

# SG Series

## 10-150 kVA high efficiency UPS Systems





## GE Energy

### GE Energy- Touching all Areas of the Energy Industry.

With more than 100,000 employees in over 100 countries, GE Energy's diverse portfolio of products and services is helping customers solve problems every day. We touch all areas of the energy industry including energy electrical management, smart grid modernization, coal, oil, gas, nuclear energy, water, wind, solar and biogas.

### GE Energy Management - Providing Reliable Power to your Mission-Critical Business Needs.

With a comprehensive energy management portfolio, GE Energy Management is uniquely qualified to provide industrial, commercial and datacenter infrastructure solutions with their Industrial Solutions and Digital Energy businesses.

Digital Energy is a global solutions provider modernizing and optimizing how we generate, move, and consume energy. Digital Energy invents, improves and integrates communications, automation, and power delivery technologies to enable cleaner, smarter, and more efficient power for electrical infrastructures and consumers around the world.

## Ensuring uptime for critical processes



For mission critical processes, customers rely on our Digital Energy's industry-leading power quality solutions to increase critical system reliability. Power Quality has technology that delivers superior performance and industry-leading energy efficiency for facility backup power management. In addition to our UPS Solutions, we provide the Standby Generator Paralleling Switchgear, Automatic Transfer Switches and Surge Suppression Devices that deliver power efficiently and reliably.

# SG Series 10-150 kVA UPS Modules

## Delivering Reliable Power in a Flexible Design

The GE Energy SG Series is one of the most efficient and reliable Three Phase UPS Systems, providing best-in-class output performance and critical power protection for your data center needs.

The SG Series UPS solutions are designed and optimized to provide high efficiency at part load conditions. The SG Series UPS assures low input current harmonic distortion and best-in-class output voltage regulation and dynamic response. This helps customers save operational costs while implementing environmentally-friendly solutions.

## Best in Class Transformer-based UPS

- Excellent operating efficiency with written efficiency guarantees
- Smart Input Filters enhances generator compatibility
- Innovative product technologies that boost efficiency, reliability and lengthen battery life

## Easier Installation and Configuration Flexibility

- Top or bottom cable access
- Matching battery and maintenance bypass cabinet for easy configuration
- Front Maintainability Design reduces mean time to repair (MTTR)
- Seismic Certifications

## Scalable Solution

- Redundant Parallel Architecture (RPA) provides reliability, redundancy and scalability
- Parallel up to 6 UPS Modules
- Long history of experience with Redundant Parallel Architecture (RPA) which increases system reliability by eliminating single point of failures



## Key Features



- Up to 65KA Withstand Fault Rating
- Smart Input Filtering for max GenSet Compatibility
- ZigZag Output Isolation Transformer
- Top or Bottom Cable Entry
- Continuous Duty Static Bypass Assembly
- Front Access Only to minimize footprint
- Input/Output Cable Length Flexibility

## Innovative Product Technology

### Space Vector Modulation (SVM)

Space Vector Modulation is the next generation of Pulse Width Modulation (PWM) inverter control technology. SVM uses an advanced switching technique for PWM driving Insulated Gate Bipolar Transistors (IGBT).

#### Advantages

- Higher Efficiency: Reduces switching losses and improves partial load efficiency
- Improved Output Performance: Reduces Total Harmonic Distortion (THD) with non-linear loads and improves transient response to step loads
- Precise Paralleled System Performance: More accurate load sharing with multiple units operating in parallel

### Superior Battery Management (SBM)

Every GE UPS incorporates a standard feature called Superior Battery Management (SBM) that can be configured to periodically test the battery system and calculate true battery runtime using measured values for temperature and load.

#### Advantages

- Works With all Battery Types: Flooded, VRLA NiCad, and Sodium (GE Durathon)
- Online Battery Test: The risk of load loss is prevented by periodic rectifier/battery testing to insure proper operation
- Increases Battery Life: Monitors all key parameters of the battery plant to maximize reliability and warn of possible problems

### Digital Signal Processor (DSP)

DSP (Digital Signal Processor) performance enables the high sampling rates required to achieve the appropriate bandwidth for the current and voltage controls for an efficient double-conversion UPS.

