branch panels, motor control centers, and individual equipment disconnects. It is equally effective against externally generated high energy impulses and internally generated switching events.

Warranty
25 Years Unlimited Free Replacement

IEEE –C62.41.1 & C62.41.2-2002 environments
Suitable for Categories: A, B & C (Most Severe Electrical Environments)

IEC Environments
Suitable for use in IEC 61643-11 environments

Circuit Topology
Parallel configured combination Frequency Attenuation Network and Voltage Responsive Circuitry circuit design incorporating component-level, thermal fusing and circuit board mounted, Patented internal over- current fusing methodology with discrete “All Mode” protection (10 modes for 3 phase Wye units). All protection circuits are encapsulated in our high-dielectric compound to promote long component life and protection from the weather and vibration.

Protection Modes
Industry-best practice of dedicated protection components for all operational modes of the electrical system. Discrete L-N, L-L (Normal Mode) and L-G, N-G (Common Mode) Example: Directly Connected Protection Elements in All 10 modes for a 3 phase, 4 wire, Wye system, (i.e. 3 L-N modes, 3 L-L modes, 3 L-G modes and 1 N-G mode).

Input Power
50-60 Hz (60 Hz nominal)

Temperature Rating
Up to 80°C

Insertion Loss Data (L-N)

Frequency	10 kHz	100 kHz	1 MHz	Max Attenuation & Freq.
Attenuation	20 dB	47 dB	26 dB	65 dB @ 135 kHz

Standard Enclosure
NEMA 1 Rated Standard Enclosure (Other enclosure options available)

Nominal Discharge Current (I_n) Rating
(ST-CSLA) 10 kA, (ST-CSLB) 20 kA

Diagnostics
Green LED’s, one per phase, normally on. A wide range of optional diagnostics is available.

Circuit Interrupt
Internal component-level, thermal fusing and patented circuit board mounted, over-current fusing. No external over-current protection required.

Short Circuit Current Rating
200 kAIC

Product Qualifications
Listed to ANSI/UL 1449-2006 3rd Edition by UL (E340498), CSA (MC#241804); UL1283* and CE Compliant
ISO 9001-2008 Certified Manufacturing Facility
2004/2006 TVSS Customer Value Enhancement Award from Frost & Sullivan

OPTIONS

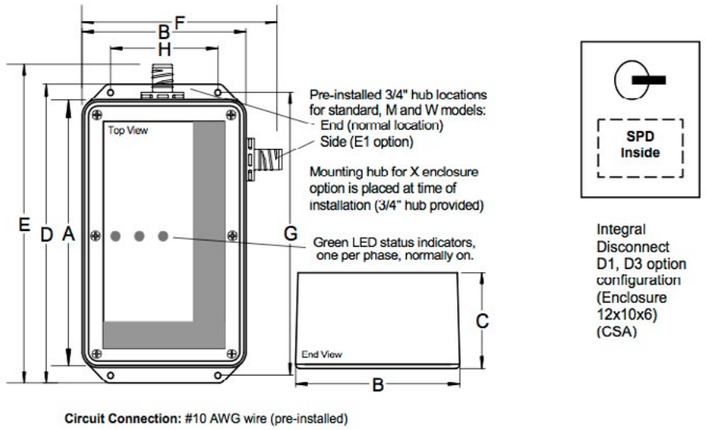
AC = Internal Audible Alarm w/ test button, mute switch and red LED
C = Form C dry relay contacts
D1 = Integral, non-fused disconnect switch (TVSS unit mounts inside)
D3 = Same as D1, except no external handle
E1 = Hub on side of enclosure
K = Gasket Kit
LP = Remote LED indicators in individual NEMA 4X housings
M = NEMA 12 Steel Enclosure
N = Removes neutral to ground Sinewave Tracking Circuit
P = Flush Mount Plate
R2 = Remote lights on separate circuit board in separate enclosure
S = Surge counter w/ reset button
W = NEMA 4 Steel Enclosure
X = NEMA 4X Composite Enclosure (Box-in-box)
X1 = NEMA 4X Composite Enclosure with Clear Lid (Box-in-box)
X2 = NEMA 1, 2, 3, 3S, 4, 4X and 12 composite enclosure
XS = NEMA 4X Stainless Steel Enclosure

External Accessories: EACS = Externally mounted diagnostic module, combines **AC**, **C**, and **S** options (Also available: **EAC**, **EC**, **ECS**, and **ES**)
Other options may be available upon request.

MECHANICAL (Model Number Ex: ST-CSLA3Y2D3 / Base Model: ST-CSL / SPD type & Nominal Discharge Current (I_n) Rating: A, B, C, D / Voltage Code: 3Y2 / Options Code: D3)

Enclosure Dimensions				
Inches (mm)	Standard Model	Enclosure Options		
		M	W	X,X1
A	8.25 (210)	10.00 (254)	10.00 (254)	12.00 (305)
B	5.00 (127)	8.00 (204)	8.00 (204)	10.50 (267)
C	3.00 (77)	4.00 (102)	4.00 (102)	6.00 (153)
D	9.37 (238)	11.50 (293)	11.50 (293)	12.50 (337)
E	9.48 (242)	12.00 (305)	12.00 (305)	13.23 (337)
F	6.23 (159)	9.00 (229)	9.00 (229)	11.73 (299)
G	8.87 (226)	10.75 (274)	10.75 (274)	12.00 (305)
H	3.37 (86)	6.00 (153)	6.00 (153)	8.00 (204)
Type	NEMA 1 ABS	NEMA 12 Steel	NEMA 4 Steel	NEMA 4X Composite
lbs. (kg)	5 (2.27)	14 (6.36)	14 (6.36)	11 (4.99)

Flush mount trim plate available for standard and “M” option models.



Circuit Connection: #10 AWG wire (pre-installed)

Voltage Code	ANSI/UL 1449-2006 (Third Edition) Voltage Protection Rating (VPR)						
	L-N	HL-N	L-G	HL-G	N-G	L-L	HL-L
1S1	500	-	500	-	500	1000	-
3Y1	500	-	500	-	500	1000	-
3D1	500	1000	500	1000	500	1000	1000
3Y2	1000	-	1000	-	1200	1800	-
3N2	-	-	1000	-	-	1000	-
3N4	-	-	1800	-	-	1800	-

MEASURED LIMITING VOLTAGE PERFORMANCE AND ELECTRICAL SPECIFICATIONS

Voltage Code	Circuit Type	Peak Surge Current	MCOV	Measured Limiting Voltages (tested with 6 inches of lead length external to the enclosure per Clauses 6.1.1 of C62.62™-2010 and 37.4.4 of ANSI/UL 1449-2006)		
				Test Mode	Cat A 30 Ω 100 kHz Ring Wave 2 kV / 67 A @ 270° Phase Angle	Category C (High) 10 kA 8/20 Current Driven Test†
1S1	120/240V 1Ø (Split) (3 wire + ground)	30 kA L-N 30 kA L-L 30 kA L-G 30 kA N-G 180 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	30 V 54 V 45 V 45 V	1011 V 1291 V 991 V 1431 V
3Y1	120/208 V 3Ø Wye (4 wire + ground)	30 kA L-N 30 kA L-L 30 kA L-G 30 kA N-G 300 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	27 V 54 V 46 V 45 V	1068 V 1381 V 1048 V 1431 V
3D1	120/240 V 3Ø High- Leg Delta (4 wire + ground)	30 kA L-N 30 kA L-L 30 kA HL-N 30 kA L-G 30 kA HL-G 30 kA N-G 300 kA Total	150 V 320 V 300 V 150 V 320 V 150 V	L-N HL-N L-L L-G HL-G N-G	24 V 53 V 54 V 47 V 75 V 45 V	1091 V 1411 V 1381 V 1076 V 1371 V 1431 V
3Y2	277/480V 3Ø Wye (4 wire + ground)	30 kA L-N 30 kA L-L 30 kA L-G 30 kA N-G 300 kA Total	320 V 550 V 320 V 320 V	L-N L-L L-G N-G	57 V 58 V 76 V 57 V	1334 V 1981 V 1304 V 1721 V
3N2	240 V 3Ø Delta (NN) (3 wire + ground)	30 kA L-L 30 kA L-G 180 kA Total	320 V 320 V	L-L L-G	76 V	1381 V 1304 V
3N4	480V 3Ø Delta (NN) (3 wire + ground)	30 kA L-L 30 kA L-G 180 kA Total	550 V 550 V	L-L L-G	76 V	1981 V 2144 V

