

UST

Utility Systems Technologies, Inc.
Sag Fighter[™]

Deep Voltage Sag Protection



Deep Voltage Sag Protection:

- Down to 30% remaining voltage
- Ultra-fast 2 ms response
- Unlimited sag correction time
- Meets SEMI F47-0706
- Without batteries
- Corrects phase shifting
- Very low O&M cost

For three phase application:

- Any voltage up to 600VAC
- 50 Hz • 60 Hz
- Compatible with all load types
- For all load power factors
- 99% energy efficient
- Very high load inrush capacity
- Small footprint

Quality Power. Better Business.



The Sag Fighter™ is shipped fully assembled and ready to operate for very easy installation



The Sag Fighter™ provides solid, affordable protection for sensitive equipment from deep voltage sags (dips) without batteries or energy storage. Available in sizes from small three phase applications up to complete facility protection, the Sag Fighter™ is compatible with all load types and power factors.

Ideal for those applications where UPS and energy storage devices are impractical or too costly, the Sag Fighter™ has no batteries or other parts to replace and requires no regularly scheduled maintenance or monitoring. The 99% electrical efficiency offers huge energy savings when compared to other sag correction products – especially for large-scale applications.

Since the Sag Fighter™ does not depend on stored energy; it provides sag protection for as long as the sag condition exists. Also, protection from consecutive deep voltage sag events is always available since the Sag Fighter™ is never offline to recharge or reset.

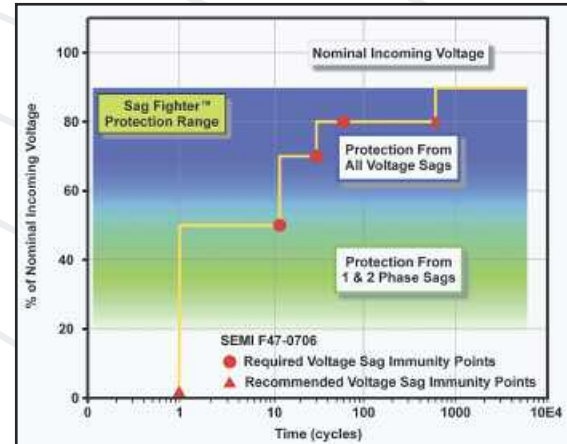
The Sag Fighter™ works simply by using additional current to create a properly shaped injection voltage to replace those portions of the voltage waveform that is missing during a sag event. The unit monitors the incoming voltage waveform for any deviation from normal and reacts to correct a sag when the voltage starts falling below 90% of nominal voltage.

Typical applications include:

- Manufacturing • Robotics
- Machining • CNC Processes
- Semiconductors • Plastics
- Textiles • Painting
- Industrial Automation
- Food Processing • Baking
- Printing • Continuous Processes
- Pulp & Paper • Batch Processes

The Sag Fighter™ difference:

- Corrects voltage sags back to 95+% of nominal voltage
- Corrects one or two phase sags down to 30% of remaining voltage
- Corrects three phase sags down to 60% of remaining voltage
- Provides a balanced, sinusoidal output
- Corrects phase shifting during sag events
- Provides correction for as long as the sag condition exists
- Uses no batteries or energy storage
- Always ready - No recharge or reset time required
- Low first cost and very low operating cost
- High Efficiency – 99%
- No scheduled maintenance



The Sag Fighter provides superior protection during long, deep sags and SEMI F47 compliance.



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Sag Fighter™ Active Voltage Conditioner – Sag Ride Through (SRT)