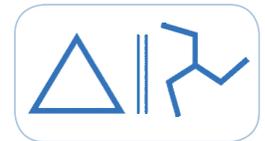
- High speed sampling rate for precise RPA control.
- Faster transient response time
- Redundant high speed communication
- All digital controls for increased reliability and stability
- All system control parameters are adjustable from the front panel

### Zig Zag Output Transformer

The ZigZag transformer enables the UPS to run with heavily unbalanced loads while supplying full kVA output capacity at 100% non-linear load.

The secondary windings of the output transformer form a ZigZag pattern to cancel triplen (third order) load harmonics. This reduces neutral conductor loading and losses in all the conductors and the input transformer.

- Provides Galvanic Isolation of the Load
- Protects Inverter from Non-Linear Loads
- Protects Inverter from High Inrush Loads



## SBM - UPS Battery Management and Test

SBM is a comprehensive and programmable management and monitoring system that protects the UPS battery string life. Batteries are prevented from overcharging and deep discharging.

- Calculates true battery autonomy and remaining battery backup time during utility outage.
- Measures the volts per cell of the battery system and compensates for temperature and load
- During UPS startup, the SBM is programmed with specific battery information
- Programmable features allow the user to select the frequency and type of battery tests that are performed. Frequency range can be from once per week to annually. Test type range can be from deep cycle to 3-min discharges.
- All tests logged in the UPS events menu and any failure is reported on the UPS front alarm panel.
- All tests done automatically with the UPS on-line.
- Manual tests can be performed at any time.
- Remote programming and configuration is available through the SG Series UPS protection software.

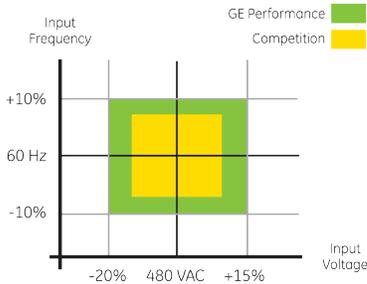


# High Performance

## Input Performance

### Robust Rectifier for Wide Input Range

The wide AC input voltage and frequency window avoids unnecessary battery discharge even when operating from an unstable AC source (i.e. diesel generator).



### Programmable Soft Start

Allows the rectifier to ramp up in a programmable time period (0-30 seconds) eliminating in-rush current. This feature reduces the need of oversizing the input power system (gensets, feeder cables, and overcurrent devices).

### Smart Input Filters, <7 % THDi

GE offers an optional internal input filter with the SG Series UPS. The "smart" filter has a programmable feature that allows the filter to be switched off during start-up and low load conditions, preventing leading power factor (PF).

### Generator Compatibility

User-programmable features such as slew rate, phase angle rate-of-change and voltage rate-of-change allow the UPS to quickly sync to a genset during emergency back-up. GE's optional input filter also has user-programmable features ensuring quick and continuous synchronization to generator voltage.

## Output Performance

### Total Harmonic Distortion (THD)

A distorted output voltage waveform affects the proper function of the load's equipment. The SG Series has very low output voltage THD, even with connected 100% unbalanced or 100% non-linear loads.