Measured Limiting Voltage (MLV) Test Parameters: Positive polarity, Category A: Line power applied, Category C: No line power applied, Voltages are peak (±10%). Measured Limiting Voltages are measured from the insertion point on the sine wave to the peak of the surge for powered tests. Each phase is the average of the modes within that mode of protection. In order to duplicate the results, the specified mode of protection must be tested in all modes (except N-G) and averaged together. (Individual mode or shot results may vary by more than 10%. *Scope Settings: Time Base = 10 microseconds per division, Sampling Rate = 2.5 Gigasamples/sec, Bandwidth = 400 MHz (200 MHz for Cat C), Probes: Tektronix P5100/P6015A. These settings help to assure MLV results are accurate).* **All tests performed with 6" lead length (external to the enclosure), simulating actual installed performance.** The MLVs reported above are certified by Third-Party, Independent Testing. Individual test reports are available upon request.
†Category C High, 10 kA is equivalent to the MLV recorded during the Nominal Discharge Current (I_n) Test from C62.62™-2010 and ANSI/UL 1449-2006.
**Other voltage configurations may be available. Contact your sales representative for additional assistance.*

ST-CKLx

120kA Per Phase
with Sinewave Tracking

* Based on 3 Phase Wye, 4 Wire and Ground

KEY FEATURES

Discrete “All Mode” Circuitry: Directly Connected Protection Elements in “All Modes” (10 modes for 3 phase, 4 wire Wye circuits) as recommend by NEMA LS-1 and IEEE Std. 1100-1999

Industry Leading Measured Limiting Voltage (let-through) Performance

Multi-stage Hybrid Optimal Sinewave Tracking® Circuit

Local & Remote Diagnostics

Independent Verification of Performance and Safety

No moving parts or springs - No mechanical or electro-mechanical thermal/ over-current protection

Rated as Type 2 SPD

Component-Level, Thermal Fusing

Patent Pending, Internal, Circuit Board Mounted, Over-Current Fusing

GENERAL

Application
The ST-CKLx series is one of the most versatile and effective devices in our product line. This durable, high performance device is intended for sensitive and critical load applications at main distribution panels, branch panels, motor control centers, and individual equipment disconnects. It is equally effective against high energy impulses and internally generated switching events.

Warranty
25 Years Unlimited Free Replacement

IEEE –C62.41.1 & C62.41.2-2002 environments
Suitable for Categories: A, B & C (Most Severe Electrical Environments)

IEC Environments
Suitable for use in IEC 61643-11 environments

Circuit Topology
Parallel configured combination Optimal Sinewave Tracking® and Optimal Response Circuitry™ circuit design incorporating component-level, thermal fusing and Patent Pending internal, circuit board mounted, over-current fusing; and discrete “All Mode” protection (10 modes for 3 phase Wye units). All protection circuits are encapsulated in our high dielectric compound to promote long component life and protection from the weather and vibration.

Protection Modes
Industry-best practice of true all mode dedicated protection components for all operational modes of the electrical system. Discrete L-N, L-L (Normal Mode) and L-G, N-G (Common Mode) Example: Directly Connected Protection Elements in All 10 modes for a 3 phase, 4 wire, Wye system, (i.e. 3 L-N modes, 3 L-L modes, 3 L-G modes and 1 N-G mode).

Input Power
50-60 Hz (60 Hz nominal)

Temperature Rating
Up to 80°C

Insertion Loss Data (L-N)

Frequency	10 kHz	100 kHz	1 MHz	Max Attenuation & Freq.
Attenuation	20 dB	47 dB	26 dB	65 dB @ 135 kHz

Standard Enclosure
NEMA 4 Rated with optional free gasket kit (K option) (Other enclosure options available)

SPD Type
Type 2 SPD (CKLB, CKLA)

Nominal Discharge Current (I_n) Rating
20 kA (CKLB) 10kA (CKLA)

Diagnostics
Green LED’s, one per phase, normally on. A wide range of optional diagnostics is available.

Circuit Interrupt
Internal component-level, thermal fusing and patent pending, circuit board mounted, over-current fusing.

UL Short Circuit Current Rating
200 kAIC

Product Qualifications
Listed to ANSI/UL 1449-2006 (3rd Edition) by CSA (CSA MC#241804); UL1283 and CE Compliant
ISO 9001 Certified Manufacturing Facility
2004/2006 TVSS Customer Value Enhancement Award from Frost & Sullivan

OPTIONS

AC = Internal Audible Alarm w/ test button, mute switch and red LED
C = Form C dry relay contacts
D1 = Integral, non-fused disconnect switch (TVSS unit mounts inside)
D2 = External non-fused disconnect switch (TVSS mounts to outside)
D3 = Same as D1, except no external handle
E1 = Hub on side of enclosure
LP = Remote LED indicators in individual NEMA 4X housings
K = Gasket Kit (installed)
M = NEMA 12 Steel Enclosure
N = Removes neutral to ground Sinewave Tracking Circuit
P = Flush Mount Plate
R1 = Remote lights on separate circuit board (board only – no enclosure)
R2 = Remote lights on separate circuit board in separate enclosure
S = Surge counter w/ reset button
W = NEMA 4 Steel Enclosure
X = NEMA 4X Composite Fiberglass Enclosure
XS = NEMA 4X Stainless Steel Enclosure

External Accessories: EACS = Externally mounted diagnostic module, combines **AC**, **C**, and **S** options (Also available: **EAC**, **EC**, **ECS**, and **ES**)

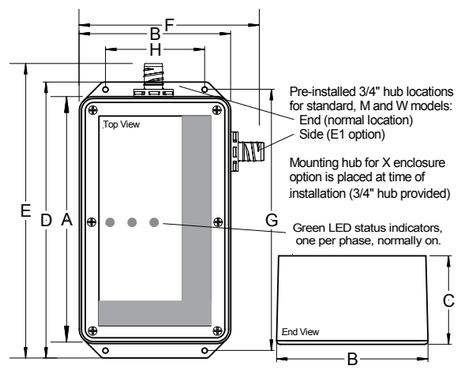
MECHANICAL (MODEL NUMBER EX: ST-CKLA3Y2D3 / BASE MODEL: ST-CKL / SPD TYPE: A, B)

Because we constantly seeking to improve our products, specifications are subject to change at any time

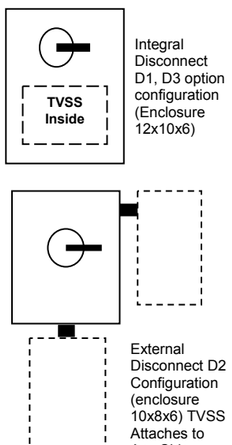
Circuit Connection: #10 AWG wire (pre-installed)

Enclosure Dimensions				
Inches (mm)	Standard Model	Enclosure Options		
		M	W	X
A	8.25 (210)	10.00 (254)	10.00 (254)	12.00 (305)
B	5.00 (127)	8.00 (204)	8.00 (204)	10.50 (267)
C	3.00 (77)	4.00 (102)	4.00 (102)	6.00 (153)
D	9.37 (238)	11.50 (293)	11.50 (293)	12.50 (318)
E	9.48 (242)	12.00 (305)	12.00 (305)	13.23 (337)
F	6.23 (159)	9.00 (229)	9.00 (229)	11.73 (299)
G	8.87 (226)	10.75 (274)	10.75 (274)	12.00 (305)
H	3.37 (86)	6.00 (153)	6.00 (153)	8.00 (204)
Type	NEMA 4X* ABS	NEMA 12 Steel	NEMA 4 Steel	NEMA 4X Composite
lbs. (kg)	5 (2.27)	14 (6.36)	14 (6.36)	11 (4.99)

* With optional gasket kit installed
Flush mount trim plate available for standard and “M” option models.