Standard Unit Specifications & Technical Data

Application			
Sizes (kVA) [3Ø only]	20, 25, 30, 50, 75, 100, 125, 150, 200, 250, 300, 400, 500, 600, 750, 1000, 1250, 1500, 1750, 2000...larger sizes available		
Input/Output Voltages	60 Hz: 208, 240, 480, 600	50 Hz: 220, 380, 400, 415	Non-standard voltages available
Sag Correction/Operating Characteristics			
Sag Correction	1 or 2 phase sags to 30% remaining voltage (-70% sag) corrected to 95% of nominal voltage 3 phase sags to 60% remaining voltage (-40% sag) corrected to 95% of nominal voltage		
Output Regulation	Nominal voltage ±5% during sag correction [Note: unit normally operates in monitoring mode until voltage reaches 90% of nominal voltage, at which time sag correction is initiated]		
Response Time	Full sag correction within 2 ms regardless of load or load power factor		
Correction Duration	Sags corrected for a minimum of 100 seconds regardless of load or power factor		
Regulation Variation	None – regulation constant for 0 to 100% load and any load power factor		
Phase Shift Correction	Phase shifts are corrected automatically during sag correction		
Harmonic Distortion	None added in monitoring mode		
Overload/Inrush Capability	6000% -1 cycle, 1000% - 1 second, 500% - 5 seconds, 200% - 1 min. ; 1000% fault clearing		
Load/ Power Factor	No minimum or part load or load power factor limitations, compatible with all load types		
Efficiency	99% during normal operation		
Operating Frequency	Conforms to NERC standards		
Noise Suppression/Protection			
Surge Suppression	Included, complies with ANSI/IEEE C62.41		
Input Circuit Breaker	Included, refer to standard circuit breaker sizes		
Failsafe Electronic Bypass	Auto-actuation on high temperature, over-current or component failure - with no loss of load		
Construction			
Technology	Microprocessor-controlled, inverter-based series voltage injection		
Transformer	Copper-wound, dry-type series transformer (3W+G input and output)		
Inverter Operation	Non-continuous operation – only during sag correction		
Cooling	Natural convection cooled with heatsink fans used only during sag correction		
Enclosure	Floor-mounted NEMA 1, ANSI 61 grey, other enclosure types & color available		
Cabling/Connections	See enclosure drawing for cable entry/exit options and circuit breaker/lug size table		
Audible Sound Level	Less than 65 dB @ 1 meter		
Display	Touchscreen event recorder and unit log (backlit LCD display on units less than 100 kVA)		
Controls	No controls or programming required, no user-adjustable controls		
Monitoring	Contacts for remote indication of unit and surge suppression status are included		
Environmental Requirements			
Temperature - Humidity	Ambient 32 to 104°F (0 to 40°C) – Relative humidity 0-95% non-condensing		
Operating Altitude	0 to 10,000 ft (3000m)		

Sag Fighter™ Active Voltage Conditioner – Sag Ride Through (SRT)

Weights & Dimensions, Model Numbers, Documentation and Common Options

Weights & Dimensions*						
kVA	Height (inches – cm)	Width (inches – cm)	Depth (inches – cm)	Weight - 60 Hz (lbs – kg)	Weight - 50 Hz (lbs – kg)	Enclosure
20	42 (107)	28 (71)	26 (66)	420 (191)	462 (210)	S28
25	42 (107)	28 (71)	26 (66)	450 (205)	495 (225)	S28
30	42 (107)	28 (71)	26 (66)	480 (218)	528 (240)	S28
50	42 (107)	28 (71)	26 (66)	550 (250)	605 (275)	S28
75	46 (117)	36 (91)	28 (71)	700 (318)	770 (350)	S36
100	46 (117)	36 (91)	28 (71)	1000 (455)	1100 (500)	S36
125	65 (165)	44 (112)	33 (84)	1150 (523)	1265 (575)	S44
150	65 (165)	44 (112)	33 (84)	1300 (591)	1430 (650)	S44
200	65 (165)	44 (112)	33 (84)	1600 (727)	1760 (800)	S44
250	65 (165)	44 (112)	33 (84)	2000 (909)	2200 (1000)	S44
300	65 (165)	44 (112)	33 (84)	2400 (1091)	2640 (1200)	S44
350	78 (198)	72 (183)	48 (122)	2800 (1273)	3080 (1400)	S72
400	78 (198)	72 (183)	48 (122)	3500 (1591)	4200 (1909)	S72
500	78 (198)	72 (183)	48 (122)	4500 (2045)	5400 (2455)	S72
600	78 (198)	72 (183)	48 (122)	5500 (2500)	6600 (3000)	S72
750	80 (203)	85 (216)	66 (168)	6500 (2955)	7150 (3250)	S85
1000	80 (203)	85 (216)	66 (168)	8500 (3864)	9350 (4250)	S85
1250	80 (203)	85 (216)	66 (168)	10000 (4545)	11000 (5000)	S85
1500	80 (203)	96 (244)	78 (198)	11000 (5000)	12100 (5500)	S96
1750	80 (203)	120 (305)	78 (198)	12000 (5455)	13200 (6000)	S120
2000	80 (203)	120 (305)	78 (198)	13000 (5909)	14300 (6500)	S120

*Weights and dimensions for standard units. Certain options may require a larger enclosure or increase weight. Contact factory for details.

Model Number Construction		
Model #: SRT - SSSS - AAA - OOOO		Example: 600 kVA, 50 Hz, 380v input with mechanical bypass: SRT-0600-380-5M
SSSS:	kVA size - include leading zeros e.g. 75 kVA = 0075	
AAA:	Input voltage (L-L) e.g. 480v = 480	
OOOO	Options – Refer to common options list for option code	

Standard Documentation & Factory Testing
Installation details (weights, enclosure dimensions, cable entry/exit, conductor connections, wiring connections) are typically issued with ten (10) working days in Portable Document Format (PDF). Two (2) copies of Owners Manual with unit information, electrical diagram(s) and factory test data are shipped with each unit. Every unit is factory tested to manufacturer's standards to confirm proper operation of the unit and any options. Contact factory for other requirements.