### Transient Response

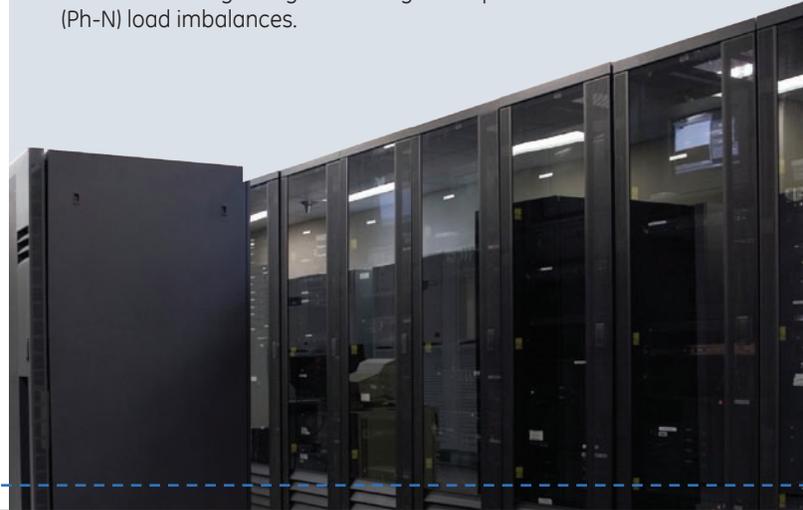
With the use of SVM and the ZigZag transformer, the GE UPS can react very quickly to zero-100% step loads (within 1/3 cycle). This reduces the need to oversize the UPS for severe pulse-load applications.

### Overload Capabilities

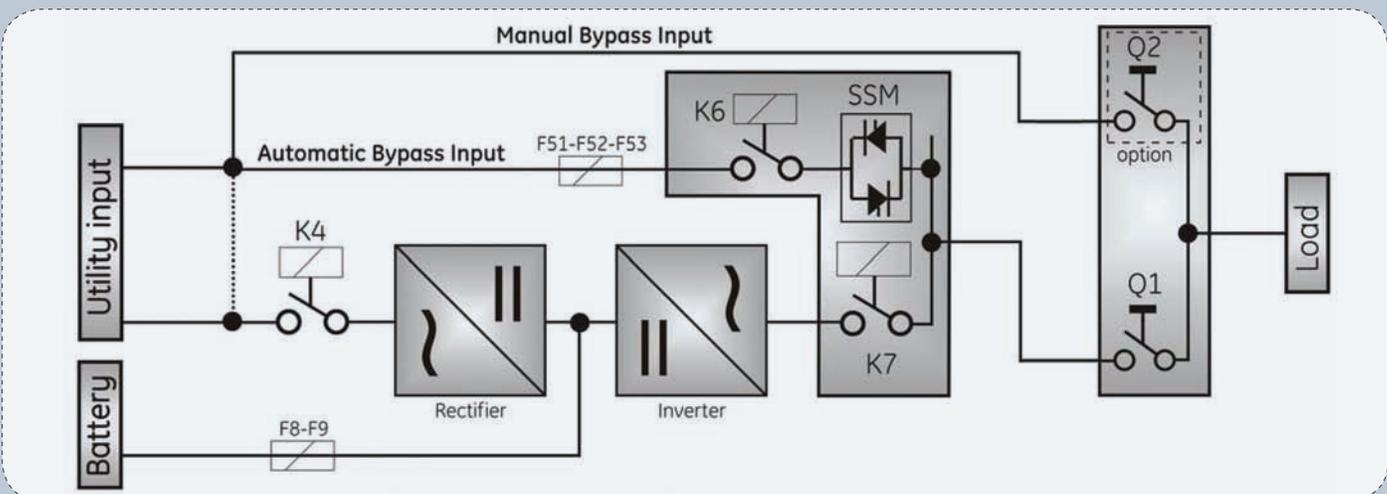
The SG Series UPS has a robust inverter capable of delivering 150% overload for 60 seconds.

### Phase Load Imbalance

The UPS Output ZigZag transformer, via its inherent characteristics and windings configuration, provides excellent voltage regulation against phase-to-neutral (Ph-N) load imbalances.



# UPS Module Power Paths



# Redundant Parallel Architecture™ (RPA) System Configuration

GE provides RPA, a unique technology that can parallel UPS modules with true redundancy by eliminating any single point of failure. RPA provides a scalable paralleling technique that reduces operating footprint and increases system reliability by eliminating the need for external paralleling equipment and cabinets (centralized bypass and master control).