Circuit Connection: #10 AWG wire (pre-installed)



Voltage Code	ANSI/UL 1449-2006 (Third Edition) Voltage Protection Rating (VPR)						
	L-N	HL-N	L-G	HL-G	N-G	L-L	HL-L
1S1	500	-	500	-	500	1000	-
3Y1	500	-	500	-	500	1000	-
3D1	500	1000	500	1000	500	1000	1000
3Y2	1000	-	1000	-	1200	1800	-
3N2	-	-	1000	-	-	1000	-
3N4	-	-	1800	-	-	1800	-

MEASURED LIMITING VOLTAGE PERFORMANCE AND ELECTRICAL SPECIFICATIONS

Voltage Code	Circuit Type	MCOV	Peak Surge Current	ANSI/IEEE C62.41.1 & .2-2002 and C62.45-2002 Let-through Voltage Test Results (tested w/6” lead length external to the enclosure per UL 1449)		
				Mode	Cat A 30 Ω 100 kHz Ring Wave 6 kV 200 A @ 90° Phase Angle	Cat C, 2 Ω Combination Wave 20 kV / 10 kA @ 90° Phase Angle
1S1	120/240V 1Ø (Split) (3 wire + ground)	40 kA L-N 40 kA L-L 40 kA L-G 40 kA N-G 240 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	35 V 38 V 56 V 55 V	914 V 1119 V 1025 V 1176 V
3Y1	120/208 V 3Ø Wye (4 wire + ground)	40 kA L-N 40 kA L-L 40 kA L-G 40 kA N-G 400 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	35 V 38 V 56 V 55 V	914 V 1119 V 1025 V 1176 V
3D1	120/240 V 3Ø High- Leg Delta (4 wire + ground)	40 kA L-N 40 kA L-L 40 kA HL-N 40 kA L-G 40 kA HL-G 40 kA N-G 400 kA Total	150 V 320 V 300 V 150 V 320 V 150 V	L-N HL-N L-L L-G HL-G N-G	35 V 35 V 38 V 56 V 56 V 55 V	914 V 1050 V 1119 V 1025 V 1262 V 1176 V
3Y2	277/480V 3Ø Wye (4 wire + ground)	40 kA L-N 40 kA L-L 40 kA L-G 40 kA N-G 400 kA Total	320 V 550 V 320 V 320 V	L-N L-L L-G N-G	51 V 126 V 75 V 52 V	1050 V 1344 V 1262 V 1575 V
3N2	240 V 3Ø Delta (NN) (3 wire + ground)	40 kA L-L 40 kA L-G 240 kA Total	320 V 320 V	L-L L-G	51 V	1262 V 1262 V
3N4	480V 3Ø Delta (NN) (3 wire + ground)	40 kA L-L 40 kA L-G 240 kA Total	550 V 550 V	L-L L-G	51 V	1344 V 1344 V

***Measured Limiting Voltage (Let-Through) Test Environment:** Positive Polarity, Net voltages are peak (±10%). All tests are static except 150 V MCOV modes. Let-through voltages on static tests calculated by subtracting sinewave peak from let-through measured from zero. 150 V MCOV mode let-through voltages measured from the insertion point on the sinewave. Each phase is the average of the 3 modes. In order to duplicate the results, the specified mode must be tested for all three phases (except N-G) and averaged together. (Individual mode or shot results may vary by more than 10%. (Scope Settings: Time Base = 10 Microseconds, Sampling Rate = 500 Megasamples/sec. These settings assure Let-through voltages test results are accurate). **All tests performed with 6” lead length (external to the enclosure), simulating actual installed performance.**

ST-CDLx

180kA Per Phase
with Sinewave Tracking

* Based on 3 Phase Wye, 4 Wire and Ground

KEY FEATURES

Discrete “All Mode” Circuitry: Directly Connected Protection Elements in “All Modes” (10 modes for 3 phase, 4 wire Wye circuits) as recommend by NEMA LS-1 and IEEE Std. 1100-1999

Industry Leading Measured Limiting Voltage (let-through) Performance

Multi-stage Hybrid Optimal Sinewave Tracking® Circuit

Local & Remote Diagnostics

Independent Verification of Performance and Safety

No moving parts or springs - No mechanical or electro-mechanical thermal/ over-current protection

Rated as Type 2 SPD

Component-Level, Thermal Fusing

Patent Pending, Internal, Circuit Board Mounted, Over-Current Fusing

GENERAL

Application
The ST-CDLx series is one of the most versatile and effective devices in our product line. This durable, high performance device is intended for sensitive and critical load applications at main distribution panels, branch panels, motor control centers, and individual equipment disconnects. It is equally effective against externally generated high energy impulses and internally generated switching events

Warranty
25 Years Unlimited Free Replacement

IEEE –C62.41.1 & C62.41.2-2002 environments
Suitable for Categories: A, B & C (Most Severe Electrical Environments)

IEC Environments
Suitable for use in IEC 61643-11 environments

Circuit Topology
Parallel configured combination Frequency Attenuation Network® and Optimal Response Circuitry™ circuit design incorporating component-level, thermal fusing and Patent Pending internal, circuit board mounted, over-current fusing; and discrete “All Mode” protection (10 modes for 3 phase Wye units). All protection circuits are encapsulated in our high dielectric compound to promote long component life and protection from the weather and vibration.

Protection Modes
Industry-best practice of true all mode dedicated protection components for all operational modes of the electrical system. Discrete L-N, L-L (Normal Mode) and L-G, N-G (Common Mode) Example: Directly Connected Protection Elements in All 10 modes for a 3 phase, 4 wire, Wye system, (i.e. 3 L-N modes, 3 L-L modes, 3 L-G modes and 1 N-G mode).

Input Power
50-60 Hz (60 Hz nominal)

Temperature Rating
Up to 80°C

Insertion Loss Data (L-N)

Frequency	10 kHz	100 kHz	1 MHz	Max Attenuation & Freq.
Attenuation	20 dB	47 dB	26 dB	65 dB @ 135 kHz

Standard Enclosure
NEMA 4 Rated with optional free gasket kit (K option) (Other enclosure options available)

SPD Type
Type 2 SPD (CDLA, CDLB)

Nominal Discharge Current (I_n) Rating
20 kA (CDLB) 10kA (CDLA)

Diagnostics
Green LED’s, one per phase, normally on. A wide range of optional diagnostics is available.

Circuit Interrupt
Internal component-level, thermal fusing and patent pending, circuit board mounted, over-current fusing.