Common Options		
Option	Code	Description
50 Hz	5	For 50 Hz units
Power monitor with ModBus interface	C	Option D with Modbus interface for RS485 or RS422
Local power monitor	D	Local, pushbutton, digital display of amps, volts, power factor, kW. For input or output. Two (2) devices are required for both input and output
Non-standard enclosure	E	Contact factory for options and further details
Mechanical bypass	M	A closed-transition (make-before-break) maintenance bypass
Non-standard voltage(s)	N	For any non-standard input or output voltages
Undefined option(s)	Q, Q2, etc.	Used for any options not already defined

Sag Fighter™ Active Voltage Conditioner – Sag Ride Through (SRT)

Input Circuit Breaker & Output Lug Sizes

KVA	20			25			30			50		
Voltage	Amps	#	Size	Amps	#	Size	Amps	#	Size	Amps	#	Size
208	69	1	14AWG-1/0	87	1	14AWG-1/0	104	1	4AWG-300kcmil	173	1	4AWG-300kcmil
240	60	1	14AWG-1/0	75	1	14AWG-1/0	90	1	14AWG-1/0	150	1	4AWG-300kcmil
380	38	1	14AWG-1/0	47	1	14AWG-1/0	57	1	14AWG-1/0	95	1	14AWG-1/0
400	36	1	14AWG-1/0	45	1	14AWG-1/0	54	1	14AWG-1/0	90	1	14AWG-1/0
480	30	1	14AWG-1/0	38	1	14AWG-1/0	45	1	14AWG-1/0	75	1	14AWG-1/0
600	24	1	2AWG-4/0	30	1	2AWG-4/0	36	1	2AWG-4/0	60	1	2AWG-4/0
KVA	75			100			125			150		
Voltage	Amps	#	Size	Amps	#	Size	Amps	#	Size	Amps	#	Size
208	260	2	3/0-250kcmil	347	2	3/0-250kcmil	434	2	250-500kcmil	520	2	250-500kcmil
240	226	1	4AWG-300kcmil	301	2	3/0-250kcmil	376	2	3/0-250kcmil	451	2	250-500kcmil
380	142	1	4AWG-300kcmil	190	1	4AWG-300kcmil	237	2	3/0-250kcmil	285	2	3/0-250kcmil
400	135	1	4AWG-300kcmil	180	1	4AWG-300kcmil	226	1	4AWG-300kcmil	271	2	3/0-250kcmil
480	113	1	4AWG-300kcmil	150	1	4AWG-300kcmil	188	1	4AWG-300kcmil	226	1	4AWG-300kcmil
600	90	1	2AWG-4/0	120	1	2AWG-4/0	150	1	2AWG-4/0	180	1	4AWG-300kcmil
KVA	200			250			300			350		
Voltage	Amps	#	Size	Amps	#	Size	Amps	#	Size	Amps	#	Size
208	694	3	2/0-400kcmil	867	4	4/0-500kcmil	1041	4	4/0-500kcmil	1214	4	4/0-500kcmil
240	601	2	250-500kcmil	752	3	2/0-400kcmil	902	4	4/0-500kcmil	1052	4	4/0-500kcmil
380	380	2	3/0-250kcmil	475	2	250-500kcmil	570	2	250-500kcmil	665	3	2/0-400kcmil
400	361	2	3/0-250kcmil	451	2	250-500kcmil	541	2	250-500kcmil	631	3	2/0-400kcmil
480	301	2	3/0-250kcmil	376	2	3/0-250kcmil	451	2	3/0-250kcmil	526	2	250-500kcmil
600	241	1	6AWG-350kcmil	301	2	3/0-250kcmil	361	2	3/0-250kcmil	421	2	250-500kcmil
KVA	400			500			600			750		
Voltage	Amps	#	Size	Amps	#	Size	Amps	#	Size	Amps	#	Size
208	1388	4	#2-600kcmil	1735	6	#2-600kcmil	2082	6	#2-600kcmil	2602	10	#2-600kcmil
240	1203	4	#2-600kcmil	1504	4	#2-600kcmil	1804	6	#2-600kcmil	2255	6	#2-600kcmil
380	760	4	#2-600kcmil	950	4	#2-600kcmil	1140	4	#2-600kcmil	1424	4	#2-600kcmil
400	722	4	#2-600kcmil	902	4	#2-600kcmil	1083	4	#2-600kcmil	1353	4	#2-600kcmil
480	601	4	#2-600kcmil	752	4	#2-600kcmil	902	4	#2-600kcmil	1128	4	#2-600kcmil
600	481	4	#2-600kcmil	601	4	#2-600kcmil	722	4	#2-600kcmil	902	4	#2-600kcmil
KVA	1000			1250			1500			1750		
Voltage	Amps	#	Size	Amps	#	Size	Amps	#	Size	Amps	#	Size
208	3470	10	#2-600kcmil	4337	12	#2-600kcmil						
240	3007	10	#2-600kcmil	3759	12	#2-600kcmil						
380	1899	6	#2-600kcmil	2374	6	#2-600kcmil	2849	6	#2-600kcmil	3324	10	#2-600kcmil
400	1804	6	#2-600kcmil	2255	6	#2-600kcmil	2706	6	#2-600kcmil	3157	10	#2-600kcmil
480	1504	4	#2-600kcmil	1879	6	#2-600kcmil	2255	6	#2-600kcmil	2631	10	#2-600kcmil
600	1203	4	#2-600kcmil	1504	4	#2-600kcmil	1804	6	#2-600kcmil	2105	6	#2-600kcmil
KVA	2000			<ul style="list-style-type: none"> • kVA = unit kVA; Voltage = input voltage; Amps = Input circuit breaker rating • # = maximum # of input/output conductors; Size = Minimum/maximum input/output conductor sizes • Contact factory for other circuit breaker or conductor arrangements • All units include an internal grounding lug in accordance with the Grounding Lug Table. Larger units also have external grounding connections as shown on the enclosure drawing 								
Voltage	Amps	#	Size									
380	3798	12	#2-600kcmil									
400	3608	12	#2-600kcmil									
480	3007	6	#2-600kcmil									
600	2406	6	#2-600kcmil									