One of the UPS modules in the system intelligently takes the leadership role, while the other UPS modules have access to all control parameters. If one UPS fails to operate, the load is automatically redistributed among the others. If the lead UPS fails to operate, then another UPS automatically takes on the leadership role. GE's RPA technology is implemented by distributing the control electronics within each UPS module in the system.

## RPA™ System Advantages

### No Single Points of Failure

The RPA system provides complete redundancy of all critical components, allows paralleling of up to 6 units for increased load capacity or redundancy.

### Scalable and Modular

The system can be easily expanded for higher capacity and redundancy without any interruption to the critical load or transfer to bypass. Redundant Communication

Redundant high speed bus and control electronics provide higher system reliability.

### Distributed Control Logic

Each module in an RPA system has its own operational controller. Each one continuously communicates with all others in order to manage the entire system like a team.

### Online Maintenance

N+1 configurations allow maintenance on any single module in the system while other modules provide online protection with battery backup.

### Sequential Soft Start

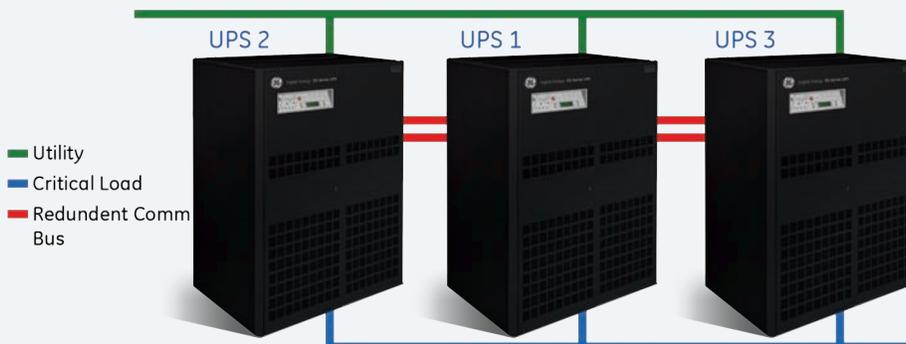
Provides sequential soft start of each module to reduce instantaneous load on input feeders during mains recovery. This helps avoid over-rating of generator and overheating of cable and fuses.

### Smaller Footprint

RPA eliminates centralized control and external static bypass cabinet.

## GE's RPA™ System

### Standard RPA™ Configuration: True Redundancy with Distributed Control & Bypass



### Inside each UPS Module is:

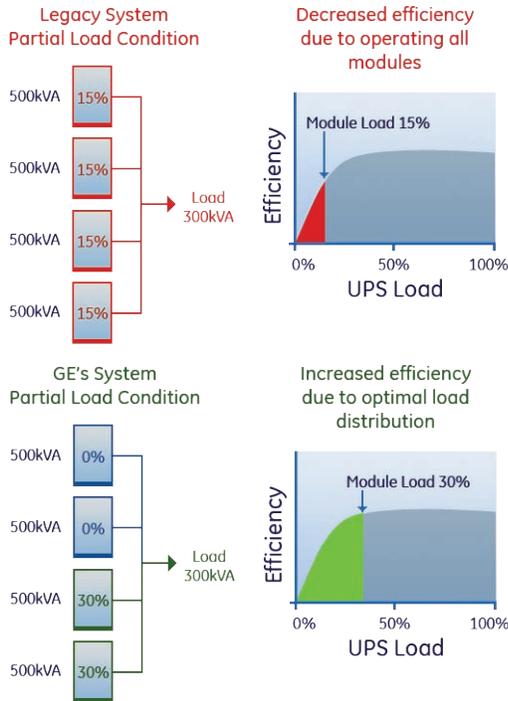
- RPA Control/ Communications
- 100% Rated Static Switch

Over 8,000 RPA UPS Systems installed globally!