UL Short Circuit Current Rating
200 kAIC

Product Qualifications
Listed to ANSI/UL 1449-2006 (3rd Edition) by CSA (CSA MC#241804); UL1283 and CE Compliant
ISO 9001 Certified Manufacturing Facility

OPTIONS

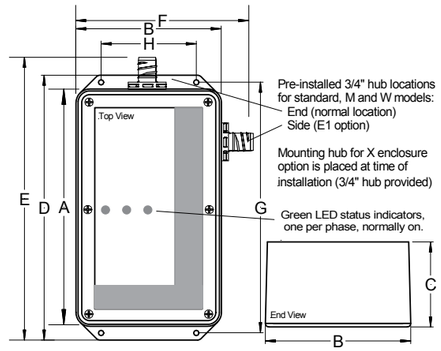
AC = Internal Audible Alarm w/ test button, mute switch and red LED
C = Form C dry relay contacts
D1 = Integral, non-fused disconnect switch (TVSS unit mounts inside)
D2 = External non-fused disconnect switch (TVSS mounts to outside)
D3 = Same as D1, except no external handle
E1 = Hub on side of enclosure
LP = Remote LED indicators in individual NEMA 4X housings
K = Gasket Kit (installed)
M = NEMA 12 Steel Enclosure
N = Removes neutral to ground Sinewave Tracking Circuit
P = Flush Mount Plate
R1 = Remote lights on separate circuit board (board only – no enclosure)
R2 = Remote lights on separate circuit board in separate enclosure
S = Surge counter w/ reset button
W = NEMA 4 Steel Enclosure
X = NEMA 4X Composite Fiberglass Enclosure
XS = NEMA 4X Stainless Steel Enclosure

External Accessories: EACS = Externally mounted diagnostic module, combines **AC**, **C**, and **S** options (Also available: **EAC**, **EC**, **ECS**, and **ES**)

MECHANICAL (MODEL NUMBER EX: ST-CDLA3Y2D3 / BASE MODEL: ST-CDL / SPD TYPE: A, B)

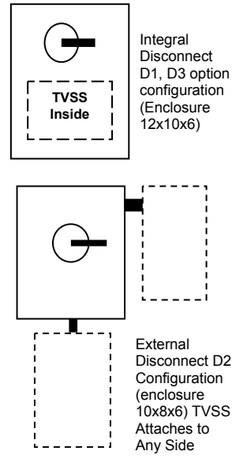
Enclosure Dimensions				
Inches (mm)	Standard Model	Enclosure Options		
		M	W	X
A	8.25 (210)	10.00 (254)	10.00 (254)	12.00 (305)
B	5.00 (127)	8.00 (204)	8.00 (204)	10.50 (267)
C	3.00 (77)	4.00 (102)	4.00 (102)	6.00 (153)
D	9.37 (238)	11.50 (293)	11.50 (293)	12.50 (318)
E	9.48 (242)	12.00 (305)	12.00 (305)	13.23 (337)
F	6.23 (159)	9.00 (229)	9.00 (229)	11.73 (299)
G	8.87 (226)	10.75 (274)	10.75 (274)	12.00 (305)
H	3.37 (86)	6.00 (153)	6.00 (153)	8.00 (204)
Type	NEMA 4X* ABS	NEMA 12 Steel	NEMA 4 Steel	NEMA 4X Composite
lbs. (kg)	5 (2.27)	14 (6.36)	14 (6.36)	11 (4.99)

* With optional gasket kit installed
Flush mount trim plate available for standard and “M” option models.



Circuit Connection: #10 AWG wire (pre-installed)

Because we are constantly seeking to improve our products, specifications are subject to change at any time.



Voltage Code	ANSI/UL 1449-2006 (Third Edition) Voltage Protection Rating (VPR)						
	L-N	HL-N	L-G	HL-G	N-G	L-L	HL-L
1S1	500	-	500	-	500	1000	-
3Y1	500	-	500	-	500	1000	-
3D1	500	1000	500	1000	500	1000	1000
3Y2	1000	-	1000	-	1200	1800	-
3N2	-	-	1000	-	-	1000	-
3N4	-	-	1800	-	-	1800	-

MEASURED LIMITING VOLTAGE PERFORMANCE AND ELECTRICAL SPECIFICATIONS

Voltage Code	Circuit Type	MCOV	Peak Surge Current	ANSI/IEEE C62.41.1 & .2-2002 and C62.45-2002 Let-through Voltage Test Results (tested w/6” lead length external to the enclosure per UL 1449)		
				Mode	Cat A 30 Ω 100 kHz Ring Wave 6 kV 200 A @ 90° Phase Angle	Cat C, 2 Ω Combination Wave 20 kV / 10 kA @ 90° Phase Angle
1S1	120/240V 1Ø (Split) (3 wire + ground)	60 kA L-N 60 kA L-L 60 kA L-G 60 kA N-G 360 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	35 V 38 V 56 V 55 V	914 V 1119 V 1025 V 1176 V
3Y1	120/208 V 3Ø Wye (4 wire + ground)	60 kA L-N 60 kA L-L 60 kA L-G 60 kA N-G 600 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	35 V 38 V 56 V 55 V	914 V 1119 V 1025 V 1176 V
3D1	120/240 V 3Ø High- Leg Delta (4 wire + ground)	60 kA L-N 60 kA L-L 60 kA HL-N 60 kA L-G 60 kA HL-G 60 kA N-G 600 kA Total	150 V 320 V 300 V 150 V 320 V 150 V	L-N HL-N L-L L-G HL-G N-G	35 V 35 V 38 V 56 V 56 V 55 V	914 V 1050 V 1119 V 1025 V 1262 V 1176 V
3Y2	277/480V 3Ø Wye (4 wire + ground)	60 kA L-N 60 kA L-L 60 kA L-G 60 kA N-G 600 kA Total	320 V 550 V 320 V 320 V	L-N L-L L-G N-G	51 V 126 V 75 V 52 V	1050 V 1344 V 1262 V 1575 V
3N2	240 V 3Ø Delta (NN) (3 wire + ground)	60 kA L-L 60 kA L-G 360 kA Total	320 V 320 V	L-L L-G	51 V	1262 V 1262 V
3N4	480V 3Ø Delta (NN) (3 wire + ground)	60 kA L-L 60 kA L-G 360 kA Total	550 V 550 V	L-L L-G	51 V	1344 V 1344 V

***Measured Limiting Voltage (Let-Through) Test Environment:** Positive Polarity, Net voltages are peak (±10%). All tests are static except 150 V MCOV modes. Let-through voltages on static tests calculated by subtracting sinewave peak from let-through measured from zero. 150 V MCOV mode let-through voltages measured from the insertion point on the sinewave. Each phase is the average of the 3 modes. In order to duplicate the results, the specified mode must be tested for all three phases (except N-G) and averaged together. (Individual mode or shot results may vary by more than 10%. (Scope Settings: Time Base = 10 Microseconds, Sampling Rate = 500 Megasamples/sec. These settings assure Let-through voltages test results are accurate). **All tests performed with 6” lead length (external to the enclosure), simulating actual installed performance.**

ST-CSEx

240kA Per Phase
with Sinewave Tracking
ANSI/UL 1449-2006 3rd Edition

A=Type 2 SPD, I_n = 10kA
B=Type 2 SPD, I_n = 20kA

* Based on 3 Phase Wye, 4 Wire and Ground I_n = Nominal Discharge Current per ANSI/UL 1449-2006

KEY FEATURES

Discrete “All Mode” Circuitry: Directly Connected Protection Elements in “All Modes” (10 modes for 3 phase Wye circuits) as recommended by IEEE Std. 1100-2005

Industry Leading Measured Limiting Voltage (let-through) Performance

Multi-stage Hybrid Frequency Attenuation Network

Local & Remote Diagnostics

Independent Verification of Performance and Safety

No moving parts or springs - No mechanical or electro-mechanical thermal/ over-current protection

Component-Level, Thermal Fusing

Patent Pending, Internal, Circuit Board Mounted, Over-Current Fusing

GENERAL

Application
The ST-CSEx series is the workhorse of our product line. This durable, high performance single port device is intended for sensitive and critical load applications at service entrance locations, main distribution panels, motor control centers, and individual equipment.