Ground Lug Table	Equivalent Area for Parallel Input Conductors (AWG/kcmil)	2 or smaller	1 or 1/0	2/0 or 3/0	Over 3/0 though 350	Over 350 through 600	Over 600 through 1100	Over 1100
		Size of Grounding Lug	8	6	4	2	1/0	2/0

Sag Fighter™ Active Voltage Conditioner – Sag Ride Through (SRT)

Overview

The Sag Fighter™ is an industrial-grade, solid state, electronic voltage sag corrector – active voltage conditioner that operates without batteries or energy storage.

Industrial-grade means that the Sag Fighter™ is compatible with all load types and load power factors and provides a minimum 1000% fault clearing capability. Unlike computer-grade products or uninterruptible power supplies (UPS), the Sure-Volt™ is designed for frequent high inrush current and low power factor loads without the need to over-size the product or to sacrifice reliability.

The Sag Fighter™ provides the following features:

- Sag protection compliant with SEMI-F47
- Full sag correction within 2 milliseconds
- Sag correction duration independent of load or power factor
- Sag correction for a minimum of 100 seconds
- Bypass operation is not required for high inrush or overload currents
- Continuous protection without the need to recharge or reset
- Non-continuous inverter operation increases reliability and provides 99% efficiency
- Battery-free design

The Sag Fighter™ consists of a three phase transformer with each of its secondary windings connected in series between the source (incoming line) and the load(s). Load current flows through the secondary windings of the transformer while the unit operates in a “monitoring” mode with the primary of the transformer shorted through SCR switches.

The Sag Fighter™ continuously monitors the input voltage waveform for any deviation from a balanced, three phase voltage. Upon sensing a deviation, the Sag Fighter™ engages an inverter circuit to apply an injection voltage to the primary windings of the series connected transformer. The injection voltage is synthesized with a magnitude, shape, and phase angle such that when added in series with the incoming voltage, a balanced, three phase voltage results. When a normal, three phase incoming voltage is detected at the input of the Sag Fighter™, the inverter circuit is disengaged and the unit returns to the monitoring mode.

The Sag Fighter™ is thermally rated to provide continuous correction for a voltage sag, although this is not normally required.

The Sag Fighter™ uses natural convection cooling and has no fans or other moving parts, however larger units may include heat sink fans that operate only when sag correction occurs. An automatic electronic failsafe bypass in the Sag Fighter™ maintains power to the load in the event of a unit malfunction.

The Sag Fighter™ works automatically to correct voltage sags with no operator effort or programming required. The unit display provides information on the unit status and timestamps sag correction events while alarm contacts are provided to permit remote indication of unit status.

Installation of the Sure-Volt™ is simple. The unit arrives completely assembled and requires no programming, testing, measuring, setting of switches or internal wiring. It installs much like a dry-type transformer – placing the unit and making input and output wiring connections. The Sag Fighter™ requires no regularly scheduled maintenance.