# Redundant Parallel Architecture™ (RPA) System Options

## Intelligent Energy Management Integrated (IEMi)

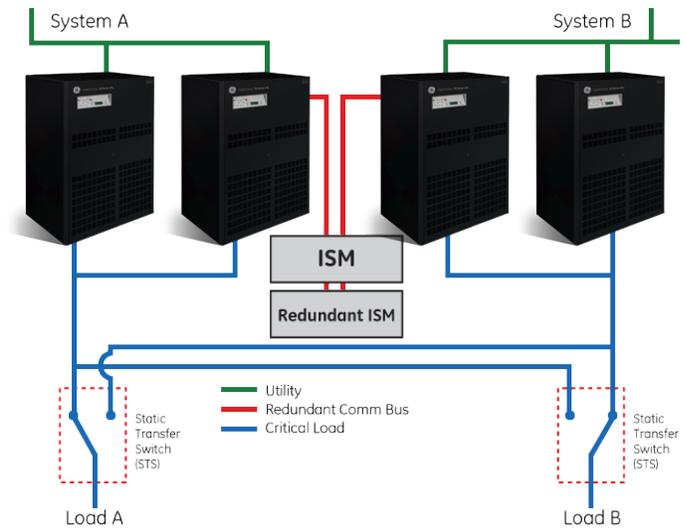
IEMi is a software package which allows RPA systems to save energy and reduce operating costs (\$) during low load conditions. Individual inverters, which are not required to support the load, can automatically be switched off to save energy costs (\$). The IEMi mode can be programmed for various operating modes and the customer defines the degree of redundancy required.



## Intelligent Sync Module (ISM)

For System + System (2N) applications, the ISM module is utilized to synchronize the outputs of two modules or two groups of UPS's that are fed from separate and independent sources. This allows the two systems to be synchronized for down-stream switching. The ISM is an intelligent control that is mounted external from the UPS module.

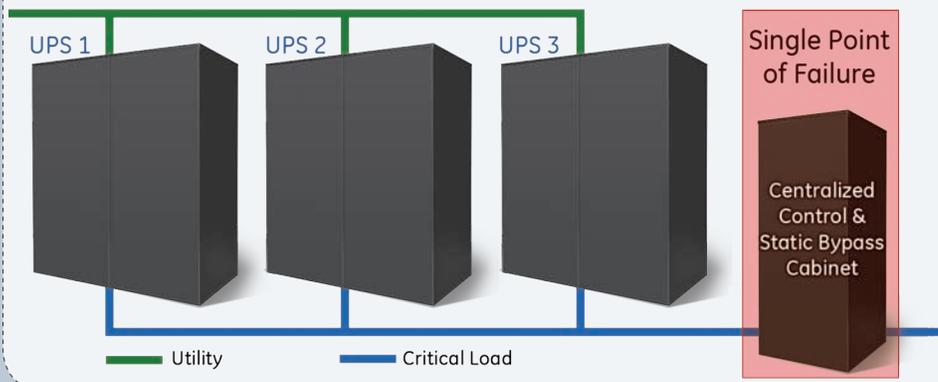
It has the ability to select which system is master and can also send/receive permissive signals from downstream devices. Additionally, the ISM follows the same tradition as RPA with redundancy in all critical components. The ISM communicates via redundant communication cables and has options for redundant power supplies and control circuitry.