Warranty
25 Years Unlimited Free Replacement

IEEE –C62.41.1 & C62.41.2-2002 environments
Suitable for Categories: A, B & C (Most Severe Electrical Environments)

IEC Environments
Suitable for use in IEC 61643-11 environments

Circuit Topology
Parallel configured combination Frequency Attenuation Network and Voltage Responsive Circuitry circuit design incorporating component-level, thermal fusing and circuit board mounted, Patented internal over- current fusing methodology with discrete “All Mode” protection (10 modes for 3 phase Wye units). All protection circuits are encapsulated in our high-dielectric compound to promote long component life and protection from the weather and vibration.

Protection Modes
Industry-best practice of dedicated protection components for all operational modes of the electrical system. Discrete L-N, L-L (Normal Mode) and L-G, N-G (Common Mode) Example: Directly Connected Protection Elements in All 10 modes for a 3 phase, 4 wire, Wye systems, (i.e. 3 L-N modes, 3 L-L modes, 3 L- G modes and 1 N-G mode).

Input Power
50-60 Hz (60 Hz nominal)

Temperature Rating
Up to 80°C

Insertion Loss Data (L-N)

Frequency	10 kHz	100 kHz	1 MHz	Max Attenuation & Freq.
Attenuation	20 dB	47 dB	26 dB	65 dB @ 135 kHz

Standard Enclosure
NEMA 1 Rated Standard Enclosure (Other enclosure options available)

Nominal Discharge Current (I_n) Rating
(ST-CSEA) 10 kA, (ST-CSEB) 20 kA

Diagnostics
Green LED’s, one per phase, normally on. A wide range of optional diagnostics is available.

Circuit Interrupt
Internal component-level, thermal fusing and patented circuit board mounted, over-current fusing. No external over-current protection required.

Short Circuit Current Rating
200 kAIC

Product Qualifications
Listed to ANSI/UL 1449-2006 3rd Edition by UL (E340498), CSA (MC#241804);
UL1283* and CE Compliant
ISO 9001-2008 Certified Manufacturing Facility
2004/2006 TVSS Customer Value Enhancement Award from Frost & Sullivan

OPTIONS

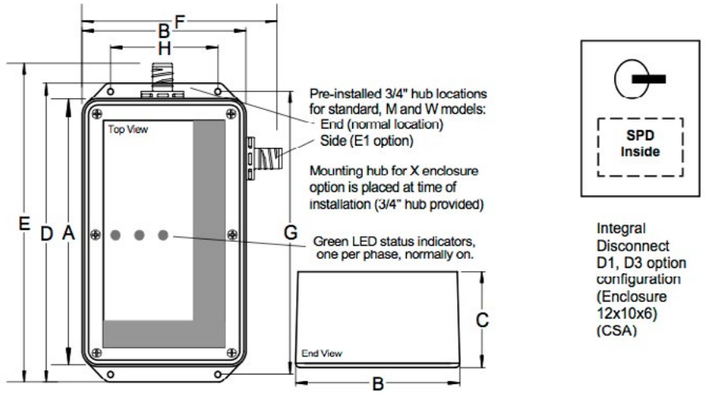
AC = Internal Audible Alarm w/ test button, mute switch and red LED
C = Form C dry relay contacts
D1 = Integral, non-fused disconnect switch (TVSS unit mounts inside)
D3 = Same as D1, except no external handle
E1 = Hub on side of enclosure
K = Gasket Kit
LP = Remote LED indicators in individual NEMA 4X housings
M = NEMA 12 Steel Enclosure
N = Removes neutral to ground Sinewave Tracking Circuit
P = Flush Mount Plate
R2 = Remote lights on separate circuit board in separate enclosure
S = Surge counter w/ reset button
W = NEMA 4 Steel Enclosure
X = NEMA 4X Composite Enclosure (Box-in-box)
X1 = NEMA 4X Composite Enclosure with Clear Lid (Box-in-box)
X2 = NEMA 1, 2, 3, 3S, 4, 4X and 12 composite enclosure
XS = NEMA 4X Stainless Steel Enclosure

External Accessories: EACS = Externally mounted diagnostic module, combines **AC**, **C**, and **S** options (Also available: **EAC**, **EC**, **ECS**, and **ES**)
Other options may be available upon request.

MECHANICAL (Model Number Ex: ST-CSEA3Y2D3 / Base Model: ST-CSE / SPD type & Nominal Discharge Current (I_n) Rating: A, B, C, D / Voltage Code: 3Y2 / Options Code: D3)

Enclosure Dimensions				
Inches (mm)	Standard Model	Enclosure Options		
		M	W	X,X1
A	8.25 (210)	10.00 (254)	10.00 (254)	12.00 (305)
B	5.00 (127)	8.00 (204)	8.00 (204)	10.50 (267)
C	3.00 (77)	4.00 (102)	4.00 (102)	6.00 (153)
D	9.37 (238)	11.50 (293)	11.50 (293)	12.50 (318)
E	9.48 (242)	12.00 (305)	12.00 (305)	13.23 (337)
F	6.23 (159)	9.00 (229)	9.00 (229)	11.73 (299)
G	8.87 (226)	10.75 (274)	10.75 (274)	12.00 (305)
H	3.37 (86)	6.00 (153)	6.00 (153)	8.00 (204)
Type	NEMA 1 ABS	NEMA 12 Steel	NEMA 4 Steel	NEMA 4X Composite
lbs. (kg)	5 (2.27)	14 (6.36)	14 (6.36)	10 (4.54)

Flush mount trim plate available for standard and “M” option models.



Circuit Connection: #10 AWG wire (pre-installed)

Voltage Code	ANSI/UL 1449-2006 (Third Edition) Voltage Protection Rating (VPR)						
	L-N	HL-N	L-G	HL-G	N-G	L-L	HL-L
1S1	500	-	500	-	500	1000	-
3Y1	500	-	500	-	500	1000	-
3D1	500	1000	500	1000	500	1000	1000
3Y2	1000	-	1000	-	1200	1800	-
3N2	-	-	1000	-	-	1000	-
3N4	-	-	1800	-	-	1800	-