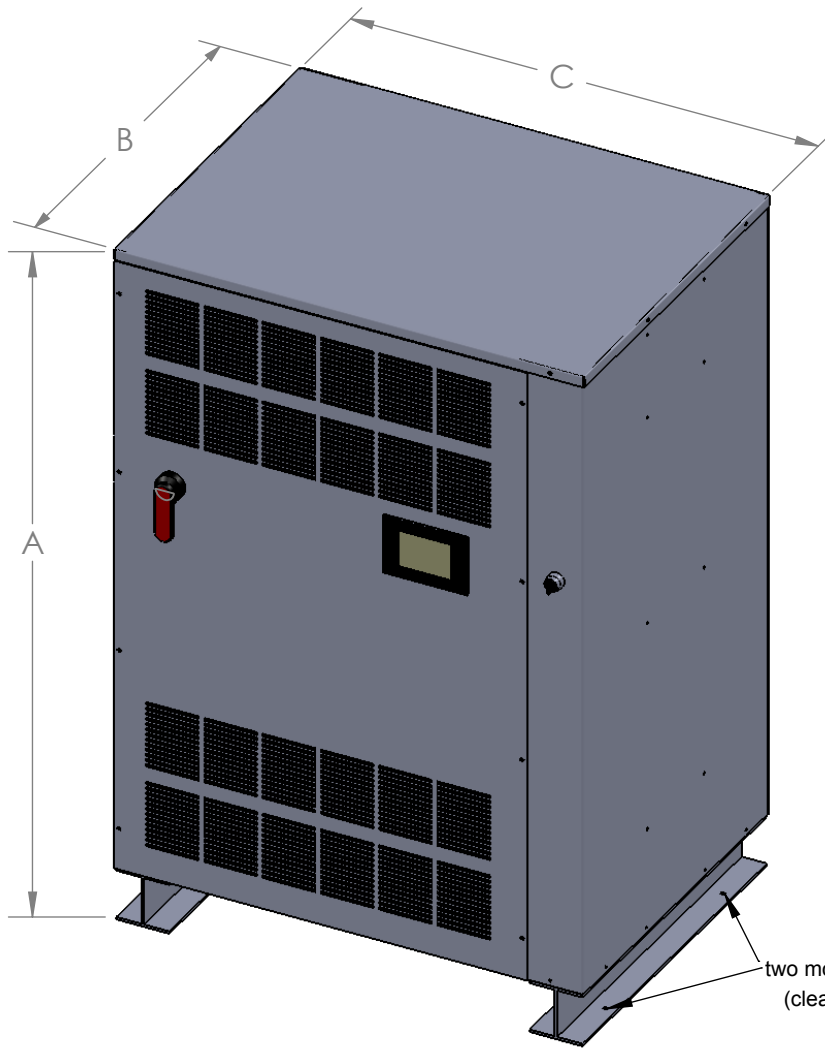


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two mounting holes each side
(clearance for 3/8" bolts)

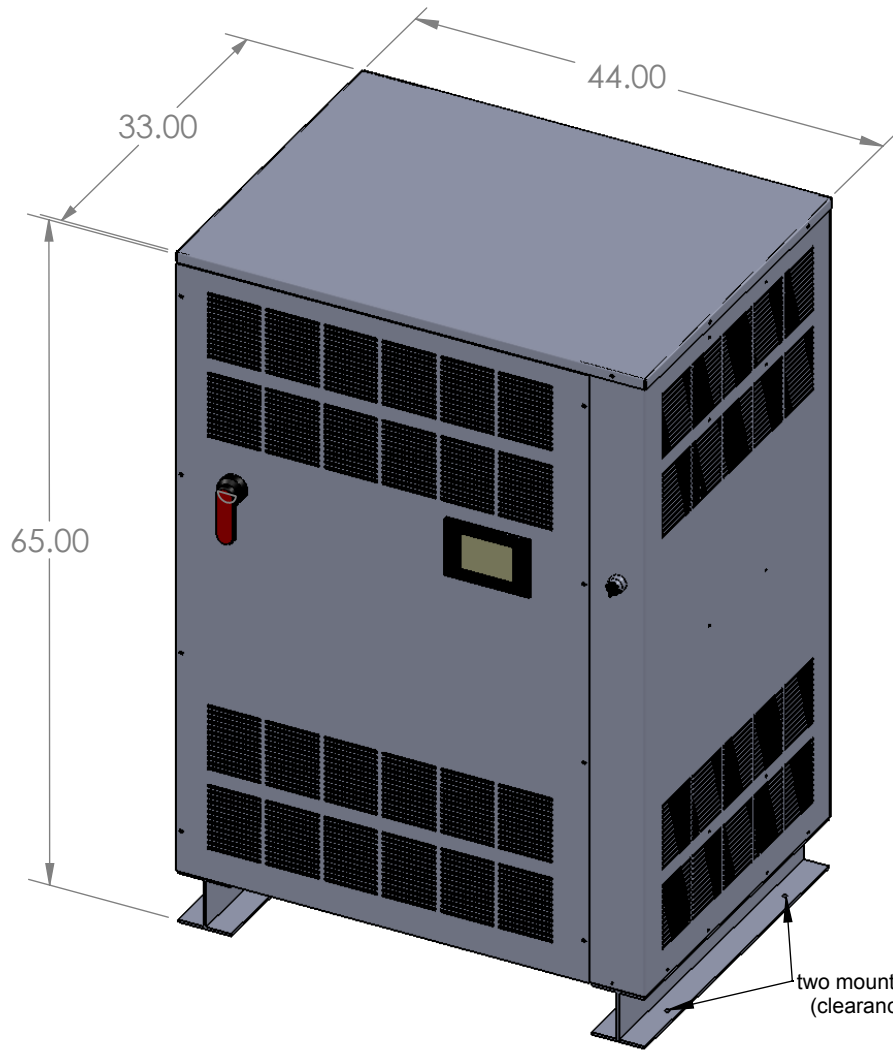
NOTES:

- 1). Penetrations may be made for cable entry/exit in the top or bottom or in the non-vented portion of the sides of the enclosure. The enclosure has no knockouts or removable panels for cable entry. The factory can pre-punch holes up to 4" diameter for conduit in the location of the customer's choice - with proper advance notification.
- 2). Recommended Minimum Clearances:
 - Front = 36", Top = 36"
 - Back = 12", Sides = 2"

Sides may have zero clearance if back clearance is increased by 3" for each side of zero clearance
- 3). The front and rear access panels are identical and are of the screw on type
- 4). Standard paint color is ANSI-61 grey
- 5). The unit **MUST** be lifted from the base only
- 6). Typical detail shown, not for construction
- 7). Dimensions:

Enclosure	A	B	C
S28	42"	26"	28"
S36	46"	28"	36"

UNLESS OTHERWISE SPECIFIED:		NAME	DATE	UTILITY SYSTEMS TECHNOLOGIES, INC P.O. BOX 110, LATHAM, NY 12110										
DIMENSIONS ARE IN INCHES	DRAWN	ERS	2/16/2009											
TOLERANCES:	CHECKED			TITLE: NEMA 1 Enclosure S28, S36										
FRACTIONAL ±	ENG APPR.													
ANGULAR:	MFG APPR.													
INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.			<table border="1" style="width: 100%;"> <tr> <td>SIZE</td> <td>DWG. NO.</td> <td>REV</td> </tr> <tr> <td style="text-align: center;">A</td> <td></td> <td></td> </tr> <tr> <td>SCALE: 1:16</td> <td>WEIGHT:</td> <td>SHEET 1 OF 1</td> </tr> </table>		SIZE	DWG. NO.	REV	A			SCALE: 1:16	WEIGHT:	SHEET 1 OF 1
SIZE	DWG. NO.	REV												
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SCALE: 1:16	WEIGHT:	SHEET 1 OF 1												
MATERIAL	COMMENTS:													
FINISH														
DO NOT SCALE DRAWING														



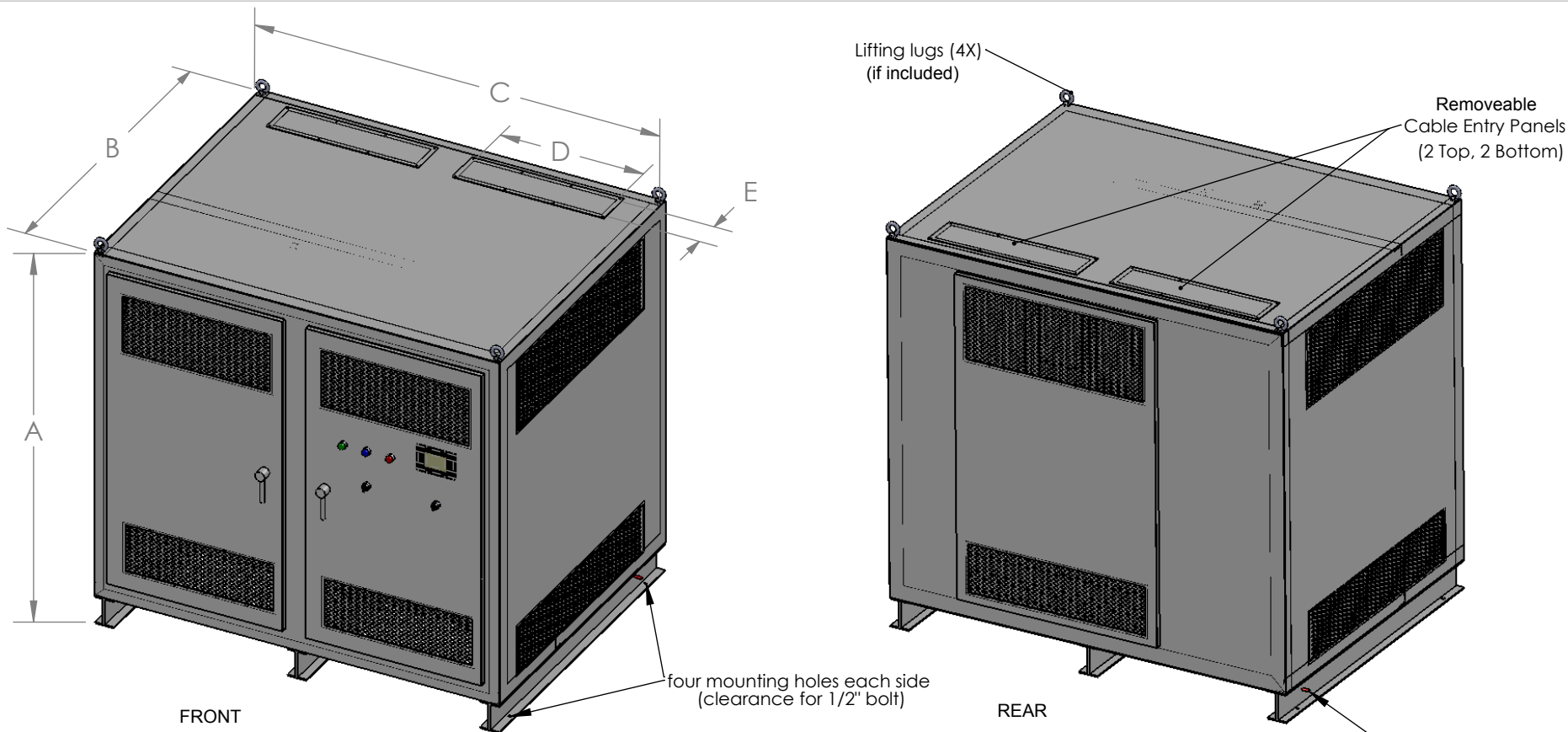
NOTES:

- 1). Penetrations may be made for cable entry/exit in the top or bottom or in the non-vented portion of the sides of the enclosure. The enclosure has no knockouts or removable panels for cable entry. The factory can pre-punch holes up to 4" diameter for conduit in the location of the customer's choice - with proper advance notification.
- 2). Recommended Minimum Clearances:

Front = 36",	Top = 36"
Back = 6",	Sides = 0 to 6"

If side clearance = 0", increase back clearance by 6" for each side blocked
- 3). The front and rear access panels are identical and are of the screw on type
- 4). The standard paint color is ANSI-61 grey
- 5). The unit **MUST** be lifted from the base only
- 6). Typical detail shown, not for construction

UNLESS OTHERWISE SPECIFIED:		NAME	DATE	UTILITY SYSTEMS TECHNOLOGIES, INC	
DIMENSIONS ARE IN INCHES	DRAWN	ERS	2/16/2009	P.O. BOX 110, LATHAM, NY 12110	
TOLERANCES:	CHECKED			TITLE:	
FRACTIONAL ±	ENG APPR.			NEMA 1 Enclosure S44	
ANGULAR:	MFG APPR.				
INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.				
MATERIAL	COMMENTS:			SIZE	DWG. NO.
FINISH				A	REV
DO NOT SCALE DRAWING				SCALE: 1:16	WEIGHT:
				SHEET 1 OF 1	

