

**Utility Systems Technologies, Inc.**

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**SagFighter™ Active Voltage Conditioner / Sag Ride Through (SRT)**

Overview

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

Industrial-grade means the SagFighter is compatible with all non-regenerative load types and load power factors and provides a minimum 1,000% fault-clearing capability. Unlike computer-grade products or uninterruptible power supplies (UPS), the SagFighter is designed for frequent high-inrush current and low-power factor loads without the need to over-size the product.

The SagFighter 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
* No need for bypass operation for high inrush or overload currents
* Continuous protection without the need to recharge or reset
* Non-continuous inverter operation that increases reliability and provides 99% efficiency
* Battery-free design

The SagFighter 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 transformer windings shorted through SRC switches.

The SagFighter™ 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 so that when it is added in series with the incoming voltage, a balanced, three-phase voltage results. When normal, three-phase incoming voltage is detected at the SagFighter input, the inverter circuit is disengaged and the unit returns to monitoring mode.

The SagFighter is thermally ranged to provide continuous correction for a voltage sag, although this is not normally required.

The SagFighter uses natural convection cooling and has no fans or other moving parts. Larger units may include heat-sink fans that operate only when the unit is correcting a sag event. An automatic electronic failsafe bypass is incorporated into the standard design so the SagFighter maintains power to the load if a unit malfunctions.

The SagFighter automatically corrects voltage sags with no operator or programming required. The unit display provides unit status and historical information on sag correction events. Alarm contacts are also provided to permit remote indication of SagFighter status.

SagFighter installation is simple. The unit arrives completely assembled and requires no programming, testing, measuring or setting of switches. It is designed to install much like a dry-type transformer: simply place the unit and make input and output wiring connections. The SagFighter typically has no maintenance schedule other than routine inspection and cleaning.

**SagFighter™**

Specifications

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| --- |
| **Application** |
| **Power Rating/Size (kVA)**  | 100, 125, 150, 200, 250, 300, 350, 400, 500, 750, 1,000, 1,250, 1,500, 1,750, 2,000 kVA  |
| **Phase - Frequency (Hz)** | 3Ø, 50 or 60 Hz  |  |  |
| **Standard 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 at least 95% of nominal voltage. 3-phase sags to 60% remaining voltage (-40% sag) corrected to at least 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 typically within 2ms, 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** | 1,000 % - 1 second, 500% - 5 seconds, 200% - 1 min.; 1,000% fault clearing |
| **Load / Power Factor** | No minimum or part load or load-power factor limitations; compatible with all load types. |
| **Efficiency** | 99% typical |
| **Operating Frequency** | +/- 3% from nominal frequency (50Hz or 60Hz) |
| **Operating Environment** | Performance specifications are based on the input (source) voltage meeting IEEE 519 standards. |
| **Noise Suppression/Load Protection** |
| **Surge Suppression**  | Included, complies with ANSI/IEEE C62.41, UL 1449 |
| **Input Circuit Breaker**  | Included, standard, UL 489, ANSI/IEEE C22.2 |
| **Failsafe Electronic Bypass**  | Auto-actuation on high temperature, over-current, 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 heat-sink fans used only during sag correction [contaminant free, dry, clean air] |
| **Enclosure** | Floor-mounted NEMA-1, ANSI 61 grey. Custom enclosures also available – contact factory. |
| **Cabling/Connections** | See enclosure drawing for cable entry/exit options and circuit breaker/lug size table. |
| **Audible Sound Level** | Less than 65dB @ 1 meter |
| **Display** | Touch-screen display with event history recorder, operational data, and utilities |
| **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 3,300 ft (1000m)  |

**SagFighter™**

Options

|  |  |  |
| --- | --- | --- |
| **Option** | **Code** | **Description** |
| **50 Hz** | 5 | Required to identify 50Hz units - standard units are 60Hz |
| **Power Monitor with ModBus Communications** | C | Local, push-button digital display of amps, volts, power factor, Power. For input and/or output. |
| **Non-Standard Enclosure** | E | Per customer specification. Contact factory for further details. |
| **Mechanical bypass** | M | An open transition bypass to power load while isolating the SagFighter™ for inspection or maintenance. The standard SagFighter includes an automatic failsafe internal bypass to maintain power to the load in the event of a malfunction and may operate indefinitely on this internal bypass. The internal bypass will be supplied even if the mechanical bypass option is selected.  |
| **Non-Standard Voltages** | N | For any non-standard input or output voltage |
| **Wiring Labels** | L |  |
| **Undefined Options (custom)** | Q | Option designed to meet specific customer requirement |

**SagFighter™**

Weights and Dimensions•

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **kVA** | **Height****Inches (cm)** | **Width****Inches (cm)** | **Depth****Inches (cm)** | **Weight - 60Hz****Lbs. (kg)** | **Weight - 50Hz****Lbs. (kg)** | **Enclosure** |
| 100 | 46 (117) | 36 (91) | 28 (71) | 1000 (455) | 500 | S36 |
| 125 | 65 (165) | 44 (112)  | 33 (84) | 1150 (523) | 575 | S44 |
| 150 | 65 (165) | 44 (112)  | 33 (84) | 1300 (591) | 650 | S44 |
| 200 | 65 (165) | 44 (112)  | 33 (84) | 1600 (727) | 800 | S44 |
| 250 | 65 (165) | 44 (112)  | 33 (84) | 2000 (909) | 1,000 | S44 |
| 300 | 80 (203) | 56 (142) | 40 (102) | 2400 (1091) | 1,200 | S56 |
| 350 | 80 (203) | 56 (142) | 40 (102) | 2800 (1273) | 1,400 | S56 |
| 400 | 80 (203) | 72 (183) | 48 (122) | 3500 (1591) | 1,909 | S72 |
| 500 | 80 (203) | 72 (183) | 48 (122) | 4500 (2045) | 2,455 | S72 |
| 600 | 80 (203) | 72 (183) | 48 (122) | 5500 (2500) | 3,000 | S72 |
| 750 | 80 (203) | 85 (216) | 66 (168) | 6500 (2955) | 3,250 | S85 |
| 1,000 | 80 (203) | 85 (216) | 66 (168) | 8500 (3864) | 4,250 | S85 |
| 1,250 | 80 (203) | 85 (216) | 66 (168) | 10000 (4545) | 5,000 | S85 |
| 1,500 | 80 (203) | 96 (244) | 78 (198) | 11000 (5000) | 5,500 | S96 |
| 1,750 | 80 (203) | 120 (305) | 78 (198) | 12000 (5455) | 6,000 | S120 |
| 2,000 | 80 (203) | 120 (305) | 78 (198) | 13000 (5909) | 6,500 | S120 |
| \* | Weights and dimensions for standard units. Certain options may require a larger enclosure or increase the weight. |
|  | Contact factory for details |  |



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