MEASURED LIMITING VOLTAGE PERFORMANCE AND ELECTRICAL SPECIFICATIONS

Voltage Code	Circuit Type	Peak Surge Current	MCOV	ANSI/IEEE C62.41.1™-2002, C62.41.2™-2002, C62.45™-2002, and C62.62™-2010 Measured Limiting Voltages (tested with 6 inches of lead length external to the enclosure per Clauses 6.1.1 of C62.62™-2010 and 37.4.4 of ANSI/UL 1449-2006)		
				Test Mode	Cat A 30 Ω 100 kHz Ring Wave 2 kV / 67 A @ 270° Phase Angle	Category C (High) 10 kA 8/20 Current Driven Test†
1S1	120/240V 1Ø (Split) (3 wire + ground)	80 kA L-N 80 kA L-L 80 kA L-G 80 kA N-G 480 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	30 V 54 V 45 V 45 V	1011 V 1291 V 991 V 1431 V
3Y1	120/208 V 3Ø Wye (4 wire + ground)	80 kA L-N 80 kA L-L 80 kA L-G 80 kA N-G 800 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	27 V 54 V 46 V 45 V	1068 V 1381 V 1048 V 1431 V
3D1	120/240 V 3Ø High- Leg Delta (4 wire + ground)	80 kA L-N 80 kA L-L 80 kA HL-N 80 kA L-G 80 kA HL-G 80 kA N-G 800 kA Total	150 V 320 V 300 V 150 V 320 V 150 V	L-N HL-N L-L L-G HL-G N-G	24 V 53 V 54 V 47 V 75 V 45 V	1091 V 1411 V 1381 V 1076 V 1371 V 1431 V
3Y2	277/480V 3Ø Wye (4 wire + ground)	80 kA L-N 80 kA L-L 80 kA L-G 80 kA N-G 800 kA Total	320 V 550 V 320 V 320 V	L-N L-L L-G N-G	57 V 58 V 76 V 57 V	1334 V 1981 V 1304 V 1721 V
3N2	240 V 3Ø Delta (NN) (3 wire + ground)	80 kA L-L 80 kA L-G 480 kA Total	320 V 320 V	L-L L-G	76 V	1381 V 1304 V
3N4	480V 3Ø Delta (NN) (3 wire + ground)	80 kA L-L 80 kA L-G 480 kA Total	550 V 550 V	L-L L-G	76 V	1981 V 2144 V

Measured Limiting Voltage (MLV) Test Parameters: Positive polarity, Category A: Line power applied, Category C: No line power applied, Voltages are peak (±10%). Measured Limiting Voltages are measured from the insertion point on the sine wave to the peak of the surge for powered tests. Each phase is the average of the modes within that mode of protection. In order to duplicate the results, the specified mode of protection must be tested in all modes (except N-G) and averaged together. (Individual mode or shot results may vary by more than 10%. *Scope Settings: Time Base = 10 microseconds per division, Sampling Rate = 2.5 Gigasamples/sec, Bandwidth = 400 MHz (200 MHz for Cat C), Probes: Tektronix P5100/P6015A. These settings help to assure MLV results are accurate).* **All tests performed with 6" lead length (external to the enclosure), simulating actual installed performance.** The MLVs reported above are certified by Third-Party, Independent Testing. Individual test reports are available upon request.
†Category C High, 10 kA is equivalent to the MLV recorded during the Nominal Discharge Current (I_n) Test from C62.62™-2010 and ANSI/UL 1449-2006.
**Other voltage configurations may be available. Contact your sales representative for additional assistance.*

ST-CMLx

300kA Per Phase
with Sinewave Tracking

* Based on 3 Phase Wye, 4 Wire and Ground

KEY FEATURES

Discrete “All Mode” Circuitry: Directly Connected Protection Elements in “All Modes” (10 modes for 3 phase, 4 wire Wye circuits) as recommend by NEMA LS-1 and IEEE Std. 1100-1999

Industry Leading Measured Limiting Voltage (let-through) Performance

Multi-stage Hybrid Optimal Sinewave Tracking® Circuit

Local & Remote Diagnostics

Independent Verification of Performance and Safety

No moving parts or springs - No mechanical or electro-mechanical thermal/ over-current protection

Rated as Type 2 SPD

Component-Level, Thermal Fusing

Patent Pending, Internal, Circuit Board Mounted, Over-Current Fusing

GENERAL

Application
The ST-CMLx series was developed to answer a broad variety of demands from our customers. This device is robust enough to handle the punishment of service entrance applications while providing protection from transients that are generated inside the facility. The constant bombardment of these combination transients damages valuable equipment and wastes budget dollars.

Warranty
25 Years Unlimited Free Replacement

IEEE –C62.41.1 & C62.41.2-2002 environments
Suitable for Categories: A, B & C (Most Severe Electrical Environments)

IEC Environments
Suitable for use in IEC 61643-11 environments

Circuit Topology
Parallel configured combination Optimal Sinewave Tracking® and Optimal Response Circuitry™ circuit design incorporating component-level, thermal fusing and Patent Pending internal, circuit board mounted, over-current fusing; and discrete “All Mode” protection (10 modes for 3 phase Wye units). All protection circuits are encapsulated in our high dielectric compound to promote long component life and protection from the weather and vibration.

Protection Modes
Industry-best practice of true all mode dedicated protection components for all operational modes of the electrical system. Discrete L-N, L-L (Normal Mode) and L-G, N-G (Common Mode) Example: Directly Connected Protection Elements in All 10 modes for a 3 phase, 4 wire, Wye system, (i.e. 3 L-N modes, 3 L-L modes, 3 L-G modes and 1 N-G mode).

Input Power
50-60 Hz (60 Hz nominal)

Temperature Rating
Up to 80°C

Insertion Loss Data (L-N)

Frequency	10 kHz	100 kHz	1 MHz	Max Attenuation & Freq.
Attenuation	20 dB	47 dB	26 dB	65 dB @ 135 kHz

Standard Enclosure
NEMA 4 Rated with optional free gasket kit (K option) (Other enclosure options available)

SPD Type
Type 2 SPD (CMLB, CMLA)

Nominal Discharge Current (I_n) Rating
20 kA (CMLB) 10kA (CMLA)

Diagnostics
Green LED’s, one per phase, normally on. A wide range of optional diagnostics is available.

Circuit Interrupt
Internal component-level, thermal fusing and patent pending, circuit board mounted, over-current fusing.

UL Short Circuit Current Rating
200 kAIC

Product Qualifications
Listed to ANSI/UL 1449-2006 (3rd Edition) by CSA (CSA MC#241804); UL1283 and CE Compliant
ISO 9001 Certified Manufacturing Facility
2004/2006 TVSS Customer Value Enhancement Award from Frost & Sullivan

OPTIONS

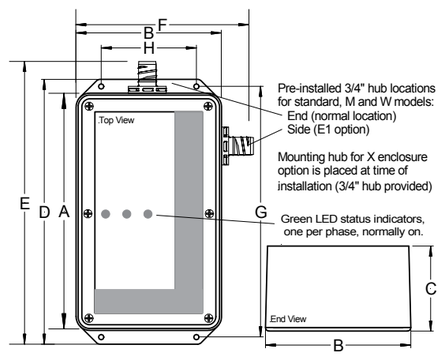
AC = Internal Audible Alarm w/ test button, mute switch and red LED
C = Form C dry relay contacts
D1 = Integral, non-fused disconnect switch (TVSS unit mounts inside)
D2 = External non-fused disconnect switch (TVSS mounts to outside)
D3 = Same as D1, except no external handle
E1 = Hub on side of enclosure
LP = Remote LED indicators in individual NEMA 4X housings
K = Gasket Kit (installed)
M = NEMA 12 Steel Enclosure
N = Removes neutral to ground Sinewave Tracking Circuit
P = Flush Mount Plate
R1 = Remote lights on separate circuit board (board only – no enclosure)
R2 = Remote lights on separate circuit board in separate enclosure
S = Surge counter w/ reset button
W = NEMA 4 Steel Enclosure
X = NEMA 4X Composite Fiberglass Enclosure
XS = NEMA 4X Stainless Steel Enclosure

External Accessories: EACS = Externally mounted diagnostic module, combines **AC**, **C**, and **S** options (Also available: **EAC**, **EC**, **ECS**, and **ES**)

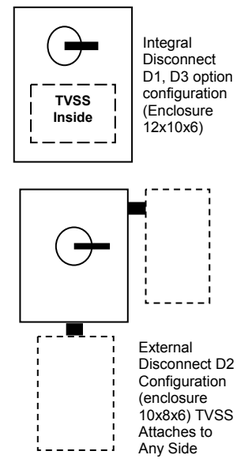
MECHANICAL (MODEL NUMBER EX: ST-CMLA3Y2D3 / BASE MODEL: ST-CML / SPD TYPE: A, B)