ISM: Standard S+S Configuration

## Competitor's Centralized Static Bypass System

### Centralized Logic / Bypass / Breaker Configuration: Single Point of Failure



#### Non-Redundant:

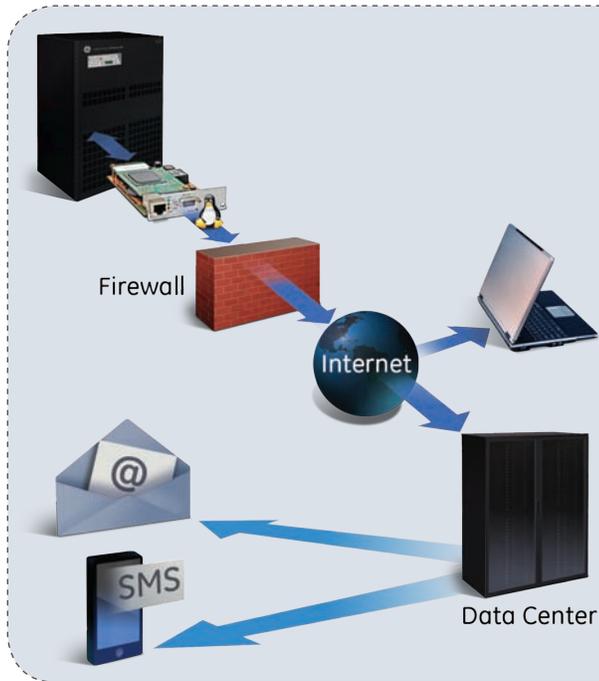
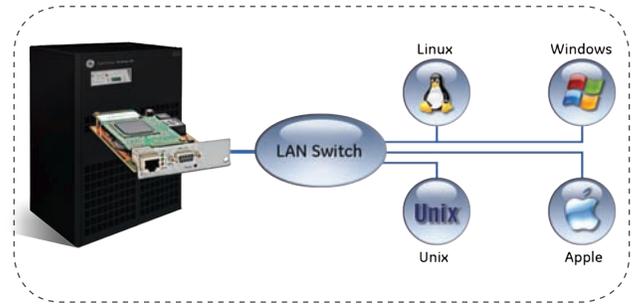
- Central Control
- Centralized Bypass
- Output Breaker
- Static Bypass Switch

# Software & Connectivity Solutions

## Protection Software

GE Data Protection software can communicate with the UPS over RS-232, USB or SNMP to receive status information and measurement values of the UPS. In case of a critical condition (time on battery, remaining battery autonomy time or low battery) for the load, the software starts a controlled shutdown.

An enhanced alarm management system provides the possibility to start applications, send messages, and send e-mails for every upcoming or disappearing alarm.



## Remote Monitoring and Diagnostic Solution

GE remote monitoring solution is an anytime, anywhere concept in UPS status monitoring and alarm notification supporting all GE UPS product lines.

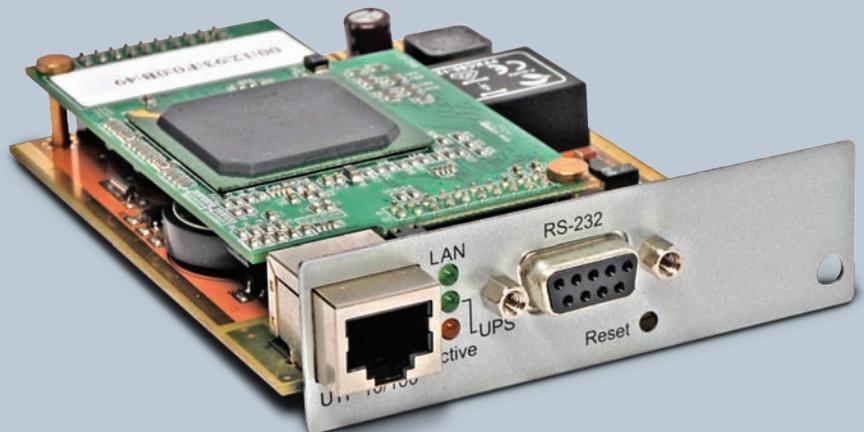
Accessing the latest site information via Web and being alerted by Email or SMS, it enables the user to make timely decisions in case of changing critical conditions. With comprehensive data collection and analysis it improves diagnostics capability and enhances response time.

- 24/7 remote access to your UPS data using standard web browser
- Automatic alerting in case of event direct and immediately to you cell phone or by email
- Regularly operational reports with proactive information on critical data
- Preventative information using PMAD (Preventative Maintenance & Advanced Diagnostics) feature
- Possibility to reduce intervention and onsite work

## Remote Connectivity to Building Management Systems

This optional Standard Network Management Protocol (SNMP) Plug-In Card allows the UPS to communicate over a LAN or interface through all major building management systems (BMS).

Integrates a modern web server for UPS monitoring Via LAN, drives remote server shutdown in case of critical UPS alarms and works as Modbus TCP Converter "as well as Modbus RTU 485".