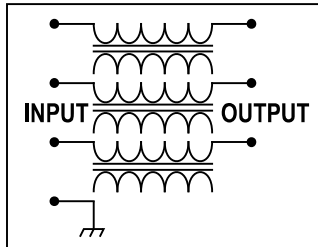
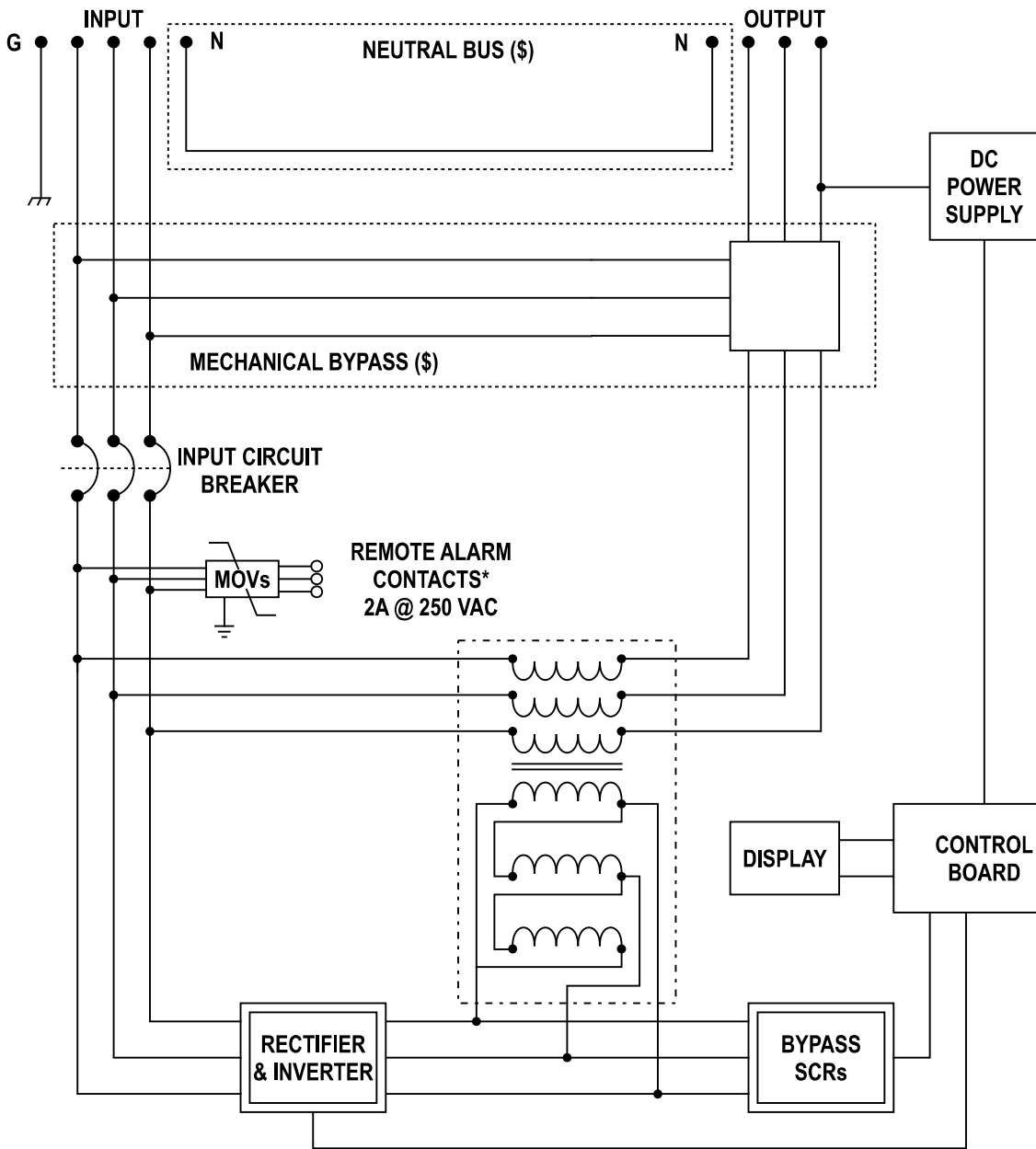


Enclosure	Dimensions			Clearances				Cable Entry Opening Size		Lifting lugs
	A	B	C	Front	Rear	Sides	Top	D	E	
S72	78"	48"	72"	34"	18"	12"	12"	20"	6"	No
S85	80"	66"	85"	40"	18"	12"	12"	30"	6"	Yes
S96	80"	78"	96"	44"	18"	12"	12"	30"	6"	Yes
S132	80"	78"	132"	44"	18"	12"	12"	Custom	Custom	Yes

NOTES:

- Units without lifting lugs MUST be lifted from the base of the unit.
- Rear panel may be removed during installation of cabling.
- Typical detail shown, NOT FOR CONSTRUCTION
- Standard paint color - ANSI-61 Grey
- The standard enclosure contains two mounting holes on each side of the base. Additional mounting holes can be included provided the request is made at the time of order.

UNLESS OTHERWISE SPECIFIED:		NAME	DATE	UTILITY SYSTEMS TECHNOLOGIES, INC P.O. BOX 110, LATHAM, NY 12110
DIMENSIONS ARE IN INCHES TOLERANCES:		DRAWN	ERS	
FRACTIONAL ±		CHECKED		TITLE: NEMA 1 Enclosure S72, S85, S96, S132
ANGULAR:		ENG APPR.		
INTERPRET GEOMETRIC TOLERANCING PER:		MFG APPR.		SIZE DWG. NO. REV
MATERIAL 12 ga. steel		Q.A.		
FINISH		COMMENTS:		SCALE: 1:30 WEIGHT: SHEET 1 OF 1
DO NOT SCALE DRAWING				



● POWER WIRING INTERFACE POINTS
 ○ CONTROL WIRING INTERFACE POINTS
 * ALL CONTROL WIRING IS DISCRETIONARY
 ITEMS MARKED (\$) ARE EXTRA COST OPTIONS

REMOTE ALARM CONTACT*
 0.6A @ 125VAC
 0.6A @ 110VAC
 2.0A @ 30VDC

Utility Systems Technologies, Inc. PO Box 110, Latham New York 12110		
TITLE: SAG FIGHTER ELECTRICAL SCHEMATIC WITH OPTIONS		
REV: 2 DATE: January 22, 2009 1 DATE: AUGUST 15, 2008 0 DATE: DECEMBER 03, 2007	SIZE: A	DWG NO.: SRT-0000-000
SCALE: NONE		REV: 0
SHEET: 1 OF 1		

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