Enclosure Dimensions				
Inches (mm)	Standard Model	Enclosure Options		
		M	W	X
A	8.25 (210)	10.00 (254)	10.00 (254)	12.00 (305)
B	5.00 (127)	8.00 (204)	8.00 (204)	10.50 (267)
C	3.00 (77)	4.00 (102)	4.00 (102)	6.00 (153)
D	9.37 (238)	11.50 (293)	11.50 (293)	12.50 (318)
E	9.48 (242)	12.00 (305)	12.00 (305)	13.23 (337)
F	6.23 (159)	9.00 (229)	9.00 (229)	11.73 (299)
G	8.87 (226)	10.75 (274)	10.75 (274)	12.00 (305)
H	3.37 (86)	6.00 (153)	6.00 (153)	8.00 (204)
Type	NEMA 1 ABS	NEMA 12 Steel	NEMA 4 Steel	NEMA 4X Composite
lbs. (kg)	5 (2.27)	14 (6.36)	14 (6.36)	11 (4.99)

Flush mount trim plate available for standard and “M” option models.



Circuit Connection: #10 AWG wire (pre-installed)



Because we are constantly seeking to improve our products, specifications are subject to change at any time.

Voltage Code	ANSI/UL 1449-2006 (Third Edition) Voltage Protection Rating (VPR)						
	L-N	HL-N	L-G	HL-G	N-G	L-L	HL-L
1S1	500	-	500	-	500	1000	-
3Y1	500	-	500	-	500	1000	-
3D1	500	1000	500	1000	500	1000	1000
3Y2	1000	-	1000	-	1000	1800	-
3N2	-	-	1000	-	-	1000	-
3N4	-	-	1800	-	-	1800	-

MEASURED LIMITING VOLTAGE PERFORMANCE AND ELECTRICAL SPECIFICATIONS

Voltage Code	Circuit Type	MCOV	Peak Surge Current	ANSI/IEEE C62.41.1 & .2-2002 and C62.45-2002 Let-through Voltage Test Results (tested w/6” lead length external to the enclosure per UL 1449)		
				Mode	Cat A 30 Ω 100 kHz Ring Wave 6 kV 200 A @ 90° Phase Angle	Cat C, 2 Ω Combination Wave 20 kV / 10 kA @ 90° Phase Angle
1S1	120/240V 1Ø (Split) (3 wire + ground)	100 kA L-N 100 kA L-L 100 kA L-G 100 kA N-G 600 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	34 V 38 V 56 V 58 V	914 V 1119 V 1025 V 1176 V
3Y1	120/208 V 3Ø Wye (4 wire + ground)	100 kA L-N 100 kA L-L 100 kA L-G 4100 kA N-G 1000 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	34 V 38 V 56 V 58 V	914 V 1119 V 1025 V 1176 V
3D1	120/240 V 3Ø High- Leg Delta (4 wire + ground)	100 kA L-N 100 kA L-L 100 kA HL-N 100 kA L-G 100 kA HL-G 100 kA N-G 1000 kA Total	150 V 320 V 300 V 150 V 320 V 150 V	L-N HL-N L-L L-G HL-G N-G	34 V 34 V 38 V 56 V 56 V 58 V	914 V 1050 V 1119 V 1025 V 1262 V 1176 V
3Y2	277/480V 3Ø Wye (4 wire + ground)	100 kA L-N 100 kA L-L 100 kA L-G 100 kA N-G 1000 kA Total	320 V 550 V 320 V 320 V	L-N L-L L-G N-G	51 V 111 V 74 V 54 V	1050 V 1344 V 1262 V 1575 V
3N2	240 V 3Ø Delta (NN) (3 wire + ground)	100 kA L-L 100 kA L-G 600 kA Total	320 V 320 V	L-L L-G	50 V	1262 V 1262 V
3N4	480V 3Ø Delta (NN) (3 wire + ground)	100 kA L-L 100 kA L-G 600 kA Total	550 V 550 V	L-L L-G	50 V	1344 V 1344 V

***Measured Limiting Voltage (Let-Through) Test Environment:** Positive Polarity, Net voltages are peak (±10%). All tests are static except 150 V MCOV modes. Let-through voltages on static tests calculated by subtracting sinewave peak from let-through measured from zero. 150 V MCOV mode let-through voltages measured from the insertion point on the sinewave. Each phase is the average of the 3 modes. In order to duplicate the results, the specified mode must be tested for all three phases (except N-G) and averaged together. (Individual mode or shot results may vary by more than 10%. (Scope Settings: Time Base = 10 Microseconds, Sampling Rate = 500 Megasamples/sec. These settings assure Let-through voltages test results are accurate). **All tests performed with 6” lead length (external to the enclosure), simulating actual installed performance.**

ST-CILxM

360kA Per Phase
with Sinewave Tracking

* Based on 3 Phase Wye, 4 Wire and Ground

KEY FEATURES

Discrete “All Mode” Circuitry: Directly Connected Protection Elements in “All Modes” (10 modes for 3 phase, 4 wire Wye circuits) as recommend by NEMA LS-1 and IEEE Std. 1100-1999

Industry Leading Measured Limiting Voltage (let-through) Performance

Multi-stage Hybrid Optimal Sinewave Tracking® Circuit

Local & Remote Diagnostics

Independent Verification of Performance and Safety

No moving parts or springs - No mechanical or electro-mechanical thermal/ over-current protection

Rated as Type 2 SPD

Component-Level, Thermal Fusing

Patent Pending, Internal, Circuit Board Mounted, Over-Current Fusing

GENERAL

Application
The ST-CILxM series was developed to answer a broad variety of demands from our customers. This device is robust enough to handle the punishment of service entrance applications while providing protection from transients that are generated inside their facility. The constant bombardment of these combination transients can damage valuable equipment and waste budget dollars.

Warranty
25 Years Unlimited Free Replacement

IEEE –C62.41.1 & C62.41.2-2002 environments
Suitable for Categories: A, B & C (Most Severe Electrical Environments)

IEC Environments
Suitable for use in IEC 61643-11 environments

Circuit Topology
Parallel configured combination Optimal Sinewave Tracking® and Optimal Response Circuitry™ circuit design incorporating component-level, thermal fusing and Patent Pending internal, circuit board mounted, over-current fusing; and discrete “All Mode” protection (10 modes for 3 phase Wye units). All protection circuits are encapsulated in our high dielectric compound to promote long component life and protection from the weather and vibration.

Protection Modes
Industry-best practice of true all mode dedicated protection components for all operational modes of the electrical system. Discrete L-N, L-L (Normal Mode) and L-G, N-G (Common Mode) Example: Directly Connected Protection Elements in All 10 modes for a 3 phase, 4 wire, Wye system, (i.e. 3 L-N modes, 3 L-L modes, 3 L-G modes and 1 N-G mode).

Input Power
50-60 Hz (60 Hz nominal)

Temperature Rating
Up to 80°C

Insertion Loss Data (L-N)

Frequency	10 kHz	100 kHz	1 MHz	Max Attenuation & Freq.
Attenuation	20 dB	47 dB	26 dB	65 dB @ 135 kHz

Standard Enclosure
NEMA 12 rated, painted steel enclosure (Other enclosure options available)

SPD Type
Type 2 SPD (CILBM, CILAM)

Nominal Discharge Current (I_n) Rating
20 kA (CILBM) 10kA (CILAM)

Diagnostics
Green LED’s, one per phase, normally on. A wide range of optional diagnostics is available.