## Options & Accessories

### *UPS Rectifier*

The 6-Pulse Rectifier is standard for the SG Series 10-150 kVA UPS Modules.

### *Input Harmonic Filters*

The 5th harmonic input filter is used for reducing the 5th harmonic generated by the 6-pulse Rectifier. This filter reduces the input harmonic distortion to less than 7% THD, and increases the output power factor to 0.93.

### *FCC EMI Filters*

GE provides an internal FCC EMI filter as a cost-effective option for installations that require FCC Class A certification (150 kVA and below).

### *Module Fault Withstand Rating*

Series SG UPS modules have Fault Withstand ratings up to 65kA maximum.

### *Remote Alarm Status Panels*

GE provides both single and multi-module versions of a Remote Alarm Status Panel for remote summary status of key UPS parameters

### *4x2 Combo Cabinets*

GE provides integrated cabinets to include 3CB maintenance bypass capability at 480V with downstream stepdown transformer to 208/120V. Feature options include SKRU kirk key interlocks and 208V output subfeed circuit breakers or panelboard.



### *Battery Cabinets*

GE provides line-and-match VRLA Battery cabinet Systems with integral overcurrent protection with various back up time configuration. Optional battery monitoring or seismic certifications available for these cabinets.

### *Maintenance Bypass Cabinets*

GE provides line-and-match Maintenance Bypass cabinets or switchgear-design non-matching cabinets. Feature options include SKRU kirk key interlocks and integrations with RPA Output Panels for paralleled UPS Systems

### *Seismic Certification*

GE has achieved certification on many UPS Modules for the healthcare vertical market and its OSHPD requirements, and such can be used on seismic needs anywhere in North America.

## Surge Protection Devices

GE provides a complete line of wallmount Surge Protection devices, up to 300kA ratings, that provide enhanced surge protection to switchgear, panelboards and UPS systems.

Transient voltage surges from both external and internal sources directly affect the performance and life expectancy of electronic equipment. From electronic lighting ballasts to computer servers, if there is a printed circuit board inside, it is susceptible to transient voltage surge damage. As microprocessors and components that make up this equipment grow smaller and faster with each new generation, their susceptibility to transient voltage surge damage becomes ever greater.

Available in ratings from 65kA - 300kA per mode, (130kA -600kA per phase) the TR7000 series is the perfect surge suppression product for protecting critical sensitive electronic equipment throughout your facility.

Recommended installation locations are service entrance switchboards, panelboards and UPS systems.



# Factory Testing and Customer Witness Testing

Factory Testing can include, but is not limited to:

- Functional test of full parallel RPA system including transfers to bypass, utility failure, EPO etc.
- Full Functional test of parallel RPA system including master fail and communications failure simulations
- Steady state measurements from 0-100% load of voltage, current, output voltage regulation, input/output power factor, output voltage THD, input current THD, frequency.
- Overload of full system up to 150%
- 100% utility failure with waveform capture
- 0-100% step loads with waveform capture
- 0-100% bypass transfers with waveform captures
- Output short circuit with waveform capture
- Removal of module from the system with waveform capture
- Inverter or power supply failure simulations
- Full functional test of RPA output switchgear including transfers in and out of main bypass mode



## Field Testing & Service Capabilities

On-Site Services that include:

- UPS Module Startup & Test
- Battery Measurement & Monitoring
- Load Bank Testing
- Thermography Testing
- Project Management
- Site Commissioning Assistance
- Repair, upgrade, retrofit
- Site Audits & Assessments



## Our UPS Backs Up Your Load, Our Service Backs Up Your UPS

GE's UPS Services offerings range far beyond standard product support: from on-site services for risk-reducing installation and startup, to availability services to help you proactively reduce downtime and meet your service-level commitments. From installation to product retirement, warranty upgrades to remote monitoring, proactive care to 24/7 problem resolution, you can rely on GE's field service organization for all your electrical infrastructure support needs.