Circuit Interrupt
Internal component-level, thermal fusing and patent pending, circuit board mounted, over-current fusing.

UL Short Circuit Current Rating
200 kAIC

Product Qualifications
Listed to ANSI/UL 1449-2006 (3rd Edition) by CSA (CSA MC#241804); UL1283 and CE Compliant
ISO 9001 Certified Manufacturing Facility
2004/2006 TVSS Customer Value Enhancement Award from Frost & Sullivan

OPTIONS

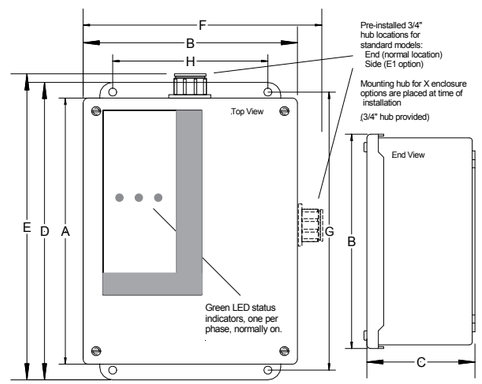
AC = Internal Audible Alarm w/ test button, mute switch and red LED
C = Form C dry relay contacts
D2 = External non-fused disconnect switch (TVSS mounts to outside)
D5 = Integral, non-fused disconnect switch (TVSS unit mounts inside)
D6 = Same as D5, except no external handle
E1 = Hub on side of enclosure
LP = Remote LED indicators in individual NEMA 4X housings
N = Removes neutral to ground Sinewave Tracking Circuit
P = Flush Mount Plate
R1 = Remote lights on separate circuit board (board only – no enclosure)
R2 = Remote lights on separate circuit board in separate enclosure
S = Surge counter w/ reset button
W = NEMA 4 Steel Enclosure
X = NEMA 4X Composite Fiberglass Enclosure
XS = NEMA 4X Stainless Steel Enclosure

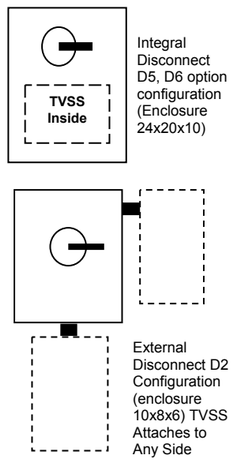
External Accessories: EACS = Externally mounted diagnostic module, combines **AC**, **C**, and **S** options (Also available: **EAC**, **EC**, **ECS**, and **ES**)

MECHANICAL (MODEL NUMBER EX: ST-CILA3Y2D3 / BASE MODEL: ST-CIL / SPD TYPE: A, B)

Enclosure Dimensions			
Inches (mm)	Standard Model	Enclosure Dimensions	
		W	X
A	10.00 (254)	10.00 (254)	16.00 (407)
B	8.00 (204)	8.00 (204)	14.00 (356)
C	4.00 (102)	4.00 (102)	8.00 (204)
D	11.50 (293)	11.50 (293)	12.00 (305)
E	11.98 (305)	11.98 (305)	17.98 (457)
F	9.98 (254)	9.98 (254)	15.98 (406)
G	10.75 (274)	10.75 (274)	16.94 (431)
H	6.00 (153)	6.00 (153)	12.00 (305)
Type	NEMA 12 Steel	NEMA 4 Steel	NEMA 4X Composite
lbs. (kg)	14 (6.36)	14 (6.36)	32 (14.52)

Circuit Connection: #10 AWG wire (pre-installed)
Mounting: 3/4” hub (provided) and integral feet





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Voltage Code	ANSI/UL 1449-2006 (Third Edition) Voltage Protection Rating (VPR)						
	L-N	HL-N	L-G	HL-G	N-G	L-L	HL-L
1S1	500	-	500	-	500	1000	-
3Y1	500	-	500	-	500	1000	-
3D1	500	1000	500	1000	500	1000	1000
3Y2	1000	-	1000	-	1200	1800	-
3N2	-	-	1000	-	-	1000	-
3N4	-	-	1800	-	-	1800	-

MEASURED LIMITING VOLTAGE PERFORMANCE AND ELECTRICAL SPECIFICATIONS

Voltage Code	Circuit Type	MCOV	Peak Surge Current	ANSI/IEEE C62.41.1 & .2-2002 and C62.45-2002 Let-through Voltage Test Results (tested w/6” lead length external to the enclosure per UL 1449)		
				Mode	Cat A 30 Ω 100 kHz Ring Wave 6 kV 200 A @ 90° Phase Angle	Cat C, 2 Ω Combination Wave 20 kV / 10 kA @ 90° Phase Angle
1S1	120/240V 1Ø (Split) (3 wire + ground)	120 kA L-N 120 kA L-L 120 kA L-G 120 kA N-G 720 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	33 V 43 V 47 V 49 V	902 V 1103 V 985 V 1086 V
3Y1	120/208 V 3Ø Wye (4 wire + ground)	120 kA L-N 120 kA L-L 120 kA L-G 120 kA N-G 1200 kA Total	150 V 300 V 150 V 150 V	L-N L-L L-G N-G	33 V 43 V 47 V 49 V	902 V 1103 V 985 V 1086 V
3D1	120/240 V 3Ø High- Leg Delta (4 wire + ground)	120 kA L-N 120 kA L-L 120 kA HL-N 120 kA L-G 120 kA HL-G 120 kA N-G 1200 kA Total	150 V 320 V 300 V 150 V 320 V 150 V	L-N HL-N L-L L-G HL-G N-G	33 V 33 V 43 V 47 V 47 V 49 V	902 V 1066 V 1103 V 985 V 1158 V 1086 V
3Y2	277/480V 3Ø Wye (4 wire + ground)	120 kA L-N 120 kA L-L 120 kA L-G 120 kA N-G 1200 kA Total	320 V 550 V 320 V 320 V	L-N L-L L-G N-G	51 V 108 V 79 V 52 V	1066 V 1456 V 1158 V 1481 V
3N2	240 V 3Ø Delta (NN) (3 wire + ground)	120 kA L-L 120 kA L-G 720 kA Total	320 V 320 V	L-L L-G	51 V	1158 V 1158 V
3N4	480V 3Ø Delta (NN) (3 wire + ground)	120 kA L-L 120 kA L-G 720 kA Total	550 V 550 V	L-L L-G	51 V	1456 V 1456 V

***Measured Limiting Voltage (Let-Through) Test Environment:** Positive Polarity, Net voltages are peak (±10%). All tests are static except 150 V MCOV modes. Let-through voltages on static tests calculated by subtracting sinewave peak from let-through measured from zero. 150 V MCOV mode let-through voltages measured from the insertion point on the sinewave. Each phase is the average of the 3 modes. In order to duplicate the results, the specified mode must be tested for all three phases (except N-G) and averaged together. (Individual mode or shot results may vary by more than 10%. (Scope Settings: Time Base = 10 Microseconds, Sampling Rate = 500 Megasamples/sec. These settings assure Let-through voltages test results are accurate). **All tests performed with 6” lead length (external to the enclosure), simulating actual installed performance.**

Energy Control Systems is proud to offer the industry's most complete and capable line of high quality Surge Protective Devices (SPD's) for Industrail, Commercial and Department of Defense applications. Our high quality, ISO 9001 manufactured devices cover the full range of applications for AC/DC power, data, current loop, and telecommunications applications from 5V DC to 7200V AC.

Our twenty five years of hands on, real world field experience can be seen in the simplicity, functionality and user friendly design of all our products. Simply stated, these are the finest, highest quality, best performing surge suppression products available anywhere in the world today. We not only set the standard, we are the standard.

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