### *On-Site & Emergency Services*

- 24/7 Emergency Hotline

### *Spare Parts*

- Spare Part Kits
- Product Replacement / Return
- Equipment Rentals
- Battery & Capacitor Replacements

### *Contractual Services*

- Maintenance Service Contracts
- Remote Monitoring & Diagnostics
- Technical Services

### *Training*

- Training for operators
- Training for maintenance staff
- Product training
- Web-based training

Your electrical infrastructure's availability, stability, and adaptability are crucial to your business success. Rely on the support professionals who know your systems best!



## Customer Service Support

Toll Free: 1.800.637.1738

US- Based Customer Service

Answered Live 24/7



# Technical Specifications

Power Rating	Output Power rating (KVA)	10	20	30	40	50	80	100	120	150	
	Output Power Rating (KW) - 0.80 PF	8	16	24	32	40	64	80	96	120	
Energy Usage	Efficiency at 50% Load	89.5%	88.7%	90.5%	90.5%	92.2%	92.5%	92.9%	93.1%	93.3%	
	Efficiency at 100% Load	90.0%	89.0%	91.0%	91.0%	91.8%	92.0%	92.4%	92.7%	92.8%	
	BTU/hr at 100% Load	3,036	6,751	8,104	10,808	12,201	19,005	22,472	25,819	11,795	
Physicals	Dimensions, w x dp x h (in.)	27 x 32 x 71				27 x 32 x 71			27 x 32 x 71		
	Weight, module only (lbs)	735	763	970	1,147	1,257	1,489	1,929	2,006	2,160	
Input	Voltage	480/277V 3ph 3w or 4w + gnd ; Input Source must be 480/277V grounded wye									
	Topology	6-Step Thyristor Bridge Rectifier									
	Input Filter	5th Harm									
	Dual Input Capable	Remove internal jumper cables for separate inputs to Rectifier & Static Bypass									
	Voltage Range (w/o battery discharge)	-20% to +15%									
	Power Factor (lagging)	0.93 (w/input filter); 0.80 w/o input filter									
	Current THD	< 10% (w/input filter)				< 7% (w/input filter)					
	Frequency	60Hz +/- 10%									
	Output	Voltage	480/277V 3ph 3w or 4w + grd								
Topology		PWM IGBT Inverter w/SVM Technology and ZigZag Isolation Transformer									
Frequency		60Hz +/- 10%									
Crest Factor		3 : 1									
Static Voltage Regulation		+/- 1%									
100% Step Load Voltage Regulation		+/- 3%									
100% Linear Load Voltage Distortion		2% THD maximum									
100% Non-Linear Load Voltage Distortion		3% THD maximum									
Overload Capability/Inverter		125% for 10 min ; 150% for 1 min									
Overload Capability/Static Bypass		110% continuous ; 200% for 5 minutes									
Battery Plant		Compatible Technologies	VRLA, Premium Durathon VRLA, Wet Cell (and DC Flwheel technologies)								
	Float Voltage	545 VDC @68 degr F (20° C)									
	Recharge Time	10X discharge time (at 30min battery runtime)									
	Internal Batteries Available	Yes	No								
General	Audible Noise	60 db(A)				63 db(A)		65 db(A)			
	Ambient Operating Temp	UPS Module: 32 to 104 degr F (0-40° C)									
	Humidity	0-95% non-condensing									
	Certifications	Seismic Certified , GE EcoMagination Certified									
	Listings/Registrations	UL1778 / IEC62040 / ISO 9001									
	Enclosure	IP20 and NEMA PE-1									
	RFI/Surge Protection	EN50091-2 / IEC 62040-2 / IEEE 587B / FCC Class A Part B Compliance. Special FCC Filters available									
	Communication/Connectivity	RS232, programmable alrms contacts, programmable relays, optional SNMP, Modbus									
	Color	Black w/grey logo & kickplates									
Warranty	12 month after startup or 18 month after shipment (whichever first). Extended warranties available.										

For more technical information, please refer to applicable product Technical Datasheet

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